PRESIDENCY UNIVERSITY
Private University Estd. in Karnataka State by Act No. 41 of 2013
Itgalpura, Rajankunte, Yelahanka, Bengaluru – 560064

PRESIDENCY SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING

Program Regulations and Curriculum 2026-2030

BACHELOR OF TECHNOLOGY (B.Tech.) in MECHANICAL ENGINEERING

based on Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

Table of Contents

Clause No.	Contents	Page Number
PART A – PROGRAM REGULATIONS		
1	Vision & Mission of the University and the School / Department	1
2	Preamble to the Program Regulations and Curriculum	2
3	Short Title and Applicability	2
4	Definitions	2
5	Program Description	4
6	Minimum and Maximum Duration	4
7	Program Educational Objectives (PEO)	5
8	Program Outcomes (PO) and Program Specific Outcomes (PSO)	5
9	Admission Criteria (as per the concerned Statutory Body)	6
10	Lateral Entry / Transfer Students requirements	7
11	Change of Branch / Discipline / Specialization	9
12	Specific Regulations regarding Assessment and Evaluation	10
13	Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc.	12
PART B: PROGRAM STRUCTURE		
14	Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements	15
15	Minimum Total Credit Requirements of Award of Degree	16
16	Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies	16
PART C: CURRICULUM STRUCTURE		
17	Curriculum Structure – Basket Wise Course List	17
18	Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project	19
19	List of Elective Courses under various Specializations / Stream Basket	21
20	List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters).	23
21	List of MOOC (NPTEL) Courses	25
22	Recommended Semester Wise Course Structure / Flow including the Program / Discipline Elective Paths / Options	26
23	Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Program Electives	30

PART A – PROGRAM REGULATIONS

1. Vision & Mission of the University and the School / Department

1.1 Vision of the University

To be a value-driven global university, excelling beyond peers and creating professionals of integrity and character having concern and care for society

1.2 Mission of the University

- Commit to be an innovative and inclusive institution by seeking excellence in teaching, research and knowledge-transfer.
- Pursue Research and Development and its dissemination to the community, at large.
- Create, sustain and apply learning in an interdisciplinary environment with consideration for ethical, ecological and economic aspects of nation building.
- Provide knowledge-based technological support and services to the industry in its growth and development.
- To impart globally-applicable skill-sets to students through flexible course offerings and support industry's requirement and inculcate a spirit of new-venture creation.

1.3 Vision of Presidency School of Engineering

To be a value based, practice-driven School of Engineering and Technology, committed to developing globally-competent Engineers, dedicated to transforming Society.

1.4 Mission of Presidency School of Engineering

- Cultivate a practice-driven environment with a contemporary Learning-pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the field of Core Engineering.
- Establish state-of-the-art facilities for effective Teaching and Learning-experiences.
- Promote Interdisciplinary Studies to nurture talent and impart relevant skill-sets for global impact.
- Instil Entrepreneurial and Leadership Skills to address Social, Environmental, and Community-needs.

1.5 Vision of Department of Mechanical Engineering

To evolve as a globally recognized Centre of Excellence in mechanical engineering and empowering students to address industrial and societal challenges through innovation, research, and sustainable solutions.

1.6 Mission of Department of Mechanical Engineering

- Impart comprehensive and cutting-edge mechanical engineering education through state-of-the-art laboratory infrastructure, experienced faculty, and an inclusive, dynamic learning environment that fosters technical excellence and innovation.

- Promote research and collaboration with industry and academia to develop practical and sustainable solutions for industrial and societal needs.

- Empower students to become ethical, skilled professionals and responsible global citizens committed to lifelong learning and continuous professional growth.

2. Preamble to the Program Regulations and Curriculum

This is the subset of Academic Regulations and it is to be followed as a requirement for the award of B.Tech degree.

The Curriculum is designed to take into the factors listed in the Choice Based Credit System (CBCS) with focus on Social Project Based Learning, Industrial Training, and Internship to enable the students to become eligible and fully equipped for employment in industries, choose higher studies or entrepreneurship.

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations of the University, the Academic Council hereby makes the following Regulations.

3. Short Title and Applicability

a. These Regulations shall be called the Bachelor of Technology Degree Program Regulations and Curriculum 2025-2029.
b. These Regulations are subject to, and pursuant to the Academic Regulations.
c. These Regulations shall be applicable to the ongoing Bachelor of Technology Degree Programs of the 2025-2029 batch, and to all other Bachelor of Technology Degree Programs which may be introduced in future.
d. These Regulations shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum, along with all the amendments thereto.
e. These Regulations shall come into force from the Academic Year 2025-2026.

4. Definitions

In these Regulations, unless the context otherwise requires:

a. "Academic Calendar" means the schedule of academic and miscellaneous events as approved by the Vice Chancellor;
b. "Academic Council" means the Academic Council of the University;
c. "Academic Regulations" means the Academic Regulations, of the University;
d. "Academic Term" means a Semester or Summer Term;
e. "Act" means the Presidency University Act, 2013;
f. "AICTE" means All India Council for Technical Education;
g. "Basket" means a group of courses bundled together based on the nature/type of the course;
h. "BOE" means the Board of Examinations of the University;
i. "BOG" means the Board of Governors of the University;
j. "BOM" means the Board of Management of the University;
k. "BOS" means the Board of Studies of a particular Department/Program of Study of the University;
l. "CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations;

m. *"Clause" means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;*

n. *"COE" means the Controller of Examinations of the University;*

o. *"Course In Charge" means the teacher/faculty member responsible for developing and organising the delivery of the Course;*

p. *"Course Instructor" means the teacher/faculty member responsible for teaching and evaluation of a Course;*

q. *"Course" means a specific subject usually identified by its Course-code and Course-title, with specified credits and syllabus/course-description, a set of references, taught by some teacher(s)/course-instructor(s) to a specific class (group of students) during a specific Academic Term;*

r. *"Curriculum Structure" means the Curriculum governing a specific Degree Program offered by the University, and, includes the set of Baskets of Courses along with minimum credit requirements to be earned under each basket for a degree/degree with specialization/minor/honours in addition to the relevant details of the Courses and Course catalogues (which describes the Course content and other important information about the Course). Any specific requirements for a particular program may be brought into the Curriculum structure of the specific program and relevant approvals should be taken from the BOS and Academic Council at that time.*

s. *"DAC" means the Departmental Academic Committee of a concerned Department/Program of Study of the University;*

t. *"Dean" means the Dean / Director of the concerned School;*

u. *"Degree Program" includes all Degree Programs;*

v. *"Department" means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;*

w. *"Discipline" means specialization or branch of B.Tech. Degree Program;*

x. *"HOD" means the Head of the concerned Department;*

y. *"L-T-P-C" means Lecture-Tutorial-Practical-Credit – refers to the teaching – learning periods and the credit associated;*

z. *"MOOC" means Massive Open Online Courses;*

aa. *"MOU" means the Memorandum of Understanding;*

bb. *"NPTEL" means National Program on Technology Enhanced Learning;*

cc. *"Parent Department" means the department that offers the Degree Program that a student undergoes;*

dd. *"Program Head" means the administrative head of a particular Degree Program/s;*

ee. *"Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum, 2025-2029;*

ff. *"Program" means the Bachelor of Technology (B.Tech.) Degree Program;*

gg. *"PSOE" means the Presidency School of Engineering;*

hh. *"Registrar" means the Registrar of the University;*

ii. *"School" means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;*

jj. *"Section" means the duly numbered Section, with Clauses included in that Section, of*

these Regulations;

kk. "SGPA" means the Semester Grade Point Average as defined in the Academic Regulations;

ll. "Statutes" means the Statutes of Presidency University;

mm. "Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;

nn. "Summer Term" means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days;

oo. "SWAYAM" means Study Webs of Active Learning for Young Aspiring Minds.

pp. "UGC" means University Grant Commission;

qq. "University" means Presidency University, Bengaluru; and

rr. "Vice Chancellor" means the Vice Chancellor of the University.

5. Program Description

The Bachelor of Technology Degree Program Regulations and Curriculum 2025-2029 are subject to, and, pursuant to the Academic Regulations. These Program Regulations shall be applicable to the following ongoing Bachelor of Technology (B.Tech.) Degree Programs of 2025-2029 offered by the Presidency School of Engineering (PSOE):

1. Bachelor of Technology in Civil Engineering, abbreviated as B.Tech. (Civil Engineering)
2. Bachelor of Technology in Electronics and Communication Engineering, abbreviated as B.Tech. (Electronics and Communication Engineering)
3. Bachelor of Technology in VLSI, abbreviated as B.Tech. (VLSI)
4. Bachelor of Technology in Electrical and Electronics Engineering, abbreviated as B.Tech. (Electrical and Electronics Engineering)
5. Bachelor of Technology in Mechanical Engineering, abbreviated as B.Tech. (Mechanical Engineering); and
6. Bachelor of Technology in Petroleum Engineering, abbreviated as B.Tech. (Petroleum Engineering)

5.1 These Program Regulations shall be applicable to other similar programs, which may be introduced in future.

5.2 These Regulations may evolve and get amended or modified or changed through appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.

5.3 The effect of periodic amendments or changes in the Program Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations

6. Minimum and Maximum Duration

6.1 Bachelor of Technology Degree Program is a Four-Year, Full-Time Semester based program. The minimum duration of the B.Tech. Program is four (04) years and each year comprises of two academic Semesters (Odd and Even Semesters) and hence the duration of the B.Tech. program is eight (08) Semesters.

6.2 A student who for whatever reason is not able to complete the Program within the normal period or the minimum duration (number of years) prescribed for the Program, may be allowed a period of two years beyond the normal period to complete the mandatory minimum credits requirement as prescribed by the concerned Program Regulations and Curriculum. In general, the permissible maximum duration (number of years) for completion of Program is 'N' + 2 years, where 'N' stands for the normal or minimum duration (number of years) for completion of the concerned Program as prescribed by the concerned Program Regulations and Curriculum.

6.3 The time taken by the student to improve Grades/CGPA, and in case of temporary withdrawal/re-joining (Refer to **Error! Reference source not found.** of Academic R egulations), shall be counted in the permissible maximum duration for completion of a Program.

6.4 In exceptional circumstances, such as temporary withdrawal for medical exigencies where there is a prolonged hospitalization and/or treatment, as certified through hospital/medical records, women students requiring extended maternity break (certified by registered medical practitioner), and, outstanding sportspersons representing the University/State/India requiring extended time to participate in National/International sports events, a further extension of one (01) year may be granted on the approval of the Academic Council.

6.5 The enrolment of the student who fails to complete the mandatory requirements for the award of the concerned Degree (refer Section 19 of Academic Regulations) in the prescribed maximum duration (Sub-Clauses 18.1 and 18.2 of Academic Regulations), shall stand terminated and no Degree shall be awarded.

7 Program Educational Objectives (PEO)

After four years of successful completion of the program, the graduates shall be to:

PEO1. Demonstrate technical proficiency and problem-solving abilities in mechanical engineering to excel in their professional careers.

PEO2. Engage in innovative research, development, and lifelong learning to contribute to technological development and address the needs of industry and society

PEO3. Exhibit leadership, ethical responsibility, and effective communication to work collaboratively in multidisciplinary and global environments.

8 Program Outcomes (PO) and Program Specific Outcomes (PSO)

8.1 Program Outcomes (PO)

On successful completion of the Program, the students shall be able to:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

8.2 Program Specific Outcomes (PSOs):

On successful completion of the Program, the students shall be able to:

PSO1: Apply core principles of thermodynamics, materials science, and manufacturing, to analyze and solve complex mechanical engineering problems using modern computational tools and emerging technologies

PS02: Demonstrate practical competence in designing, manufacturing, and testing mechanical components and systems through laboratory experiments, workshops, industry-driven projects and internships.

PSO3: Exhibit professional ethics, effective communication, teamwork, and leadership skills to function effectively in multidisciplinary and societal environments.

9 Admission Criteria (as per the concerned Statutory Body)

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be made through

a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time**.** The admission criteria to the B.Tech. Program is listed in the following Sub-Clauses:

9.1 An applicant who has successfully completed Pre-University course or Senior Secondary School course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognized university of India or outside or from Senior Secondary Board or equivalent, constituted or recognized by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the Program.

9.2 Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University / Higher Secondary / (10+2) / (11+1) examination, along with either Chemistry / Biology / Electronics / Computer Science / Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.

9.3 The applicant must have appeared for Joint Entrance Examinations (JEE) Main / JEE (Advanced) / Karnataka CET / COMED-K, or any other State-level Engineering Entrance Examinations.

9.4 Reservation for the SC / ST and other backward classes shall be made in accordance with the directives issued by the Government of Karnataka from time to time.

9.5 Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission, issued from time to time, by the Government of India.

9.6 Candidates must fulfil the medical standards required for admission as prescribed by the University.

9.7 If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.

9.8 The decision of the BOM regarding the admissions is final and binding.

10 Lateral Entry / Transfer Students requirements

10.1 Lateral Entry

The University admits students directly to the second year (3rd Semester) of the B.Tech. Degree program as per the provisions and/or regulations of the Government of Karnataka pertaining to the "Lateral Entry" scheme announced by the Government from time to time. Further, the general conditions and rules governing the provision of Lateral Entry to the B.Tech. Program of the University are listed in the following Sub-Clauses:

10.1.1 Admission to 2nd year (3rd Semester) of the B.Tech. Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognized by the University), who have secured not

less than forty-five percentage (45%) marks in the final year examination (5th and 6th Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC / ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).

10.1.2 Provided further that, candidates seeking Lateral Entry may be required to complete specified bridge Courses as prescribed by the University. Such bridge Courses, if any, shall not be included in the CGPA computations.

10.1.3 All the existing Regulations and Policies of the University shall be binding on all the students admitted to the Program through the provision of Lateral Entry.

10.1.4 The Course requirements prescribed for the 1st Year of the B.Tech. Program shall be waived for the student(s) admitted through Lateral Entry and the duration of the B.Tech. Program for such students is three (03) years, commencing from the 3rd Semester (commencement of the 2nd Year) of the B.Tech. Program and culminating with the 8th Semester (end of the 4th Year) of the B.Tech. Program.

10.1.5 Provided that, if a Lateral Entry student misses any mandatory program specific courses that are typically offered in the 1st year (1st or 2nd semesters), then those courses must be cleared by the students as soon as possible, preferably during the Summer Term.

10.1.6 The existing Program Regulations of the concerned Program to which the student is admitted through the provision of Lateral Entry shall be binding on the student with effect from the 3rd Semester of the Program. i.e., the Program Structure and Curriculum from the 3rd to 8th Semesters of the Program concerned shall be binding on the student admitted through Lateral Entry. Further, any revisions / amendments made to the Program Regulations thereafter, shall be binding on all the students of the concerned Program.

10.1.7 All the Courses (and the corresponding number of Credits) prescribed for the 1st Year of the concerned B.Tech. Program shall be waived for the student(s) admitted to the concerned B.Tech Program through Lateral Entry. Further, the *Minimum Credit Requirements* for the award of the B.Tech. Degree in the concerned Program shall be prescribed / calculated as follows:

The ***Minimum Credit Requirements*** for the award of the Bachelor of Technology (B.Tech.) Degree prescribed by the concerned Bachelor of Technology Degree Program Regulations and Curriculum, 2025-2029, minus the number of Credits prescribed / accepted by the Equivalence Committee for the 1st Year (1st and 2nd Semesters) of the B.Tech. Program.

For instance, if the *Minimum Credit Requirements* for the award of the Bachelor of Technology (B.Tech.) Degree as prescribed by the Regulations for B.Tech. (Mechanical Engineering) is "N" Credits, and, if the total credits prescribed in the 1st Year (total credits of the 1st and 2nd Semesters) of the Program concerned is "M" Credits, then the *Minimum Credit Requirements* for the award of the B.Tech. in Mechanical Engineering for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

10.1.8 Further, no other waiver except the Courses prescribed for the 1st year of the B.Tech. Program of the University shall be permissible for students joining the B.Tech. Program through the provision of Lateral Entry.

10.2 Transfer of student(s) from another recognized University to the 2nd year (3rd Semester) of the B.Tech. Program of the University

A student who has completed the 1st Year (i.e., passed in all the Courses / Subjects prescribed for the 1st Year) of the B.Tech. / B.E. / B.S., Four-Year Degree Program from another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the B.Tech. Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:

10.2.1 The concerned student fulfils the criteria specified in Sub-Clauses 10.1.1, 10.1.2 and 10.1.3.

10.2.2 The student shall submit the Application for Transfer along with a non-refundable Application Fee (as prescribed by the University from time to time) to the University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) B.Tech. Program commencing on August 1 on the year concerned.

10.2.3 The student shall submit copies of the respective Marks Cards / Grade Sheets / Certificates along with the Application for Transfer.

10.2.4 The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the B.Tech. / B.E. / B.S. Four Degree Program from the concerned University, are declared equivalent and acceptable by the Equivalence Committee constituted by the Vice Chancellor for this purpose. Further, the Equivalence Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the B.Tech. Program of the University.

10.2.5 The Branch / Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

11. Change of Branch / Discipline / Specialization

A student admitted to a particular Branch of the B.Tech. Program will normally continue studying in that Branch till the completion of the program. However, the University reserves the right to provide the option for a change of Branch, or not to provide the option for a change of Branch, at the end of 1st Year of the B.Tech. Program to eligible students in accordance with the following rules and guidelines: framed by the University from time to time.

11.1 Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the B.Tech. Program and obtained a CGPA of not less than 6.50 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.

11.2 Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the B.Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.

11.3 The student provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the B.Tech. Program, the Fee Policy pertaining to that Branch of the B.Tech. Program, and, all other rules pertaining to the changed Branch existing at the time.

11.4 Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.

11.5 The eligible student may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the conditions given below:

11.5.1 The actual number of students in the 3rd Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch;

11.5.2 The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.

The process of change of Branch shall be completed within the first five days of Registration for the 3rd Semester of the B.Tech. Program.

12 Specific Regulations regarding Assessment and Evaluation (including the Assessment Details of NTCC Courses, Weightages of Continuous Assessment and End Term Examination for various Course Categories)

12.1 The academic performance evaluation of a student in a Course shall be according to the University Letter Grading System based on the class performance distribution in the Course.

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 12.5 of academic regulations) shall be clearly defined in the Course Plan for every Course, and approved by the DAC.

12.3 Format of the End-Term examination shall be specified in the Course Plan.

12.4 Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:

- Non-Teaching Credit Courses (NTCC)
- Courses with a class strength less than 30

Absolute grading method may be adopted, where necessary with prior approval of concerned DAC.

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10 of academic regulations) shall be awarded to a student based on her/his overall performance relative to the class performance distribution in the concerned Course. These Letter Grades not only indicate a qualitative assessment of the student's performance but also carry a quantitative (numeric) equivalent called the Grade Point.

12.5 Assessment Components and Weightage

Table 1: Assessment Components and Weightage for different category of Courses		
Nature of Course and Structure	**Evaluation Component**	**Weightage**
Lecture-based Course L component in the L-T-P Structure is predominant (more than 1) (Examples: 3-0-0; 3-0-2; 2-1-0; 2-0-2, 2-0-4 etc.)	Continuous Assessments	50%
	End Term Examination	50%
Lab/Practice-based Course P component in the L-T-P Structure is predominant (Examples: 0-0-4; 1-0-4; 1-0-2; etc.)	Continuous Assessments	75%
	End Term Examination	25%
Skill based Courses like Industry Internship, Capstone project, Research Dissertation, Integrative Studio, Interdisciplinary Project, Summer / Short Internship, Social Engagement / Field Projects, Portfolio, and such similar Non-Teaching Credit Courses, where the pedagogy does not lend itself to a typical L-T-P structure	Guidelines for the assessment components for the various types of Courses, with recommended weightages, shall be specified in the concerned Program Regulations and Curriculum / Course Plans, as applicable.	

The exact weightages of Evaluation Components shall be clearly specified in the concerned PRC and respective Course Plan.

Normally, for Practice/Skill based Courses, without a defined credit structure (L–T–P) [NTCC], but with assigned Credits (as defined in Clause 5.2 of the Academic Regulations), the method of evaluation shall be based only on Continuous Assessments. The various components of Continuous Assessments, the distribution of weightage among such components, and the method of evaluation/assessment, shall be as decided and indicated in the Course Plan/PRC. The same shall be approved by the respective DAC.

12.6 Minimum Performance Criteria:

12.6.1 Theory only Course and Lab/Practice Embedded Theory Course

A student shall satisfy the following minimum performance criteria to be eligible to earn the credits towards the concerned Course:

a. A student must obtain a minimum of 30% of the total marks/weightage assigned to the End Term Examinations in the concerned Course.

b. The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of the components of Continuous Assessments, Mid Term Examinations and End Term Examinations in the concerned Course.

12.6.2 Lab/Practice only Course and Project Based Courses

The student must obtain a minimum of 40% of the AGGREGATE of the marks/weightage of all assessment components in the concerned Course.

12.6.3 A student who fails to meet the minimum performance criteria listed above in a Course shall be declared as "Fail" and given "F" Grade in the concerned Course. For theory Courses, the student shall have to re-appear in the "Make-Up Examinations" as scheduled by the University in any subsequent semester, or, re-appear in the End Term Examinations of the same Course when it is scheduled at the end of the following Semester or Summer Term, if offered. The marks obtained in the Continuous Assessments (other than the End Term Examination) shall be carried forward and be included in computing the final grade, if the student secures the minimum requirements (as per sub-Clause 8.9.1 and 8.9.2 of academic regulations) in the "Make-Up Examinations" of the concerned Course. Further, the student has an option to re-register for the Course and clear the same in the summer term/ subsequent semester if he/she wishes to do so, provided the Course is offered.

13 Additional clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc. – Note: These are covered in Academic Regulations

The University allows students to acquire credits from other Indian or foreign institutions and/or Massive Open Online Course (MOOC) platforms, subject to prior approval. These credits may be transferred and counted toward fulfilling the minimum credit requirements for the award of a degree. The process of transfer of credits is governed by the following rules and guidelines:

13.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (Refer Annexure B of academic regulations) and approved by the Dean - Academics.

13.2 Students may earn credits from other Indian or foreign Universities/Institutions with which the University has an MOU, and that MOU shall have specific provisions, rules and guidelines for transfer of credits. These transferred credits shall be counted towards the minimum credit requirements for the award of the degree.

13.3 Students may earn credits by registering for Online Courses offered by *Study Web of Active Learning by Young and Aspiring Minds* (SWAYAM) and *National Program*

on Technology Enhanced Learning (NPTEL), or other such recognized Bodies/ Universities/Institutions as approved by the concerned BOS and Academic Council from time to time. The concerned School/Parent Department shall publish/include the approved list of Courses and the rules and guidelines governing such transfer of credits of the concerned Program from time to time. The Rules and Guidelines for the transfer of credits specifically from the Online Courses conducted by SWAYAM/ NPTEL/ other approved MOOCs are as stated in the following Sub-Clauses:

13.3.1 A student may complete SWAYAM/NPTEL/other approved MOOCs as mentioned in Clause 13.3 (as per academic regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and/or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.

13.3.2 SWAYAM/NPTEL/ other approved MOOCs as mentioned in Clause 13.3 (as per academic regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.

13.3.3 Parent Departments may release a list of SWAYAM/NPTEL/other approved MOOCs for Pre-Registration as per schedule in the Academic Calendar or through University Notification to this effect.

13.3.4 Students may Pre-Register for the SWAYAM/NPTEL/other approved MOOCs in the respective Departments and register for the same Courses as per the schedule announced by respective Online Course Offering body/institute/ university.

13.3.5 A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 13.3.2 above.

13.3.6 SWAYAM/NPTEL/other approved MOOCs Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM/NPTEL/other approved MOOCs and obtained a certificate of successful/satisfactory completion.

13.3.7 A student who has successfully completed the approved SWAYAM/NPTEL/ other approved MOOCs and wants to avail the provision of transfer of equivalent credits, must submit the original Certificate of Completion, or such similar authorized documents to the HOD concerned, with a written request for the transfer of the equivalent credits. On verification of the Certificates/Documents and approval by the HOD concerned, the Course(s) and equivalent Credits shall be forwarded to the COE for processing of results of the concerned Academic Term.

13.3.8 The credit equivalence of the SWAYAM/NPTEL/other approved MOOCs are based on Course durations and/or as recommended by the Course offering body/institute/university. The Credit Equivalence mapped to SWAYAM/ NPTEL approved Courses based on Course durations for transfer of credits is summarised in Table shown below. The Grade will be calculated from the marks received by the Absolute Grading Table 8.11 in the academic regulations.

Table 2: Durations and Credit Equivalence for Transfer of Credits from SWAYAM-NPTEL/ other approved MOOC Courses		
Sl. No.	**Course Duration**	**Credit Equivalence**
1	4 Weeks	1 Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

13.3.9 The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree.

13.3.10 The University shall not reimburse any fees/expense; a student may incur for the SWAYAM/NPTEL/other approved MOOCs.

13.4 The maximum number of credits that can be transferred by a student shall be limited to forty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum for the award of the concerned Degree. However, the grades obtained in the Courses transferred from other Institutions/MOOCs, as mentioned in this Section (13.0), shall not be included in the calculation of the CGPA.

13.5 Mandatory Non-Credit Course Completion Requirements: All mandatory non-credit courses shall be satisfactorily completed by the student as part of the degree requirements. These courses will be evaluated and awarded letter grades based on the following criteria:

- **S (Satisfactorily Completed):** Awarded when the student successfully completes all prescribed course requirements.
- **NC (Not Completed):** Awarded when the student fails to meet the prescribed course requirements.

A student receiving an NC grade must reappear for and complete the course in accordance with the guidelines prescribed by the University.

In the case of non-taught and non-credited mandatory courses—where students are advised to undertake learning through MOOC platforms—there shall be a clearly

defined **Course Catalogue** and a corresponding Course Plan. The **Course Plan** shall outline the assessment components, which will form the basis for evaluation.

PART B – PROGRAM STRUCTURE

14. Structure / Component with Credit Requirements Course Baskets & Minimum Basket Wise Credit Requirements

The B.Tech. (Mechanical Engineering) Program Structure (2025-2029) totaling 160 credits. Table 3 summarizes the type of baskets, number of courses under each basket and the associated credits that are mandatorily required for the completion of the Degree.

Table 3: B.Tech. (Mechanical Engineering) 2025-2029: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets

Sl. No.	Baskets	Credit Contribution
1	Humanities and Social Sciences including Management Courses (HSMC)	10
2	Basic Science Courses (BSC)	24
3	Engineering Science Courses (ESC)	22
4	Professional Core Courses (PCC)	64
5	Professional Elective Courses (PEC)	18
6	Open Elective Courses (OEC)	6
7	Project Work (PRW)	16
8	Mandatory Courses (MAC)	0
	Total Credits	**160**

In the entire Program, the practical and skill based course component contribute to an extent of approximately 46% out of the total credits of 160 for B.Tech. (Mechanical Engineering) program of four years' duration.

The curriculum structure is designed as per the CBCS and incorporating OBE Principles. The students are provided with utmost flexibility in selection of the courses of their choice.

A student will have to complete a minimum of 12 credits of Discipline Electives from a given specialization basket, to earn a specialization certificate in addition to the base degree to which he/she has taken admission

Minor Group	Minimum Credits from each minor group for various programs	
	MECHANICAL (MEC)	MECHATRONICS (MCM)
Manufacturing	**18**	**6**
Thermal		
Design		
Mechatronics		**12**
Total credits to be earned in discipline elective basket	**18**	**18**

15. Minimum Total Credit Requirements of Award of Degree

As per the AICTE guidelines, a minimum of 160 credits is required for the award of a B.Tech. degree.

16. Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies,

16.1 The award of the Degree shall be recommended by the Board of Examinations and approved by the Academic Council and Board of Management of the University**.**

16.2 A student shall be declared to be eligible for the award of the concerned Degree if she/he:

a. Fulfilled the Minimum Credit Requirements and the Minimum Credits requirements under various baskets;

b. Secure a minimum CGPA of 4.50 in the concerned Program at the end of the Semester/Academic Term in which she/he completes all the requirements for the award of the Degree as specified in Sub-Clause a of Academic Regulations**;**

c. No dues to the University, Departments, Hostels, Library, and any other such Centers/ Departments of the University; and

d. No disciplinary action is pending against her/him.

PART C: CURRICULUM STRUCTURE

17. Curriculum Structure – Basket Wise Course List List of Courses Tabled – aligned to the Program Structure (Course Code, Course Name, Credit Structure (LTPC), Contact Hours (CH), Course Basket, Type of Skills etc., as applicable).

Table 3.1 : List of Humanities and Social Sciences including Management Courses (HSMC)						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	ENG1900	English for Technical Communication	2	0	0	2
2	PPS4006	Logical and Critical Thinking	0	0	2	1
3	ENG2501	Advanced English	2	0	0	2
4	FIN1005	Finance Essentials for Decision Making	3	0	0	3
5	PPS3019	Corporate Communications	0	0	2	1
6	DES1146	Introduction to Design Thinking	1	0	0	1
		Total No. of Credits				**10**

Table 3.2 : List of Basic Science Courses (BSC)						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MAT1211	Linear Algebra, Differential Equations and Statistical Methods	3	1	0	4
2	MAT1214	Calculus, Differential Equations and Vector Analysis	3	1	0	4
3	PHY2503	Fundamentals of Materials Physics	3	0	0	3
4	CHE2505	Materials Chemistry for Engineers	3	0	0	3
5	PHY2506	Fundamentals of Materials Physics Lab	0	0	2	1
6	CHE2506	Materials Chemistry Lab	0	0	2	1
7	MAT2315	Laplace Transform, Complex Variables and Optimization Techniques for Mechanical Engineering	3	1	0	4
8	MAT2325	Partial Differential Equations and Numerical Methods for Mechanical Systems	3	1	0	4
		Total No. of Credits				**24**

Table 3.3 : List of Engineering Science Courses (ESC)						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CIV1200	Foundations of Integrated Engineering	2	0	0	2

2	MEC1000	Workshop Practice	0	0	2	1
3	MEC1006	Engineering Graphics	2	0	0	2
4	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3
5	EEE1251	Basics of Electrical and Electronics Engineering Lab	0	0	2	1
6	MEC2500	Engineering Mechanics	3	0	0	3
7	MEC2505	Mechanics of Solids	3	1	0	4
8	ECE1511	Design Workshop	1	0	2	2
9	CSE2282	Computational Thinking and AI Programming	3	0	0	3
10	CSE2283	Computational Thinking and AI Programming Lab	0	0	2	1
					Total No. of Credits	**22**

Table 3.4 : List of Professional Core Courses (PCC)

S. No	Course Code	Course Name	L	T	P	C
1	MEC2020	Material Science and Metallurgy	3	0	0	3
2	MEC2021	Material Science and Material Testing Lab	0	0	2	1
3	MEC2501	Basic Thermodynamics	3	0	0	3
4	MEC2502	Fluid Mechanics and Machinery	3	1	0	4
5	MEC2022	Production Technology	4	0	0	4
6	MEC2023	Foundry Forging and Welding Lab	0	0	2	1
7	MEC2503	Fluid Mechanics and Machinery Lab	0	0	2	1
8	MEC2025	Metrology and Measurements Lab	0	0	2	1
9	MEC2504	Theory of Machines	3	1	0	4
10	MEC2024	Metrology and Measurements	3	0	0	3
11	MEC2515	Applied Thermodynamics	3	1	0	4
12	MEC2509	Heat and Mass Transfer	3	1	0	4
13	MEC2510	Heat and Mass Transfer Lab	0	0	2	1
14	MEC2507	Computer Aided Engineering Drawing	0	0	2	1
15	MEC2028	Machine Shop Practice Lab	0	0	2	1
16	MEC2508	Design of Machine Elements-I	3	0	0	3
17	MEC2514	Design of Machine Elements-II	3	1	0	4
18	MEC2026	Mechatronics	3	0	0	3
19	MEC3068	Production and Operations Management	3	0	0	3
20	MEC2027	Mechatronics Lab	0	0	2	1
21	MEC2017	Computer Aided Machine Drawing	0	0	4	2
22	MEC2512	Finite Element Analysis	3	0	0	3
23	MEC3062	Hydraulics and Pneumatics	3	0	0	3
24	MEC2516	IC Engines and Fuels	3	0	0	3
25	MEC4008	Mechanisms, Machines and Design Lab	0	0	2	1
26	MEC3032	Energy Conversion Lab	0	0	2	1
27	MEC2513	Finite Element Analysis Lab	0	0	2	1

Total No. of Credits	**64**

Table 3.5 : List of course in Project Work basket (PRW)						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MEC7100	Minor Project	-	-	-	4
2	MEC7000	Internship	-	-	-	2
3	MEC7300	Capstone Project	-	-	-	10
					Total No. of Credits	**16**

Table 3.6 : Mandatory Course						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CHE7601	Environmental Studies	1	0	0	0
2	LAW7601	Indian Constitution	1	0	0	0
3	CIV7601	Universal Human Values and Ethics	1	0	0	0
4	PPS1025	Industry Readiness Program - I	0	0	2	0
5	PPS1026	Industry Readiness Program - II	0	0	2	0
6	APT4002	Introduction to Aptitude	0	0	2	0
7	APT4004	Aptitude Training - Intermediate	0	0	2	0
8	APT4006	Logical and Critical Thinking	0	0	2	0
					Total No. of Credits	0

18. Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini project

Practical / Skill based Courses like internship, project work, capstone project, research project / dissertation, and such similar courses, where the pedagogy does not lend itself to a typical L-T-P-C Structure as defined in Clause 5.1 of the Academic Regulations are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Handout.

18.1 Internship

A student may undergo an Internship for a period of 4-6 weeks in an industry / company or academic / research institution during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters. Alternatively, he/she may complete a 12- to 14-

week internship during a full semester (7th or 8th semester) subject to the following conditions:

18.1.1 The Internship shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.

18.1.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Internship to a student;

18.1.3 The number of Internships available for the concerned Academic Term. Further, the available number of internships shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Internship, as stated in Sub-Clause 18.1.2 above.

18.1.4 A student may opt for Internship in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Internship confirms to the University that the Internship shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

18.1.5 A student selected for an Internship in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

18.2 Project Work

A student may opt to do a Project Work for a period of 4-6 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Internship during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters or during the 5th / 6th / 7th Semester as applicable, subject to the following conditions:

18.2.1 The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.2.2 The student may do the project work in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.2.1). Provided further, that the Industry / Company or academic / research institution offering such project work confirms to the University that the project work will be conducted in accordance with the Program Regulations and requirements of the University.

18.3 Capstone Project

A student may undergo a Capstone Project for a period of 12-14 weeks in an industry / company or academic / research institution in the 7th / 8th Semester as applicable, subject to the following conditions:

18.3.1 The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.

18.3.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Capstone Project to a student;

18.3.3 The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated in Sub-Clause 18.3.2 above.

18.3.4 A student may opt for Capstone Project in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the I Capstone Project on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Capstone Project confirms to the University that the Capstone Project shall be conducted in accordance with the Program Regulations and Capstone Project Policy of the University.

18.3.5 A student selected for a Capstone Project in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Capstone Project Policy of the University.

18.4 Research Project / Dissertation

A student may opt to do a Research Project / Dissertation for a period of 12-14 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Capstone Project, subject to the following conditions:

18.4.1 The Research Project / Dissertation shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.4.1). Provided further, that the Industry / Company or academic / research institution offering such Research Project / Dissertation confirms to the University that the Research Project / Dissertation work will be conducted in accordance with the Program Regulations and requirements of the University.

19.List of Elective Courses under various Specialisations / Stream Basket

Table 3.7 : Professional Electives Courses/Specialization Tracks – Minimum of 12 credits is to be earned by the student in a particular track and overall 18 credits.

Track 1 - Manufacturing

S.No	Course Code	Course Name	L	T	P	C
1	MEC3034	Computer Integrated Manufacturing	3	0	0	3
2	MEC3038	Smart Manufacturing	3	0	0	3

3	MEC3009	Nanotechnology	3	0	0	3
4	MEC3036	Flexible Manufacturing Systems	3	0	0	3
5	MEC3055	Product Design for Manufacturing and Assembly	3	0	0	3
6	MEC3035	Production Planning and Control	3	0	0	3
7	MEC3019	Additive Manufacturing and Its Applications	3	0	0	3
8	MEC3046	Micro and Nano Manufacturing	3	0	0	3
9	MEC3016	Statistics and Quality Control	3	0	0	3
10	MEC3409	Digital Manufacturing and IOT	3	0	0	3
11	MEC3410	Lean Manufacturing	3	0	0	3
12	MEC3040	Modern Manufacturing Processes	3	0	0	3
13	MEC3440	Fixed Equipment in Oil and Gas Industry	3	0	0	3
14	MEC3441	Reliability and Maintenance in Oil and Gas Industry	3	0	0	3
Track 2 – Mechatronics						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MEC3060	Robotics	3	0	0	3
2	MEC3063	Control Engineering	3	0	0	3
3	MEC3413	Vehicle Health Monitoring, Maintenance and Safety	3	0	0	
4	MEC3414	Introduction to marine and Aerial Robotics	3	0	0	3
5	MEC3099	Autonomous Mobile Robots	3	0	0	3
6	MEC3076	Human Robot Interaction	3	0	0	3
7	MEC3417	Smart Mobility and Intelligent Vehicles	3	0	0	3
8	MEC3064	Manufacturing Control and Automation	3	0	0	3
9	MEC3419	Micro electro Mechanical systems	3	0	0	3
10	MEC3065	Introduction to Robotics and Automation	3	0	0	3
11	MEC3445	AI In Robotics & Automation	0	0	2	1
12	MEC3446	Predictive Maintenance and Condition Monitoring using AI	0	0	2	1
13	MEC3447	Computational Methods and AI Tools in Mechanical Design	3	0	0	3
Track 3 – Thermal Engineering						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MEC3025	Power Plant Engineering	3	0	0	3
2	MEC3026	Turbomachinery	3	0	0	3
3	MEC2001	Renewable Energy Systems	3	0	0	3
4	MEC3029	Advanced Heat Transfer	3	0	0	3
5	MEC3028	Compressible Fluid Flow	3	0	0	3
6	MEC3027	Refrigeration and Air Conditioning	3	0	0	3
7	MEC3033	Alternate Fuels	3	0	0	3
8	MEC3428	Computational Fluid Dynamics	3	0	0	3
9	MEC3082	Elements of Solar Energy Conversion	3	0	0	3
10	MEC3096	Product Design in RAC	3	0	0	3
Track 4 – Design						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	MEC3431	Mechanical Vibrations	3	0	0	3
2	MEC3050	Experimental Stress Analysis	3	0	0	3

3	MEC4010	Product Life Cycle Management	2	0	2	3
4	MEC3053	Theory of Elasticity	3	0	0	3
5	MEC3054	Theory of Plasticity	3	0	0	3
6	MEC3436	Tribology	3	0	0	3
7	MEC3051	Fracture Mechanics	3	0	0	3
8	MEC3049	Mechanics of Composite Materials	3	0	0	3
9	MEC3075	Automotive Body Design	3	0	0	3

20. List of Open Electives to be offered by the School / Department (Separately for ODD and EVEN Semesters.

Sl. No.	Course Code	Course Name	L	T	P	C	Anti-requisites
Chemistry Basket							
1	CHE3001	Smart Materials and 3D Printing	3	0	0	3	-
2	CHE3002	Energy and Sustainability	3	0	0	3	-
3	CHE3003	Nano technology and its applications	3	0	0	3	-
4	CHE3004	Corrosion and control	3	0	0	3	-
5	CHE3005	Green Chemistry and Sustainable Technology	3	0	0	3	-
6	CHE3006	Food Technology	3	0	0	3	-
Civil Engineering Basket (not to be offered for Civil Engineering Department students)							
1	CIV3100	Disaster mitigation and management	3	0	0	3	-
2	CIV3101	Sustainability Concepts in Engineering	3	0	0	3	-
3	CIV3102	Occupational Health and Safety	3	0	0	3	-
4	CIV3103	Sustainable Materials and Green Buildings	3	0	0	3	-
5	CIV3104	Integrated Project Management	3	0	0	3	-
6	CIV3105	Environmental Impact Assessment	3	0	0	3	-
7	CIV3106	Infrastructure Systems for Smart Cities	3	0	0	3	-
8	CIV3107	Geospatial Applications for Engineers	2	0	2	3	-
9	CIV3108	Environmental Meteorology	3	0	0	3	-
10	CIV3109	Project Problem Based Learning	3	0	0	3	-
11	CIV3110	Sustainability for Professional Practice	3	0	0	3	-
Commerce Basket							
1	MGT2015	Engineering Economics	3	0	0	3	-
2	MGT2020	Marketing Fundamentals for Engineers	3	0	0	3	-
3	MGT2021	Finance for Engineers	3	0	0	3	-
4	MGT2007	Digital Entrepreneurship	3	0	0	3	-
5	COM1020	Business Accounting & Financial Analysis	2	1	0	3	-
6	BBA2088	Management and Behavioural Practices	3	0	0	3	-
Design Basket							
1	DES2001	Design Thinking	3	0	0	3	-
Electrical and Electronics Basket							
1	EEE3100	IoT based Smart Building Technology	3	0	0	3	-

Sl. No.	Course Code	Course Name	L	T	P	C	Anti-requisites
2	EEE3101	Basic Circuit Analysis	3	0	0	3	-
3	EEE3102	Fundamentals of Industrial Automation	3	0	0	3	-
4	EEE3103	Electric Vehicles & Battery technology	3	0	0	3	-
5	EEE3104	Smart Sensors for Engineering Applications	3	0	0	3	-
Electronics and Communication Engineering Basket							
1	ECE3800	Fundamentals of Electronics	3	0	0	3	-
2	ECE3801	Microprocessor based systems	3	0	0	3	-
3	ECE3802	Artificial Neural Networks	3	0	0	3	-
4	ECE3803	Smart Electronics in Agriculture	3	0	0	3	-
5	ECE3804	Environment Monitoring Systems	3	0	0	3	-
6	ECE3805	Consumer Electronics	3	0	0	3	-
7	ECE3806	Product Design of Electronic Equipment	3	0	0	3	-
8	ECE3807	Introduction to Data Analytics	3	0	0	3	-
9	ECE3808	Machine Vision for Robotics	3	0	0	3	-
English Basket							
1	ENG1906	Law and Crime in Popular Imagination	3	0	0	3	-
2	ENG1909	Exploring Gender: Narratives from Campus to Community	3	0	0	3	-
3	ENG1910	Trauma Narratives: From Page to Pixel	3	0	0	3	-
4	ENG1911	'Nonsense' Across Media	3	0	0	3	-
5	ENG1912	Language and Interpretation	3	0	0	3	-
Law Basket							
1	LAW2015	Cyber Law	3	0	0	3	-
2	LAW5005	Law relating to Infrastructure Projects	3	0	0	3	-
Mathematics Basket							
1	MAT3030	Optimization Techniques for Engineers	3	0	0	3	-
2	MAT3031	Basic Statistics & Data Analysis	3	0	0	3	-
3	MAT3032	Mathematics for Machine Learning	3	0	0	3	-
4	MAT3033	Bioinformatics & Computational Biology	3	0	0	3	-
5	MAT3034	Time-Frequency Transforms for Signal Analysis	3	0	0	3	-
6	MAT3035	Mathematical Modelling	3	0	0	3	-
7	MAT3036	Bio-Statistics and Bio-Modelling	3	0	0	3	-
8	MAT3037	Linear Algebra & Matrix Theory	3	0	0	3	-
9	MAT3038	Financial Mathematics	3	0	0	3	-
10	MAT3039	Fuzzy Logic & Neural Networks	3	0	0	3	-
11	MAT3040	Discrete Mathematics	3	0	0	3	-
Media Studies Basket							
1	BAJ3006	Brand Management	3	0	0	3	-
2	BAJ3007	Communication for Social Impact	3	0	0	3	-
3	BAJ3035	Business Journalism	3	0	0	3	-
4	BAJ3017	Political Communication	3	0	0	3	-
5	BAJ3042	Media Literacy Education	3	0	0	3	-
Mechanical Basket							
1	MEC3250	Engineering Drawing	1	0	4	3	-

Sl. No.	Course Code	Course Name	L	T	P	C	Anti-requisites
2	MEC3251	Supply Chain Management	3	0	0	3	-
3	MEC2004	Six Sigma for Professionals	3	0	0	3	-
4	MEC2005	Fundamentals of Aerospace Engineering	3	0	0	3	-
5	MEC2006	Safety Engineering	3	0	0	3	-
6	MEC3255	Additive Manufacturing	3	0	0	3	-
7	MEC3256	Sustainable Technologies and Practices	3	0	0	3	-
8	MEC3257	Industry 4.0	3	0	0	3	-
Petroleum Basket							
1	PET3301	Energy Industry Dynamics	3	0	0	3	-
2	PET3302	Energy Sustainability Practices	3	0	0	3	-
Management Basket – I (One Course to be opted as part of HSMC Basket)							
1	MGTXXXX	Managerial Economics and Finance	3	0	0	3	-
2	MGT2004	Development of Enterprises	3	0	0	3	-
3	MGT2010	Managing People and Performance	3	0	0	3	-
4	MGT2020	Marketing for Engineers	3	0	0	3	-

21.List of MOOC (NPTEL) Courses

21.1 NPTEL - Discipline Elective Courses for B. Tech. (Mechanical Engineering)

Sl. No.	Course ID	Course Name	Duration
1	noc25-ge54	Sustainable Power Generation Systems	12 Weeks
2	noc25-me162	Microfluidics and Nanofluidics	12 Weeks
3	noc25-me167	Energy Conservation and Waste Heat Recovery	12 Weeks
4	noc25-me177	Microrobotics	12 Weeks
5	noc25-me180	Design of Precision Machines	12 Weeks
6	MEC3442	Fundamentals of Additive Manufacturing Technologies	12 Weeks
7	MEC3443	Electric Vehicles	12 Weeks

21.2 NPTEL - Open Elective Courses for B. Tech. (Mechanical Engineering)

Sl. No.	Course ID	Course Name	Duration
1	MEC3444	Engineering Aspects of Biofuels and Biomass Conversion Technologies	12 Weeks
2	noc25-me110	Explosions and Safety	12 Weeks
3	noc25-me125	Rapid Manufacturing	12 Weeks
4	noc25-me133	Compliant Mechanisms: Principles and Design	12 Weeks
5	noc25-me142	Mathematical Modeling of Manufacturing Processes	12 Weeks

22. Recommended Semester Wise Course Structure / Flow including the Program / Discipline Elective Paths / Options

Semester 1 (Physics Cycle)										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	ENG1030	Fundamentals of Communication	1	0	2	2	3	HSMC	-	-
2	MAT1211	Linear Algebra, Differential Equations and Statistical Methods	3	1	0	4	4	BSC	-	-
3	PHY2503	Fundamentals of Materials Physics	3	0	0	3	3	BSC	-	-
4	MEC1006	Engineering Graphics	2	0	0	2	2	ESC	-	-
5	MEC2500	Engineering Mechanics	3	0	0	**3**	3	ESC	-	-
6	ECE1512	Design Thinking in Practice	2	0	2	3	4	ESC	-	-
7	PHY2506	Fundamentals of Materials Physics Lab	0	0	2	1	2	BSC	-	-
8	PPS1025	Industry Readiness Program – I	0	0	2	0	2	MAC	-	-
TOTAL			**16**	**1**	**6**	**18**	**23**		**-**	

Semester 2 (Chemistry Cycle)										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	ENG2030	Communication in Practice	1	0	2	2	3	HSMC	-	-
2	MAT1214	Calculus, Differential Equations and Vector Analysis	3	1	0	4	4	BSC	-	-
3	CHE2505	Materials Chemistry for Engineers	3	0	0	3	3	BSC	-	-
4	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	ESC	-	-
5	MEC1000	Workshop Practice	0	0	2	**1**	2	ESC	-	-
6	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	ESC	-	-
7	CHE2506	Materials Chemistry Lab	0	0	2	1	2	BSC	-	-
8	EEE1251	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	ESC	-	-
9	PPS1026	Industry Readiness Program – II	0	0	2	0	2	MAC	-	-
TOTAL			**15**	**1**	**8**	**17**	**23**	**-**	**-**	**-**

HSMC = Humanities and Social Sciences including Management Courses, BSC = Basic Science Courses, ESC = Engineering Science Courses, PCC = Professional Core Courses, PEC = Professional Elective Courses, OEC = Open Elective Courses, PRW = Project Work, MAC = Mandatory Courses, MGTC = Management Course FC = Foundation Course, SD = Skill Development, EM = Employability, EN = Entrepreneurship GS = Gender Sensitization, ES = Environment and Sustainability, HP = Human Values and Professional Ethics, CH=Contact Hours

Semester 3										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	MAT2315	Laplace Transform, Complex Variables and Optimization Techniques for Mechanical Engineering	3	1	0	4	4	BSC	SD	-
2	MEC2501	Basic Thermodynamics	3	0	0	3	3	PCC	SD	-
3	MEC2502	Fluid Mechanics and Machinery	3	1	0	4	4	PCC	SD	-

4	MEC2503	Fluid Mechanics and Machinery Lab	0	0	2	1	2	PCC	SD	-
5	MEC2022	Production Technology	4	0	0	4	4	PCC	SD	-
6	MEC2023	Foundry Forging and Welding Lab	0	0	2	1	2	PCC	SD	-
7	MEC2020	Material Science and Metallurgy	3	0	0	3	3	PCC	SD	-
8	MEC2021	Material Science and Material Testing Lab	0	0	2	1	2	PCC	SD	-
9	FIN1005	Finance Essentials for Decision Making	3	0	0	3	3	HSMC	EN	-
10	CIV7601	Universal Human Values and Ethics	1	0	0	0	1	-	-	-
11	APT4002	Introduction to Aptitude	0	0	2	0	2	MAC	-	-
TOTAL			**20**	**2**	**8**	**24**	**30**			

Semester 4										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	MAT2325	Partial Differential Equations and Numerical Methods for Mechanical Systems	3	1	0	4	4	BSC		-
2	MEC3068	Production and Operations Management	3	0	0	3	3	PCC	SD	-
3	MEC2505	Mechanics of Solids	3	1	0	4	4	ESC	SD	-
4	MEC2515	Applied Thermodynamics	3	1	0	4	4	PCC	SD	-
5	MEC2024	Metrology and Measurements	3	0	0	3	3	PCC	SD	-
6	MEC2025	Metrology and Measurements Lab	0	0	2	1	2	PCC	SD	-
7	CSE2282	Computational Thinking and AI Programming	3	0	0	3	3	ESC		-
8	CSE2283	Computational Thinking and AI Programming Lab	0	0	2	1	2	ESC		-
9	MEC2507	Computer Aided Engineering Drawing	0	0	2	1	2	PCC	SD	-
10	MEC2028	Machine Shop Practice Lab	0	0	2	1	2	PCC	SD	-
11	APT4004	Aptitude Training - Intermediate	0	0	2	0	2	MAC	-	-
12	CHE7601	Environment Studies	1	-	-	0	1	MAC	-	-
TOTAL			**18**	**3**	**10**	**25**	**32**	**-**	**-**	**-**

Semester 5

S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	MEC2508	Design of Machine Elements-I	3	0	0	3	3	PCC	SD	-
2	MEC2504	Theory of Machines	3	1	0	4	4	PCC	SD	-
3	MEC2509	Heat and Mass Transfer	3	1	0	4	4	PCC	SD	-
4	MEC2510	Heat and Mass Transfer Lab	0	0	2	1	2	PCC	SD	-
5	MECXXXX	Professional Elective – I	3	0	0	3	3	PEC	EM	-
6	MECXXXX	Professional Elective – II	3	0	0	3	3	PEC	EM	-
7	MEC2017	Computer Aided Machine Drawing	0	0	4	2	4	PCC	SD	-
8	APT4006	Logical and Critical Thinking	0	0	2	0	2	MAC	-	-
9	MEC7100	Minor Project	-	-	-	4	-	PRW	SD/EM/EN	-
TOTAL			**15**	**2**	**8**	**24**	**25**			

Semester 6										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	MEC2512	Finite Element Analysis	3	0	0	3	3	PCC	SD	-
2	MEC2513	Finite Element Analysis Lab	0	0	2	1	2	PCC	SD	-
3	MEC2516	IC Engines and Fuels	3	0	0	3	3	PCC	SD	-
4	MEC2514	Design of Machine Elements-II	3	1	0	4	4	PCC	SD	-
5	MEC4008	Mechanisms, Machines and Design Lab	0	0	2	1	2	PCC	SD	-
6	MEC3032	Energy Conversion Lab	0	0	2	1	2	PCC	SD	-
7	MECXXXX	Professional Elective - III	3	0	0	3	3	PEC	EM	-
8	MECXXXX	Professional Elective - IV	3	0	0	3	3	PEC	EM	-
9	APT4005	Aptitude for Employability	0	0	2	1	2	HSMC	-	-
10	XXXXXXX	Open Elective – I	3	0	0	3	3	OEC	EN	-
11	LAW7601	Indian Constitution	1	-	-	-	1	MAC	LAW7601	
TOTAL			**18**	**1**	**8**	**23**	**28**	**-**	**-**	**-**

Semester 7										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			

1	MEC2026	Mechatronics	3	0	0	3	3	PCC	SD	-
2	MEC2027	Mechatronics Lab	0	0	2	1	2	PCC	SD	-
3	MEC3062	Hydraulics and Pneumatics	3	0	0	3	3	PCC	SD	-
4	MECXXXX	Professional Elective – V	3	0	0	3	3	PEC	EM	-
5	MECXXXX	Professional Elective – VI	3	0	0	3	3	PEC	EM	-
6	XXXXXXX	Open Elective – II	3	0	0	3	3	OEC	EN	-
7	MEC7000	Internship	-	-	-	2	-	PRW	SD/EM/EN	-
8	PPS3018	Preparedness for Interview	0	0	2	1	2	HSMC	-	-
TOTAL			**15**	**0**	**4**	**19**	**19**			

Semester 8										
S. NO.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE					BASKET	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C	CH			
1	MEC7300	Capstone Project	-	-	-	10	0	PRW	SD/EM/EN	-
TOTAL						**10**	**0**			

23. Course Catalogue

Course Catalogue of all Courses Listed including the Courses Offered by other School / Department and Discipline / Program Electives – Course Code, Course Name, Prerequisite, Anti-requisite, Course Description, Course Outcome, Course Content (with Blooms Level, CO, No. of Contact Hours), Reference Resources.

Course Catalogues:
The Course Catalogues for the Courses offered by the department of Mechanical Engineering are shared below:

Course Catalogues:

Course Code: MAT1211	**Course Title: Linear Algebra, Differential Equations and Statistical Methods** **Type of Course:1] School Core**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					

Course Pre-requisites	NIL
Anti-requisites	NIL
Course Description	This course introduces fundamental mathematical concepts from linear algebra, differential calculus, ordinary differential equations and statistics. The content includes matrices, systems of linear equations, eigenvalues and eigenvectors, functions of several variables, differential equations, correlation and regression analysis, and curve fitting techniques. The course combines theoretical developments with illustrative applications drawn from scientific and engineering settings. The course emphasizes the application of these mathematical tools in solving problems in science and engineering. It extends student's problem-solving abilities through analytical and computational approaches, with focus on both theoretical understanding and applications.
Course Objective	The objective of this course is to provide students with a strong mathematical foundation required for engineering and scientific studies. The course introduces fundamental concepts from linear algebra, differential calculus, ordinary differential equations, and statistical methods that are widely used in modeling, analysis and problem solving. It aims to familiarize students with mathematical techniques for representing engineering systems, studying relationships among variables, describing dynamic processes and interpreting data. The course serves as a foundation to prepare students for advanced engineering subjects that rely on mathematical modeling, computation and analytical methods.
Course Out Comes	On successful completion of the course the students shall be able to: **CO1:** Use linear algebra concepts to evaluate properties of matrices and quadratic forms. (L3) **CO2:** Apply matrix-based methods to solve systems of linear equations. (L3) **CO3:** Use fundamental theorems and analytical techniques of differential calculus to single variable functions. (L3) **CO4:** Apply the concepts of partial derivatives to multivariable functions. (L3) **CO5:** Solve first order ordinary differential equations using analytical methods. (L3) **CO6:** Employ statistical techniques for data analysis and to interpret relationships between variables. (L3)

Course Content:

odule 1	**Fundamentals of Linear Algebra**	**(15L+5T=20 Sessions)**
Matrices, echelon forms, rank of matrix, Systems of linear equations: Consistency, solution to system of linear homogeneous and non-homogeneous equations- Gauss elimination method, Gauss-Jordan method (Self-study), LU decomposition method, Network analysis using linear systems, Design of traffic patterns, Electrical circuits. Eigenvalue and eigenvector, diagonalization of symmetric matrices, quadratic forms.		
odule 2	**Differential Calculus**	**(15L+5T=20 Sessions)**
Introduction, limit, continuity, Rolle's theorem, mean value theorems, Indeterminate forms and L'Hôpital's rule. Partial derivatives, Euler's theorem, total derivative, Jacobians, Taylor's and Maclaurin's theorems, maxima, minima and saddle points, method of Lagrange multipliers, Current Growth in an RL Circuit, Velocity Estimation, Fuel consumption optimization, Cost function optimization.		
odule 3	**Ordinary Differential Equations**	**(6L+2T=8 Sessions)**
Definition, types of differential equations-variable separable, homogeneous, exact, linear and		

Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Newton's law of cooling, Current in RL circuit.

odule 4	**Statistical Methods and Curve Fitting**	**(9L+3T=12 Sessions)**

Measures of central tendency, moments, skewness, and kurtosis. Correlation - Karl Pearson's coefficient of correlation, rank correlation, multiple correlation. Regression analysis - lines of regression, multiple regression. Principle of least square, curve fitting- straight line, parabola and exponential curves, Stress and strain curve fitting, Feature selection and Prediction models.

rgeted Applications & Tools that can be used:

- Linear Algebra is applied to solve systems of equations in circuits, traffic flow, and network analysis, with eigenvalues and quadratic forms aiding stability and optimization studies.
- Differential Calculus supports process speed analysis, velocity estimation, and optimization techniques such as minimizing fuel consumption and cost functions.
- Differential Equations model dynamic behaviours like current in RL circuits, heat transfer in materials, and growth or decay in environmental and nuclear engineering.
- Statistical Methods and Curve Fitting enable effective data analysis through correlation, regression, and curve fitting, supporting predictive modeling and interpretation of experimental data such as stress-strain relationships.

Software: MATLAB, Python, R Programming, Mathematica, Scilab, Octave

Assignment:

Select any one simple differential equation pertaining to the respective branch of engineering, identify the dependent and independent variable – obtain the solution and compare the solution sets by varying the values of the dependent variable.

Text Book

1. B. S. Grewal, *Higher Engineering Mathematics*, 44th ed. New Delhi, India: Khanna Publishers, 2017.
2. D. C. Montgomery and G. C. Runger, *Applied Statistics and Probability for Engineers*, 7th ed. Hoboken, NJ, USA: Wiley, 2018.

References:

1. P. V. O'Neil, *Advanced Engineering Mathematics*, 8th ed. Boston, MA, USA: Cengage Learning, 2018.
2. R. I. Miller and J. E. Freund, *Probability and Statistics for Engineers*, 9th ed. Noida, India: Pearson Education Ltd., 2017.
3. E. Kreyszig, *Advanced Engineering Mathematics*, 10th ed. Hoboken, NJ, USA: John Wiley & Sons, 2011.
4. V. Henner, T. Belozerova, and M. Khenner, *Ordinary and Partial Differential Equations*. Boca Raton, FL, USA: CRC Press, 2013.

E-resources/ Web links:

1. https://nptel.ac.in/courses/111105121
2. https://nptel.ac.in/courses/111106146
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_106839
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_61605
5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719

6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=TEXTBOOK_LIBRARY01_06082022_174	
Topics relevant to SKILL DEVELOPMENT: The course focuses on the concepts of differential calculus, differential equations and statistical methods with reference to specific engineering problems. The course is of both conceptual and analytical type in nature through Problem solving. This is attained through the assessment component mentioned in course handout.	
Catalogue prepared by	**Dr. Kavita Permi, Dr. Rahul M. P. and Dr. Athmakoori Prashant**
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
CIV1200</td><td colspan="3">Course Title: Foundations of Integrated Engineering
Type of Course: Engineering Science Course</td><td>L-T-P-C</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This interdisciplinary course introduces first-year engineering students to foundational principles and practices across key engineering domains, emphasizing real-world problem-solving, sustainability, and ethical innovation. Students explore how civil, mechanical, electrical, and IT systems intersect with emerging technologies like IoT, AI, and geomatics to address global challenges. Through case studies, learners gain deeper understanding of smart infrastructure, prototyping mechanical/electronic systems, and securing IT solutions. Topics include bioinformatics for environmental monitoring, GIS-enabled urban planning, renewable energy integration, and cybersecurity fundamentals. The course cultivates a holistic understanding of engineering’s role in sustainable development, safety, and ethical decision-making, preparing students to contribute meaningfully to multidisciplinary projects in a technology-driven world.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is skill development of student by using Participative Learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:
CO1] Recall key principles of Agile, DevOps, and bioinformatics used in interdisciplinary engineering contexts.
CO2] Explain the role of GIS, LiDAR, and sustainable materials in designing smart infrastructure and disaster management systems.
CO3] Describe core components of mechanical systems and their real-world applications.
CO4] Describe the functionality of IoT-enabled wearable devices, embedded systems, and renewable energy integration in smart grids.
CO5] List foundational IT concepts such as cloud computing architectures, cybersecurity threats, and blockchain applications.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Foundations of Engineering Practice</td><td>Assignment</td><td colspan="2">Case studies</td><td colspan="2">6 Sessions</td></tr>
<tr><td colspan="8">Real-world problem-solving using data logic and practical applications, Collaboration and Innovation through multi-domain project, Engineering Ethics & Environmental Impact
Emerging Fields: Automation, and Introduction to bioinformatics and its application
Sustainability & Safety: Circular economy principles, carbon footprint analysis.</td></tr>
<tr><td>Module 2</td><td colspan="2">Civil Engineering & Geomatics</td><td>Assignment</td><td colspan="2">Article Review</td><td colspan="2">6 Sessions</td></tr>
<tr><td colspan="8">Smart Infrastructure & Geomatics: GIS mapping, LiDAR, drone surveys for urban planning, Geospatial data analysis for disaster management.
Sustainable Construction: 3D-printed structures, self-healing concrete, Digital twins for infrastructure monitoring.</td></tr>
</table>

Green Innovations: Net-zero energy buildings, rainwater harvesting systems.				
Module 3	Mechanical Engineering in Action	Assignment & Quiz	Data Collection	6 Sessions
Advanced Manufacturing: Collaborative robots (cobots), additive manufacturing and 3D printing, Reverse engineering and prototyping. Energy Systems: Solar/wind energy harvesting, piezoelectric applications. Biomechanics: Prosthetics design, ergonomic product lifecycle.				
Module 4	Electrical & Electronics Engineering	Assignment & Quiz	Data Collection and visualization	6 Sessions
Smart Devices & Systems: Embedded systems, Wearable technology, Edge computing and hardware platforms Energy Innovations: EV charging infrastructure, wireless power transfer, Smart grid integration with renewables.				
Module 5	Fundamentals of IT	Assignment & Quiz	Case studies	6 Sessions
Core IT Topics: Networking basics, Cloud computing Cybersecurity & Data: Encryption, phishing prevention, zero-trust models, Database management. Emerging Tech: Blockchain for supply chains, AI/ML basics, IoT integration with cloud platforms				
Targeted Application & Tools that can be used: Application Areas include Interdisciplinary problem-solving, Smart city planning, disaster management, Robotics prototyping, renewable energy systems, Wearable health tech, smart grids, Secure cloud systems. Tools: 3D Printers, Autocad, Tinkercad, ArcGIS / QGIS, Arduino/Raspberry Pi				
Text Book: 1. William Oakes & Les Leone, "Engineering Your Future: An Introduction to Engineering", Oxford University Press, 9th Edition, 2021 2. Barry F. Kavanagh, "Introduction to Geomatics", Pearson, 5th Edition, 2021 3. Ian Gibson, David Rosen, & Brent Stucker, "Additive Manufacturing Technologies", Springer, 3rd Edition, 2021 4. Sudip Misra, "The Internet of Things: Enabling Technologies, Protocols, and Use Cases", Wiley, 2nd Edition, 2022 5. James Kurose & Keith Ross, "Computer Networking: A Top-Down Approach", Pearson, 8th Edition, 2020				
References 1. Supratim Choudhuri, "Bioinformatics for Beginners: Genes, Genomes, and Molecular Evolution", Academic Press, 1st Edition, 2023, 2. Robert McGinn, "The Ethical Engineer: Contemporary Concepts and Cases", Princeton University Press, 1st Edition, 2020 3. Charles J. Kibert, "Sustainable Construction: Green Building Design and Delivery", Wiley, 5th Edition, 2022 4. Anthony M. Townsend, "Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia", W.W. Norton & Company, 1st Edition, 2020 5. David Buchla, "Renewable Energy Systems: A Smart Energy Systems Approach", Pearson, 2nd Edition, 2023 6. Charles Platt, "Make: Electronics: Learning Through Discovery", Make Community, 3rd Edition, 2021 7. Charles J. Brooks, Christopher Grow, & Philip Craig, "Cybersecurity Essentials", Wiley, 2nd Edition, 2021				
Web-resources:				

1. Post-parametric Automation in Design and Construction https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1155197&site=ehost-live 2. Smart Cities : Introducing Digital Innovation to Cities https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1993146&site=ehost-live 3. Innovation Energy: Trends and Perspectives or Challenges of Energy Innovation https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=2323766&site=ehost-live 4. Additive Manufacturing: Opportunities, Challenges, Implications https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1134464&site=ehost-live	
Catalogue prepared by	Dr. Nakul Ramanna, Dr. Rajiv Ranjan Singh, Mr. N. Gopalakrishnan, Mr. Ajay H A
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: **MEC1000**	**Course Title:** **Workshop Practice** **Type of Course:** **Engineering Science Course**	**L-T-P-C**	**0**	**0**	**2**	**1**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The primary objective of this course is to expose students to the basic skills in handling various tools in a workshop and cover some of the processes used for converting raw materials to finished products. It is a practical oriented Course detailing about various hand tools and conventional manufacturing processes. This course trains the student to manufacture the components using fitting, sheet metal, Arc welding and Soldering. Also, the course introduces basic workshop concepts which include Plumbing, Basic metrology and Electrical circuits					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Workshop Practice**" and attain SKILL DEVELOPMENT through Experiential learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: **Demonstrate** the use of hand tools to machine workpieces to desired dimensions and achieve proper fits through fitting operations. CO2: **Apply** the principles and applications of electric arc welding to create various types of welded joints. CO3: **Apply** the working techniques of sheet metal tools to fabricate different types of sheet metal components. CO4: **Apply** basic workshop practices including plumbing, metrology, and electrical wiring relevant to household and industrial CO5: **Demonstrate** safe working practices and follow standard operating procedures across all workshop sections. CO6: **Interpret** engineering drawings and specifications to carry out workshop tasks with accuracy and precision.					
Course Content:						

Syllabus:

Introduction to basic workshop lab:

All the safety and precaution parameters to be explained. Use of Vernier caliper, Screw gauge and Vernier height gauge will be explained

Preparation of Fitting Model: Explanation to different types of files, try square, hacksaw blade, etc. To cut and file metallic plates to given dimensions in order to make a suitable fit.

Preparation of Sheet Metal Model: Explanation of sheet metal cutting machine, sheet metal thickness measurements, applications, SWG, cutting techniques. Sheet bending & forming technique and tools used for the same.

Preparation of Welding Model: Explanation about welding theory, safety precautions to be adopted, welding machine, tools & accessories, polarity, electrodes, welding positions , various joints, applications etc.

Demonstration:

Plumbing: Explanation of different types of pipes, pipeline connections, holding devices, valves and pipe accessories

Metrology: Measurement of dimensions such as length, inner and outer diameter, depth etc. by using Vernier Caliper and Micrometer

Electrical Circuits: Electrical connections and wiring involved
Targeted Application & Tools that can be used:
Textook: 1. B. S. Nagendra Parashar, R. K. Mittal, "Elements of Manufacturing Processes," Prentice Hall of India . **Reference:** 2. S. K. Hajra Choudhury, "Elements of Workshop Technology - Volume I - Manufacturing Processes,"Media Promoters and Publishers Pvt. Ltd . **Course Material:** "Basic Workshop Lab Manual," Presidency University **Web Resources:** https://presiuniv.knimbus.com/user#/searchresult?searchId=elements%20of%20Mechanical%20Engineering&_t=1659588753433
Topics relevant to "SKILL DEVELOPMENT": Manufacturing processes with machines tools, welding types and process for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Madhusudhan M
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: CHE2505	**Course Title: Materials Chemistry for Engineers** **Type of Course: Theory only (Basic Sciences course)**	L- T-P- C	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Fundamental Knowledge of Chemistry					
Anti-requisites	NIL					
Course Description	The primary objective of the course is to introduce the students to the fundamental concepts and applications of materials chemistry in Engineering. The course also aims to enhance the knowledge of chemical composition of materials, their properties and recent method for the preparation of the materials for various engineering applications. The course further seeks to cultivate the ability to recognize the role of chemistry in smart engineered products used in households and industry. It targets to strengthen the fundamental concepts of chemistry and materials then builds an interface with their industrial applications. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **'Materials Chemistry for Engineers'** and attain **'Skill Development'** through **'Participative Learning'** techniques**.**					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Recognize the principles of water chemistry to develop innovative solutions in water technology. CO2. Describe the general introduction of nanomaterials for water treatment and industrial processes. CO3. Summarize the importance of various chemical and electrochemical sources in modern energy systems. CO4. Relate the knowledge of electrochemical principles for protection of different metals from corrosion. CO5. Identify the suitable polymers to replace the conventional materials.					
Course Content:						
Module 1	Water Chemistry and Nano technology	Assignment/Quiz	Data Collection and analysis	13 Sessions		
Water technology: Introduction to water chemistry, Hardness of water: types, causes and numerical problems, disadvantages of hard water, Boiler feed water and common boiler troubles, Potable water- Standards and Specifications, Treatment of water for municipal supply, Desalination by Reverse osmosis and ion exchange process, Waste water analysis- Chemical Oxygen Demand (COD) and Dissolved Oxygen (DO) estimation using Winkler's method, Sewage treatment: Primary, Secondary and Tertiary processes. **Nanomaterials:** Introduction to nanoscience and nanomaterials, size-dependent properties of nanomaterials, Classification of nanomaterials: Carbon Nanotubes (CNTs), Nanorods, Nanotubes, Fullerenes, Nanocomposites, Carbon Nanofibres, Nanowires, and Nanopowders, synthesis of nanomaterials by Top-down and Bottom-up approaches, Properties and applications of graphene and carbon nanotubes, Softening of industrial wastewater by Nanofiltration techniques,					

Advantages and future scope of nanomaterials in water treatment.				
Module 2	Chemical and Electrochemical energy sources	Assignment/Quiz	Data collection	12 Sessions
Chemical energy sources: Definition and classification of fuels, Characteristics of good fuels, calorific value, Gross and net calorific value, Bomb Calorimeter-numerical problems, Fractional distillation of petroleum, Knocking and octane number, cetane number, Cracking of petroleum, Fluid Catalytic Cracking (FCC). **Electrochemical energy sources:** Introduction to electrochemistry, basic concepts of batteries and characteristics, Classification of batteries –Primary battery: Dry cell and Li-MnO_2, Secondary battery- Pb-acid, Ni-MH and Lithium-ion batteries. Supercapacitor: classification, construction and applications in hybrid vehicles, Fuel cells: hydrogen-oxygen and Methanol-oxygen fuel cells: Principle, working mechanism and their applications.				
Module 3	Corrosion and metal finishing	Assignment/Seminar	Data collection and analysis	09 Sessions
Introduction to Corrosion – Reasons for corrosion, Effects of corrosion, Types of Corrosion, Electrochemical theory of corrosion, Differential metal Corrosion, Differential aeration Corrosion and cases, and Stress Corrosion. Factors that affecting the rate of corrosion- Primary and Secondary Factors. Corrosion Control Methods–Design and selection, Protective Coatings-Anodic and Cathodic coatings, Cathodic protection- Sacrificial anodic methods and impressed current method, Inorganic Coatings-Anodizing. Metal Finishing- Importance, Techniques, electroplating (Cr and Ni), Difference between electroplating and electroless plating, electroless plating of Cu on PCBs.				
Module 4	Macromolecules as engineering materials	Assignment/Seminar	Data collection and analysis	11 Sessions
Polymers: Introduction, Classifications, Types of Polymerization: Addition and Condensation polymerization, Degree of polymerization, Molecular weight of the polymers – numerical, Thermoplastics & thermosetting polymers. Preparation, properties, and applications of industrially important polymers - Teflon, PVC, Nylon 6,6 and Phenol-formaldehyde resin; Elastomers: Natural rubber, Merits and Demerits of Natural rubber. Vulcanization of rubber, Synthetic Rubber-Advantages, Inorganic rubbers- silicone polymers. Polymer composites-Synthesis and applications of Kevlar, conducting polymers-Criteria for conduction, synthesis of conducting polyaniline and applications, Biodegradable polymers-introduction, examples and applications.				
Targeted Application & Tools that can be used: **Application areas:** Water treatment sector, boilers, battery technology, nanotechnology, polymers, automotive and manufacturing industries. **Tools:** Statistical analysis of Corrosion in materials using software tools like Design expert (ANOVA (Analysis of Variance) and RSM (Response Surface Methodology) etc.).				
Project work/Assignment:				
Assessment Type • Midterm exam • Assignments (Review of digital/ e-resource from PU link given in references section - mandatory to submit screen shot accessing digital resource.) • Quiz/Seminar				

- End Term Exam
- Self-Learning

Text Book

1. Wiley. *Engineering Chemistry*. Wiley Publishing.
2. Ozin, G.A., & Arsenault, A.C. (2009). *Nanochemistry: A Chemical Approach to Nanomaterials*. Royal Society of Chemistry.
3. Gadag, R.V., & Shetty, Nityananda. (2016). *A Textbook of Engineering Chemistry* (2nd ed.). I.K. International Publishing House.
4. Wiley. *Introduction to Petroleum Engineering*. Wiley Publishing.

Reference Books

1. Engineering Chemistry, Jain and Jain (18th Edition) Dhanpat Rai Publishing Company
2. Engineering Chemistry, Shika Agrawal (2018), Cambridge University Press
3. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2008
4. Chemistry for Engineering Students, B.S. Jai Prakash, R. Venugopal, Sivakumaraiah & Dr. Pushpa Iyengar., Subash Publications, 5th Edition, 2014.
5. Callister, W. D., & Rethwisch, D. G., Materials Science and Engineering: An Introduction, 10th Edition, Wiley, 2018.

E-resources:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_108033
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_50412
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_222231
https://archive.nptel.ac.in/courses/103/107/103107212/
https://nptel.ac.in/courses/118104008
https://archive.nptel.ac.in/courses/113/105/113105102/
https://nptel.ac.in/courses/113108051
https://www.mdpi.com/books/pdfview/book/1069
https://www.bloomsburycollections.com/book/fuel-an-ecocritical-history/
https://www.youtube.com/watch?v=S-SOEBTplOM&t=1537s
https://interestingengineering.com/science
https://www.sciencedirect.com/book/9780123838469/standard-handbook-of-petroleum-and-natural-gas-engineering
https://www.bagchee.com/books/BB66394/petroleum-refining-technology

Skill Sets

All topics in theory component are relevant to Environment and Sustainability.

Catalogue prepared by		Faculty Members, Department of Chemistry
Recommended by the Board of Studies on		BoS No.: 13th BoS held on xx/xx/xxxx
Date of Approval by the Academic Council		Xxth Academic council meeting held on xx/xx/xxxx

Course Code: CHE2506	**Course Title: Materials Chemistry Lab** **Type of Course: Laboratory only-Basic science course**		L-T-P- C	0	0	2	1
Version No.	1.0						
Course Pre-requisites	Before undertaking this Materials Chemistry Lab course, students are expected to possess foundational knowledge of chemistry, particularly in acids and bases, redox reactions, titration techniques, and the use of laboratory apparatus. Additionally, students should be familiar with handling chemicals and glassware safely and adhering to essential laboratory safety precautions.						
Anti-requisites	**NIL**						
Course Description	The laboratory course aims to develop experimental skills and apply fundamental chemical principles to address chemistry-related problems in engineering. The experiments are carefully designed to complement the theoretical concepts covered in lectures, providing hands-on experience to deepen scientific understanding and reinforce learning.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Materials Chemistry Lab" and attain **SKILL DEVELOPMENT** through **EXPERIENTIAL LEARNING** techniques.						
Course Outcomes (COs)	On successful completion of the course, students shall be able to: **CO1:** Identify the basic techniques used in chemistry laboratories for both small- and large-scale water analysis and purification processes. **CO2:** Estimate the presence of ions or metal ions in domestic or industrial/domestic wastewater using laboratory methods. **CO3:** Recognize the laboratory techniques, such as titrations, separation/purification, and instrumentations, to perform chemical analysis. **CO4:** Compare the experimental results and demonstrate improved experimental skills through hands-on laboratory experience.						
Course Content:	**Total 30 sessions**						
Experiment 1	Experiment- 1	Experimental	Data Collection	Analysis and interpretation			
Estimation of Fe (II) in Mohr's salt using Standard Potassium permanganate (Water treatment, metallurgy).							
Experiment 2	Experiment-2	Experimental	Data Collection	Analysis and interpretation			
Estimation of total hardness of water by EDTA complexometric method (Water quality parameter).							
Experiment 3	Experiment-3	Experimental	Data Collection	Analysis and interpretation			
Determination of Chemical Oxygen Demand (COD) of Industrial Wastewater sample (Water Quality Assessment)							
Experiment 4	Experiment-4	Experimental	Data Collection	Analysis and interpretation			
Estimation of calcium oxide in cement solution by rapid EDTA method (Cement quality control)							
Experiment 5	Experiment-5	Experimental	Data Collection	Analysis and interpretation			
Estimation of Copper by iodometric method. (Metallurgy and mining)							
Experiment 6	Experiment-6	Experimental	Data Collection	Analysis and interpretation			
Estimation of strength of an acid by Conductometric titration (Water Quality Assessment)							
Experiment 7	Experiment-7	Experimental	Data Collection	Analysis and			

				interpretation
Potentiometric estimation of iron from industrial effluents (Electrochemical Analysis)				
Experiment 8	Experiment-8	Experimental	Data Collection	Analysis and interpretation
Determination of Viscosity co-efficient of a liquid mixture using Ostwald's viscometer (Fluid Dynamics)				
Experiment 9	Experiment-9	Experimental	Data Collection	Analysis and interpretation
Determination of pKa of weak acid using pH meter				
Experiment 10	Experiment-10	Experimental	Data Collection	Analysis
Determination of corrosion of mild steel in acidic medium by weight loss method (Understanding corrosion process)				
Experiment 11	Experiment-11	Experimental	Data Collection	Analysis
Determination of calorific value of a given solid fuel by Bomb Calorimeter (Fuel energy calculation)				
Experiment 12	Experiment-12	Experimental	Data Collection	Analysis
Synthesis of polyaniline (Understanding method of Materials synthesis)				

Any 8-9 experiments will be conducted out of 12

Assessment:

- Midterm exam
- Experimental Evaluation
- Report submission and Viva-voce
- End-term Exam

Text Book

1. Ramadevi, B., & Aparna, P., *Lab Manual for Engineering Chemistry*, S. Chand Publications, New Delhi, 2022.
2. Vogel, A. I., *Textbook of Practical Organic Chemistry*, 5th Edition.
3. Vogel, A. I., *Inorganic Quantitative Analysis*, ELBS Publications.
4. Ahluwalia, V. K., *College Practical Chemistry*, Narosa Publishing House, New Delhi.

References

Manoj Kumar Solanki, Engineering Chemistry Laboratory Manual – Educreation Publishing.
Sudha rani, S. K. Bashin, Engineering Chemistry Lab Manual – Krishna's Educational Publishers.

E-resources:

1. https://books-library.net/files/download-pdf-ebooks.org-kupd-679.pdf

Video Links:

1. https://www.youtube.com/watch?v=gDsGHYUHeBE
2. https://www.youtube.com/watch?v=1QkYvERH0sg
3. https://www.youtube.com/watch?v=ODFN6RZktn0
4. https://www.youtube.com/watch?v=L7KDozP1Tfo
5. https://www.youtube.com/watch?v=qKIA8EPnsyA
6. https://www.youtube.com/watch?v=y3Oa0L404oM

The topics related to Skill Development

All the experiments are relevant to **Skill Development** through **Experiential Learning Techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Faculty Members, Department of Chemistry
Recommended by the Board of Studies on	BoS No.: 13th BoS held on xx/xx/xxxx
Date of Approval by the Academic Council	Xxth Academic council meeting held on xx/xx/xxxx

Course Code: EEE1200	**Course Title: Basics of Electrical and Electronics Engineering.** **Type of Course: Engineering Science Course**		**L-T-P-C**	3	0	0	3
Version No.	2.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain **Skill Development** through **Participative Learning** techniques.						
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1. Apply** basic law**s** of Electrical Engineering to compute voltage, currents and other parameters in the circuits. **CO2. Discuss** various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. **CO3. Summarize** the operations of different biasing configurations of BJTs and amplifiers. **CO4. Discuss** the performance characteristics and applications of various electrical Machines.						
Course Content:							
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	merical solving Task	10 Sessions			
DC Circuits: Concept of Circuit and Network, Types of elements, Network Reduction Techniques- Series and parallel connections of resistive networks, Star–to-Delta Transformations, Mesh Analysis, Nodal Analysis, Numerical examples. **AC Circuits:** Fundamentals of single phase circuits - Series RL, RC and R-L-C Circuits, Concept of active power, reactive power and Power factor, Numerical examples. Introduction to three phase system and relation between line and phase values in Star & Delta connection, Numerical examples.							
Module 2	Semiconductor and Diode applications	Assignment/ Quiz	mory Recall based Quizzes	10 Sessions			
Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.							
Module 3	Transistors and its Applications	Assignment/ Quiz	mory Recall-based	10 Sessions			

			Quizzes	
Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt – Ampere characteristics). Pinch- off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.				
Module 4	Fundamentals of Electrical Machines	Assignment/ Quiz	merical solving Task	10 Sessions
Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications.				
Self-Learning Topics: Clipping and clamping circuits, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair. **Special Machines:** Introduction to special electrical machines and its applications.				
Targeted Application & Tools that can be used: **Targeted Applications:** Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design. Professionally Used Software: Multisim/ P Spice Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis.				
Project Work/ Assignment: **1. Article review:** At the end, of course an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. **2. Presentation:** There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same. **3. Case Study**: - At the end of the course students will be given a 'real-world' application based circuits like Power Amplifier, Signal/Function Generator etc. as a case study. Students will be submitting a report which will include Circuit Diagrams, Design, Working Mechanism and Results etc. in appropriate format				
Text Book(s): 1. Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill Education 2. Theraja B.L. and Theraja A.K., "A Textbook of Electrical Technology: Basic Electrical Engineering" in S.I. System of Units, 23rd ed., New Delhi: S. Chand, 2002. 3. A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007 4. J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition. 5. Basics of Electrical & Electronics Laboratory Manual.				
Reference Book (s): 1. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling				

Kindersley), Pearson,2011
2. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
3. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
4. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
5. A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
6. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

Online Resources (e-books, notes, ppts, video lectures etc.):

1. https://presidencyuniversity.linways.com
2. https://www.digimat.in/nptel/courses/video/108105112/L01 "Fundamentals of Electrical Engineering-Basic Concepts, Examples"
3. Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ "Electrical Measurements"
4. Video lectures on "Electronic Devices" by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
5. Video lectures on "Analog Electronics" by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
6. Video lectures on "Diodes", by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

E-content:

1. "Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/"

M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 974-977, June 2022, doi: 10.1109/LED.2022.3168243
https://ieeexplore-ieee-org-resiuniv.knimbus.com/document/9758727

2. F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier
Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg-presiuniv.knimbus.com/document/9764749

3. M. Chanda, S. Jain, S. De and C. K. Sarkar, "Implementation of Subthreshold Adiabatic Logic for Ultralow-Power Application," in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. .23, no. 12, pp. 2782-2790, Dec. 2015.
https://ieeexplore.ieee.org/document/7018053

4. R. Raut and O. Ghasemi, "A power efficient wide band trans-impedance amplifier in submicron CMOS integrated circuit technology," 2008 Joint 6th International IEEE Northeast Workshop on Circuits and Systems and TAISA Conference, 2008, pp. 113-116, doi: 0.1109/NEWCAS.2008.4606334. https://ieeexplore.ieee.org/document/4606334

Topics relevant to "SKILL DEVELOPMENT": Performing suitable experiments to compute the electric circuit parameters, performance operation of machines, and operation of semiconductor devices for **Skill Development** through **Participative Learning techniques.** This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Dr. Ajay Kumar Maurya
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: EEE1251	**urse Title: Basics of Electrical and Electronics Engineering Laboratory** **Type of Course: ESC - Laboratory**	**L-T-P-C**	0	0	2	1
Version No.	**1.0**					
Course Pre-requisites	**Nil**					
Anti-requisites	**Nil**					
Course Description	This fundamental laboratory provides an opportunity to validate the concepts taught in the basics of electrical and electronics engineering and enhances the ability to visualize real system performance, using both hardware and simulation tools.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain Skill Development through Experiential Learning techniques.					
Basic skill sets required for the laboratory	**The students shall be able to develop:** 1) An attitude of enquiry. 2) Confidence and ability to tackle new problems. 3) Ability to interpret events and results. 4) Ability to work as a leader and as a member of team. 5) Assess errors and eliminate them. 6) Observe and measure physical phenomenon. 7) Write Reports. 8) Select suitable equipment, instruments and materials. 9) Locate faults in systems. 10) Skills for setting and handling equipment. 11) The ability to follow standard test procedures. 12) An awareness of the need to observe safety precautions. 13) To judge magnitudes without actual measurement.					
Course Outcomes	On successful completion of the course, the students shall be able to: 1. **Demonstrate** the behavior of passive elements and fundamental electrical circuit laws 2. **Determine** the power factor, impedance, and phase relationship of R and RL loads under AC supply conditions. 3. **Develop** electrical circuits and three-phase supply systems using MATLAB/Simulink to study resistance, voltage, and current characteristics. 4. **Analyze** the performance characteristics of electrical machines, including single-phase transformers and three-phase induction motors, under different operating conditions. 5. **Examine** the output characteristics and performance parameters of half-wave and full-wave rectifiers. 6. **Illustrate** the performance characteristics of Zener diode and MOSFET under different operating conditions.					
Course Content:	**List of Laboratory Tasks:** **Experiment No 1:** Familiarization of passive elements. Level 1: Identify and understand the function and ratings of basic passive elements.					

	Level 2: Study the behavior of passive elements in simple electrical circuits by measuring voltage, current, and impedance. **Experiment No 2:** Experimental Verification of Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL). Level 1: Study and Verify KVL and KCL for the given electrical Circuit. **Experiment No 3:** Determination of Power Factor, and Impedance for R and RL Loads. Level 1: Determine the power factor and impedance of R and RL loads under steady-state AC supply conditions. Level 2: Analyze the effect of inductance on power factor, impedance, and phase angle for RL loads under varying load conditions. **Experiment No 4:** Modeling and Simulation of effective resistances in different circuit connections Using Simulink. Level 1: Model and simulate series and parallel resistor circuits in Simulink and determine their effective resistance. Level 2: Analyze the effect of different resistor combinations on total resistance, current distribution, and voltage drop. **Experiment No 5:** Simulation and analysis of line and phase voltages in Star-connected and Delta- connected supply systems. Level 1: Model and simulate star-connected and delta-connected three-phase supply systems and observe line and phase voltages. Level 2: Analyze and compare the relationship between line and phase voltages in star and delta connections. **Experiment 6:** Determination of transformation ratio of a Single-Phase Transformer Under different tapping conditions. Level 1: Determine the transformation ratio of a single-phase transformer under no-load condition for various tap settings. Level 2: Analyze the effect of different tapping conditions on secondary voltage, regulation, and transformer performance. **Experiment No. 7:** Study of the speed-torque characteristics of a Three-Phase Induction Motor. Level 1: Study and analyze the speed–torque characteristics of a three-phase induction motor. Level 2: Evaluate the effect of supply voltage and current on motor performance parameters such as slip, and torque. **Experiment 8:** Performance Analysis of Half-Wave and Full-Wave Rectifier Circuits Using Simulink. Level 1: Model and simulate half-wave and full-wave rectifier circuits in Simulink and analyze their output waveforms. Level 2: Evaluate and compare rectifier performance parameters such as ripple factor, efficiency, and output voltage. **Experiment 9:** Study of the characteristics of a Zener Diode. Level 1: Study the forward and reverse V–I characteristics of a Zener diode using DC analysis. Level 2: Analyze the Zener breakdown characteristics and determine the Zener voltage and regulation behavior. **Experiment 10:** Study of the Output and Transfer Characteristics of a MOSFET. Level 1: Study, analyze and implement the output characteristics of a MOSFET under different gate-source voltage conditions and observe their results. Level 2: Analyze the transfer characteristics of a MOSFET and evaluate key parameters such as threshold voltage and transconductance.

Targeted Application & Tools that can be used:

Targeted Applications: Application area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: MATLAB SIMULINK

Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis.

urse Material

1. Basics of Electrical and Electronics Engineering Laboratory Manual, Presidency University, Bengaluru.

Text Book:

1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 4th Edition, McGraw Hill Education, New Delhi, 2019.
2. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology, Volume-I: Basic Electrical Engineering in SI Units, 24th Edition, S. Chand Publishing, New Delhi, 2024.

References

1. John Hiley, Keith Brown and Ian McKenzie-Smith, Hughes Electrical and Electronic Technology, 12th Edition, Pearson Education, 2016.
2. S. K. Bhattacharya and D. Devaraj, Basic Electrical and Electronics Engineering, 2nd Edition, Pearson Education India, 2017.
3. T. K. Nagsarkar and M. S. Sukhija, Principles of Basic Electrical Engineering, 1st Edition, Oxford University Press, 2018.
4. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 12th Edition, Pearson Education, 2019.
5. A. K. Maini and Varsha Agrawal, Electronic Devices and Circuits, 2nd Edition, Wiley India, 2019.
6. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits, 8th Edition, Oxford University Press, 2019.

Online Resources:

1. https://presidencyuniversity.linways.com
2. https://www.digimat.in/nptel/courses/video/108105112/L01 “Fundamentals of Electrical Engineering - Basic Concepts, Examples”
3. Video lectures on “Electronic Devices” by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
4. NPTEL lectures on “Rectifiers”, by Prof. G. Bhuvaneswari, IIT Delhi https://nptel.ac.in/courses/108102145
5. NPTEL Lectures on “Electrical Machines II”, by Prof. G. Sridhara Rao, IIT Madras. https://nptel.ac.in/courses/108106072

Topics relevant to “EMPLOYABILITY SKILLS”: All the experiments which are listed are for **Skill Development** through **Experiential Learning Techniques**. This is attained through the assessment component mentioned in course handout.

Topics relevant to “HUMAN VALUES & PROFESSIONAL ETHICS”: Standard test methods, safety procedure.

Catalogue prepared by	
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code:**ENG1900**	**Course Tittle: English for Technical Communication** **Type of Course:**	**L- T- P- C**	**2**	**0**	**0**	**2**
Version No.	1.0					
Course Pre-requisites	+2 Level					
Anti-requisites	NIL					
Course Description	This course enhances the technical communication skills of BTech students, focusing on clarity, precision, and conciseness in academic and professional settings. Students will learn to differentiate between general and technical communication, analyze technical content, develop structured writing skills, and deliver effective presentations. Through interactive activities such as TED Talk analyses, report writing, and presentation practice, the course provides hands-on experience for real-world applications. By the end, students will be equipped to communicate complex technical information effectively in various professional contexts.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1. Differentiate between general and technical communication. CO2. Explain key reading comprehension techniques to enhance understanding of technical texts. CO3. Write clear, concise, and well-structured technical reports and documents. CO4. Deliver technical presentations and implement peer feedback for continuous improvement. CO5. Explain ethical practices in digital communication for professional use.					

Course Content: Theory

Module 1	**Technical communication**	**Quiz**	**Listening**	**9 Sessions**

Introduction to Communication

Technical vs. General Communication

Characteristics of technical communication

Importance of clarity, precision, and objectivity

Activity:

- Watching TED Talks/videos to identify differences in technical and general vocabulary

Module 2	Technical Reading	Assignment	Reading	12 Sessions

Reading Comprehension

Note making & Notetaking

Content Analysis

Activity:

- Reading technical articles and answering comprehension questions
- Note making techniques

Module 3	Technical Writing	Assignment	Writing	12 Sessions

Paragraph Writing

Structure of a paragraph (topic sentence, supporting details, coherence)

Report Writing

Structure of technical and project reports (Introduction, Methods, Results, Discussion)

Activity:

- Writing a structured paragraph on a technical topic
- Writing project reports

Module 4	Professional Presentation	Presentation	Speaking	12 Sessions

Introduction to Presentation Skills

Preparing a Presentation

- Structuring content (Introduction, Body, Conclusion)
- Designing effective slides (Text. visual aids, readability, and impact)

Delivering a Presentation

- Engagement techniques, Storytelling, narration, pitching ideas handling Q&A
- Conviction, commitment, generating interest through enthusiasm

Demonstration & Practice

- Giving presentations on topics based on their academic interest
- Evaluating and providing peer feedback

Activity:

- Analyze a real-world engineering issue and present solutions using a structured approach.

Targeted Application & Tools that can be used: YouTube, Instagram, Quill Bot, Grammarly, & Padlet.

References:

Text books:

1. Gupta, R.C. *Technical Communication.* 2nd ed., Cambridge University Press, 2021.
2. Lannon, John M., and Laura J. Gurak. *Technical Communication.* 15th ed., Pearson, 2022.

Reference Books:

1. Gerson, Sharon J., and Steven M. Gerson. Technical Communication: Process and Product. 9th ed., Pearson, 2020.
2. Lannon, John M., and Laura J. Gurak. Technical Communication. 15th ed., Pearson, 2022.
3. Markel, Mike, and Stuart A. Selber. Technical Communication. 13th ed., Bedford/St. Martin's, 2020.

Web Resources:

1. https://owl.purdue.edu/owl/subject_specific_writing/technical_writing.
2. https://journals.ieeeauthorcenter.ieee.org/.
3. https://www.stc.org/.
4. https://ocw.mit.edu/.https://www.ted.com/talks.
   https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/digital_writing.html

Topics Relevant to "employability": Teamwork and Collaboration, Critical Thinking and Problem-Solving

Topics Relevant to "Human Values and Professional Ethics": Critical reasoning, Inclusivity and Fairness

Catalogue prepared by	**Dr. Vinodhini Chinnaswamy & Dr. T. Naresh Naidu**
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:

PPS1025</td><td colspan="2">Course Title: Industry Readiness Program – I
Type of Course: Practical Only Course</td><td>L- T - P- C</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">• Students are expected to understand Basic English.
• Students should have desire and enthusiasm to involve, participate and learn.</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">This course is designed to enable students to set SMART goals, form professional & personal ethics for success and learn various email writing techniques. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with the concepts of “Employability for Young Professionals” and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques</td></tr>
<tr><td>Course Out Comes</td><td colspan="7">On successful completion of this course the students shall be able to:
CO 1 Define their career goals
CO 2 Practice ethical habits for better career success
CO3 Demonstrate effective email writing techniques</td></tr>
<tr><td>Course Content</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td>Goal Setting & Grooming</td><td colspan="2">Classroom activities</td><td colspan="2"></td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="8">Topics: SMART Goals, formal grooming through self-introduction activity

Activity: Real world scenarios</td></tr>
<tr><td>Module 2</td><td>Habit Formation</td><td colspan="2">Role plays</td><td colspan="2"></td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="8">Topics: Professional and Personal ethics for success and activity-based practice

Activity: Students to present 2 min video on building professional ethics</td></tr>
</table>

Module 3	Email Etiquettes	Individual and group presentation		10 Sessions
Topics: Types of prompts to generate effective or desired results for email etiquettes **Activity:** Individual student presenting various search prompts				
Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Activities				
Assignment proposed for this course Assignment 1: SMART Goal Assignment 2: AI tools for prompt search				
Continuous Individual Assessment Module 1: Presentation Module 2: Activity based assessment Module 3: Class assessment				
The topics related to skill development: Students acquire knowledge on SMART goals, implement grooming standards, practice ethical behavior in class and campus, acquire hands-on experience to use AI tools to get search prompts for desired email etiquettes.				
Catalogue prepared by	Faculty of L&D			
Recommended by the Board of Studies on	**BOS held on**			
Date of Approval by the Academic Council	**Academic Council Meeting held on**			

Course Code: LAW7601	**Indian Constitution** **Type of Course: MAC course**	**L- T- P- C**	**1**	**0**	**0**	**0**
		Contact hours	**-**	**-**	**-**	**-**
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamentals of Indian Constitution concepts and their relevance to 75+ Years of Republic of India (https://constitution75.com/) as well as **#AzaadiKaAmrutMahotsav / Azadi Ka Amrit Mahotsav** (https://amritmahotsav.nic.in). It is designed to equip students with the knowledge about the Constitution of India. This course aims to introduce the constitutional law of India to students from all walks of life and help them understand the constitutional principles as applied and understood in everyday life. The objective of making the Constitution of India, familiar to all students, and not only to law students, this course aims and objectifies legal understanding in the simplest of forms. **This course is designed to cater to Constitutional Studies.**					
Course Objective	The objective of the course is **'SKILL DEVELOPMENT'** of the student by using **'PARTICIPATIVE LEARNING'** techniques					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Describe the basic understanding of the Indian Constitution and the concepts and issues relevant to day-to-day life of the nation and to equip the Citizen with the zeal of capacity building. Recognizing and identify the values of the Constitution of India. CO2. Enabling the Citizen-centric Awareness of Rights and Responsibilities of the State CO3. Explain the role of the State actors in building India. CO4. Understanding the Gandhian vision over the power of the LSG (Local Self-Governance)					
Course Content:						
Module 1	Understanding the Making of the Constitution: The Constituent Assembly & The Constitution of India					
Topics: Historical Context of Constituent Assembly - Compositions & Functions of Constituent Assembly What is a Constitution? – Why have a Constitution? – Constitutional Change - Features of Indian Constitution – Preamble of Indian Constitution						
Module 2	Citizen's Fundamental Rights and State's Responsibilities (Directive Principles)					
Topics: Introduction to Fundamental Rights - Right to Equality – Facets of Right to Equality - Right to Freedom - Constitutional Position of Some Democratic Rights - Right Against Exploitation - Right to Freedom of Religion - Right to Constitutional Remedies Directive Principles of the State Policy						
Module 3	Organs Of the Government					

Topics:
Executive: The President of India - Powers and Functions of President of India - Emergency Powers and the Position of the President
Legislature: Union Council of Ministers - Prime Minister - The Rajya Sabha - The Lok Sabha - Relation between the Lok Sabha & Rajya Sabha - Office of the Speaker – Important Parliamentary Committees
Judiciary: The Structure and Organization of the Judiciary & the High Court - The Supreme Court - Role of The Supreme Court - Judicial Activism in India - Basic Structure Doctrine & PIL

Module 4	Federalism & Decentralization			

Topics:
What is Federalism? - Centre-State Legislative Relations - Centre-State Administrative Relations - Centre-State Financial Relations
The 5th & 6th Schedules - Municipality- (History of Indian Municipality, Organization & Functions) – Panchayat 1 (Idea of Panchayat, Organization and Powers of Panchayats in India)

Targeted Application & Tools that can be used:
Application areas to familiarize students with fundamentals of Indian Constitutional concepts.
Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type

- Online end term exam will be conducted as notified by the Presidency University.

Online Link*:

1) Prof. Amitabha Ray, SWAYAM Course: "Constitutional Government & Democracy in India"
https://onlinecourses.swayam2.ac.in/cec19_hs13/preview

* Other source links are available in below Resources link.

Text Book

1. Durga Das Basu --- Introduction to the Constitution of India, 23rd Edition (Gurgaon; LexisNexis, 2018).
2. MP Jain's Constitutional Law of India, Lexis Nexis
3. V.N Shukla's Indian Constitutional Law, M.P Singh 13th Edition
4. MV Pylee's Constitution of India
5. J.C.Johari -- The Constitution of India: A Politico-Legal Study (Greater Noida: Sterling Publishers Pvt. Ltd. 2013).
6. Himangshu Roy and M.P.Singh – Indian Political System, 4th Edition (Bengaluru; Pearson Education, 2018)
7. Vidya Bhushan & Vishnoo Bhagwan--- Indian Administration (S. Chand, 2011)
8. S.R.Maheswari --- Indian Administration (Orient Blackswan, 2001)
9. Dr. A.Avasthi & A.P. Avasthi --- Indian Administration (L.N. Agarwal Educational Publishing, 2017).
10. B. L. Fadia --- Indian Government and Politics (Sahitya a. Bhawan, 13th Revised Edition, 2017).
11. P.M.Bakshi – The Constitution of India (Prayagraj, UP; a. Universal Law Publishing, January, 2018)

Reference Books

1. HM Seervai, Constitutional Law of India, 4th Ed. Vol I, II, & III
2. Uday Raj Rai, Constitutional Law-I
3. Democracy and Constitutionalism in India, Oxford University Press 2009

Resources:

1. https://onlinecourses.nptel.ac.in/noc20_lw03/course?&force_user=true
2. https://onlinecourses.swayam2.ac.in/cec19_hs13/course?&force_user=true
3. https://nptel.ac.in/courses/129106003
4. https://nptel.ac.in/courses/129106411

5. https://nptel.ac.in/courses/129105608
6. https://nptel.ac.in/courses/129106002

Topics relevant to Skill Development:

1. An attitude of inquiry.
2. Write reports

The topics related to Constitutional Studies and its application :

All topics in theory component are relevant to Indian Constitution.

Catalog prepared by	Faculty members of the Department of Law.
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: MAT1214	**Course Title: Calculus, Differential Equations and Vector Analysis** **Type of Course:1] School Core**	**L-T- P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces advanced topics in calculus, differential equations, and vector analysis, emphasizing analytical techniques for solving mathematical problems involving curves, functions of several variables, ordinary differential equations, multiple integrals, and vector fields. The course covers polar curves and curvature, partial differentiation and optimization of multivariable functions, higher-order differential equations, applications of definite and multiple integrals, and the fundamental concepts and theorems of vector calculus. These topics provide a strong mathematical foundation for modeling, analyzing, and solving problems arising in science and technology.					
Course Objective	Upon successful completion of this course, students will be able to apply the concepts of polar curves, curvature, and multivariable differential calculus to analyze the geometric and analytical properties of functions and curves. They will be capable of solving higher-order ordinary differential equations using appropriate analytical methods and applying these techniques to practical problems. Students will also evaluate definite, improper, double, and triple integrals to determine areas, volumes, centers of mass, and other related quantities. Furthermore, they will apply the principles of vector fields, line, surface, and volume integrals, along with the fundamental theorems of vector calculus, to solve a variety of mathematical problems. Overall, the course will enhance their analytical thinking and problem-solving abilities by enabling them to effectively apply advanced calculus concepts to diverse mathematical situations.					
Course Outcomes	On successful completion of the course the students shall be able to: **CO1:** Apply the properties of polar curves to solve problems related to tangents, intersections, and curvature (L3) **CO2:** Apply the mathematical properties of Beta and Gamma functions to solve definite and improper integrals (L3) **CO3:** Employ multivariable differential calculus to solve problems in multidimensional physical systems (L3) **CO4:** Solve the second and higher-order linear differential equations by using appropriate methods (L3) **CO5:** Apply the concept of double and triple integrals to calculate area, volume (L3)					

	CO6: Employ vector integral theorems to simplify multi-dimensional field equations into solvable boundary integrals for engineering analysis (L3)	
Course Content:		
Module 1	**Polar Curves and Curvatures**	**(14L+5T=19 Sessions)**
Polar Coordinates, polar curves, angle between radius vector and the tangent, angle between two curves, pedal equations, curvature and radius of curvature. Curvature of Highway Curves for civil, Cam Profile problem for mechanical, Well Trajectory problem for petroleum Temperature Distribution in Concrete (civil), Heat Transfer analysis (mechanical), Reservoir Pressure (petroleum)		
Module 2	**Integral Calculus**	**(10L+3T=13 Sessions)**
Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; definite integrals to evaluate surface areas and volumes of revolutions. Double integrals (Cartesian), Change of order of integration in double integrals, Triple integrals, Change of variables (Cartesian to polar, cylindrical and spherical coordinates), area, volume -Center of mass and Gravity (constant and variable densities), orthogonal curvilinear coordinates, Problems involving cubes, sphere and rectangular parallelepiped. Water Flow Through a Channel (Civil), Improper Integral in Heat Transfer (Mechanical), Reservoir Probability Models (petroleum).		
Module 3	**ODE Higher Order**	**(9L+3T=12 Sessions)**
Linear differential equations of second and higher order with constant coefficients-non-homogenous term of the type Q(x)=e^ax, Sianax, Cosax, e^ax V(x)-Method of variation of parameters. Problem on Bridge Vibration (Civil), Spring-Mass System (Mechanical), Pressure Variation (petroleum).		
Module 4	**Vector Calculus**	**(12L+4T=16 Sessions)**
Vector & Scalar Functions and Fields, Derivatives, Curve, Arc length, Curvature & Torsion, Gradient of Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Physical interpretation, Solenoidal and Irrotational Vector Fields. Line Integrals, Path Independence of Line Integrals, Surface and Volume Integrals: Green's Theorem in the plane, Divergence Theorem of Gauss, Stokes's Theorem. Problems on Temperature Distribution, Road Construction, Groundwater Flow (Civil), Shaft Design, Heat Flow, Work Done (Mechanical), Pipeline energy calculations, Reservoir boundary analysis (petroleum)		
Targeted Applications & Tools that can be used: • Highway curve design, road alignment, cam profile design, well trajectory planning, temperature distribution analysis, heat transfer modeling, and reservoir pressure estimation using polar curves, curvature, and differential calculus concepts. • Evaluation of areas, volumes, centers of mass, and gravity for engineering structures using definite, improper, double, and triple integrals; applications in water flow analysis, heat transfer problems, and reservoir probability modeling.		

- Analysis of bridge vibrations, spring-mass systems, pressure variation in reservoirs, and other dynamic engineering systems using higher-order ordinary differential equations and variation of parameters.
- Modeling and analysis of vector fields, temperature distribution, groundwater flow, road construction, shaft design, heat flow, work done, pipeline energy calculations, and reservoir boundary analysis using vector calculus, line, surface, and volume integrals.
- Applications in civil, mechanical, and petroleum engineering, scientific computing, computational mathematics, fluid mechanics, structural analysis, optimization, and numerical simulation.

Softwares: MATLAB, Mathematica, Maple, Python, GeoGebra, Octave, R, Scilab.

Text Book

1. E. Kreyszig, Advanced Engineering Mathematics, 10th ed. Hoboken, NJ, USA: John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44th ed. New Delhi, India: Khanna Publishers, 2018.

References:

1. E. Kreyszig, Advanced Engineering Mathematics, 10th ed. Hoboken, NJ, USA: John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44th ed. New Delhi, India: Khanna Publishers, 2018.
3. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5th ed. New Delhi, India: Narosa Publishing House, 2016.
4. G. B. Thomas, M. D. Weir, and J. Hass, Thomas' Calculus, 14th ed. Boston, MA, USA: Pearson, 2018.
5. H. Anton, I. Bivens, and S. Davis, Calculus: Early Transcendentals, 11th ed. Hoboken, NJ, USA: John Wiley & Sons, 2016.
6. D. G. Zill and W. S. Wright, Advanced Engineering Mathematics, 6th ed. Burlington, MA, USA: Jones & Bartlett Learning, 2018.

E-resources/ Web links:

1. https://research.ebsco.com/c/n5guci/search/details/rqkwq6imwb?request-context=plink&db=nlebk
2. https://open.umn.edu/opentextbooks/textbooks/24
3. https://research.ebsco.com/c/n5guci/search/details/6wtbgoqnff?request-context=plink&db=nlebk

Topics relevant to SKILL DEVELOPMENT: The course develops analytical thinking, mathematical modeling, computational proficiency, optimization techniques, engineering simulation skills, and problem-solving abilities required for Civil, Mechanical, and Petroleum Engineering applications using modern software tools such as MATLAB, ANSYS, COMSOL, Civil 3D, SolidWorks, and Petrel.

Catalogue prepared by	**Dr. K Govindarajulu**

Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: PHY2503	**Course Title Fundamentals of Materials Physics** **Type of Course: Basic Science**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	NIL					
Course Description	The course is intended to provide an overview of physics principles which determine the properties and behavior of materials. This knowledge will help students in identifying the most suitable material for a desired function and in estimating their behavior under different environmental conditions**.** This theory course integrated with lab providing practical application of the concepts taught while developing an **attitude of enquiry and confidence to tackle new problems**. The course also develops **team working and report writing skills through project work and assignments.**					
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Identify the crystal structure of materials from X-ray diffraction patterns. CO2] Describe the electrical and thermal properties of Materials. CO3] Discuss the mechanical properties of materials. CO4] To understand the physics of nanomaterial and material characterization techniques.					
Course Objective	This course aims to provide a foundational understanding of the structure, properties, and behavior of materials. It introduces key concepts in physical metallurgy, functional and bulk properties of materials, and nano-materials, along with their synthesis and characterization techniques. .					
Course Content:						
Module 1	Introduction To Physical Metallurgy	Assignment	Prepare models of crystal structures	12 Sessions		
Topics: Space lattice and unit cells, Bravais Lattices, Miller Indices, calculation of packing fractions, coordination number, defects in solids , The Phase Rule , Binary Phase Diagrams , cooling curves, Microstructural Changes during Cooling .The Iron Carbon Equilibrium Diagram.						
Module 2	Functional Properties Of Materials	Assignment	Data collection	10 Sessions		
Electrical Properties of Materials: Classification of materials based on band gap, Fermi energy, Fermi						

temperature. Semiconductors and its applications, Hall effect, Dielectric Materials: Introduction, polarization, expression for polarization, types of polarization, expression for electronic polarizability.
Thermal Properties: Thermal conductivity, Seebeck effect, Peltier effect, and Thomson effect. Theory and determination of thermal conductivity using Forbe's and Lee–Charlton's methods

Module 3	Properties Of Bulk Matter	Term paper		12 Sessions

Elastic Properties of Materials: Types of Stress and Strain, Stress, Strain equivalence relations, Relation between Elastic constants, stress and strain curve. Bending of beams: neutral surface and neutral axis, expression for bending moment of a beam: Torsion of a cylinder - Expression for twisting couple per unit twist. Torsional pendulum.
Basic concepts of Fluid Mechanics: Definition of Fluid, concept of continuum, classification of fluids, Fluid Properties, Newton's Law of viscosity, Absolute and Kinematic viscosity, No slip condition

Module 4	Nano materials and characterization of materials	Term paper	Case study on applications of Nano materials	11 Sessions

Introduction to Nano-materials and Properties, Carbon Nano-tubes (CNT), type of synthesis approach of nano materials, application of nano materials.
Characterization of Materials: X-ray diffraction, crystallite size determination by Scherrer equation, X-ray photoelectron spectroscopy (XPS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Numerical problems.

Targeted Application & Tools that can be used:
1. Application area in determination of standard values using UTM machine, strength of materials, building materials, machine tools.
2. Microsoft Excel for mathematical calculations.
3. JCPDS data for XRD analysis, ASTM.

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Assessment Type
- Midterm exam
- Assignment (review of digital/ e-resource from PU link given in references section - mandatory to submit screen shot accessing digital resource.)
- Quiz
- End Term Exam
- Self-Learning

Assignment 1:
1. Identify the crystal planes and directions for a given crystal structure (Schematic)
2. Draw the plane and directions for a given miller indices (Ex. (111), (110), (010), ($1\bar{1}$ 1) <110>)
3. Collect the data like, Elastic modulus, Stiffness, Ultimate Tensile Strength, Yield point for a given material.
4. Determine the mechanical properties of given sample (Ex. Aluminum), ASTM standards

Text Book
1. M.A. Wahab, Structure and Properties of Materials, Solid State Physics, Third Edition, Narosa Publications 2015.
2. Materials Engineering By V. Raghavan, Sixth Edition, Eastern Economy Edition.

References:

<table>
<tr><td colspan="2">1. Charles P. Poole Jr, Frank J. Owens, Introduction to Nanotechnology, ISBN: 0471079359. Wiley Publications, 2003.
2. P.N. Chandramouli, Fundamentals of Strength of Materials, PHI learning Private Limited, 2013.
3. Chares Kittel, Introduction to Solid State Physics, Wiley publications, 2015.
4. Engineering Physics by Avadhanalu, Revised edition, S. Chand Publications,2018</td></tr>
<tr><td colspan="2">Material Physics e-content:
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=754098&site=ehost-live
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1076817&site=ehost-live
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=18084&site=ehost-live
https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=683520&site=ehost-live
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBOOKDIRECTORY_1_3517
https://presiuniv.knimbus.com/user#/searchresult?searchId=material%20physics&_t=1657688744862</td></tr>
<tr><td colspan="2">Topics relevant to development of "FOUNDATION SKILLS": Elastic, thermal and mechanical properties of materials.
Topics relevant to "HUMAN VALUES &PROFESSIONAL ETHICS": Emphasizes team work, self-learning and professional development.</td></tr>
<tr><td>Catalogue prepared by</td><td>Dr. G. Srinivas Reddy , Dr. Naveen C S ,Dr. Sivasankar Reddy, , Dr. Mahaboob Pasha</td></tr>
<tr><td>Recommended by the Board of Studies on</td><td></td></tr>
<tr><td>Date of Approval by the Academic Council</td><td></td></tr>
</table>

Course Code: PHY2506	**Course Title: : Fundamentals of Materials Physics Lab** **Type of Course: Basic Science Course and Laboratory only**	**L-T-P- C**	**0**	**0**	**2**	**1**
Version No.	1.0					
Course Pre-requisites	**Class 11 and 12 Physics**					
Anti-requisites	**NIL**					
Course Description	The lab provides practical application of the concepts taught while developing an attitude of enquiry and confidence to tackle new problems. The course also develops team working and report writing skills.					
Course Objective	The objective of the course is **Skill Development** of student by using **Experiential Learning Techniques**.					
Course Outcomes (COs)	On successful completion of the course the students shall be able to: CO1: understand mechanical and thermal properties of materials. CO2: Students can able to Design, build, or assemble a part, product, or system using specific methodologies, equipment and materials**.**					
Course Content:	**Total 30 sessions**					

Experiment 1	Experimental	Data Collection	Analysis and nterpretation
Experimental errors and uncertainty using excel			
Experiment 2	Experimental	Data Collection	Analysis and Interpretation
Determination of rigidity modulus using torsional pendulum			
Experiment 3	Experimental	Data Collection	Analysis and Interpretation
Calculate the spring constant of a set of parallel / series connected springs			
Experiment 4	Experimental	Data Collection	Analysis and Interpretation
To determine the proportionality of Hall Voltage, magnetic flux density and the polarity of Charge carrier.			
Experiment 5	Experimental	Data Collection	Analysis and Interpretation
To plot the characteristics of thermistor and hence find the temperature coefficient of resistance.			
Experiment 6	Experimental	Data Collection	Analysis and Interpretation
Determination of Fermi energy of copper coil			
Experiment 7	Experimental	Data Collection	Analysis and

			Interpretation
Determination of Dielectric constant of given material			
Experiment 8	Experimental	Data Collection	Analysis and Interpretation
To determine the wavelength of semiconductor diode Laser			
Experiment 9	Experimental	Data Collection	Analysis
Calculation of lattice parameter and particle size using X-ray diffraction pattern			
Experiment 10	Experimental	Data Collection	Analysis
Determine the specific heat capacity of a material using a calorimeter Determination of Stefan's constant and verification of Stefan-Boltzmann Law.			
Any 8 experiments will be conducted out of 10			

Continuous Internal Assessment:

- Midterm exam
- Experimental Evaluation
- Viva-voce
- Endterm exam

Text Book

5. A text book of Engineering physics practical – Dr. Ruby Das
6. **Physics lab manual**

References:

Video Links: https://www.youtube.com/@dr.spbasavaraju4939

The topics related to Skill Development

All the experiments are relevant to Skill Development through Experiential Learning Techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. G. Srinivas Reddy , Dr. Naveen C S ,Dr. Sivasankar Reddy, , Dr. Mahaboob Pasha
Recommended by the Board of Studies on	13th BOS conducted on 6th June 2025
Date of Approval by the Academic Council	

Course Code: **MEC2500**	**Course Title: Engineering Mechanics** **Type of Course: Engineering Science Course**		**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	MAT1211					
Anti-requisites	NIL					
Course Description	This course is a basic course to understand the behaviour of mechanical components. It analyses the components using the principles of Physics and Mathematics. It deals with machines and components in both static and dynamic conditions. The different forces, their planes are well explained. Establishing equilibrium of rigid bodies with focus on moments, couple, vectors are dealt. Concepts of Friction and its types which play an important role in all moving parts are laid out clearly. The centroid, centre of gravity and moment of inertia concepts are dealt in detail.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Mechanics of Solids**" and attain **SKILL DEVELOPMENT** through Problem solving methodologies.					
Course Outcomes	CO1 To understand techniques of analysing forces in statically determinate beams. CO2 Estimate Centre of Gravity and Moment of Inertia of CO3 Evaluate friction coefficient in different applications CO4 Predict the different motion types and their applications					
Course Content:						
Module 1	Forces and equilibrium	Assignment	Data collection	10 Sessions		
Topics: Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams.						
Module 2	Centre of Gravity and Moment of Inertia	Assignment	Mathematical	10 Sessions		
Topics: Concept and methods of calculation of Centroid, Centre of Gravity and Moment of Inertia.						
Module 3	Friction	Assignment	Mathematical	10 Sessions		
The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.						
Module 4	Kinematics	Assignment	Mathematical	15 Sessions		
Topics: Displacement, speed, velocity, acceleration and their varieties. Newton's Second law of motion, rectilinear and curvilinear motion. Numerical problems. Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies. D' Alembert's principle and its application.						
Targeted Application & Tools that can be used: Application Area is Geophysical phenomenon, Aerospace, Aerodynamics, Microfluidics, Pipe network, Turbo-machinery. Industries using above applications and tools – Siemens, TATA, Triveni Engineering, GE etc						
TEXTBOOKS: 1. Andy Ruina and Rudra Pratap, Introducing to Statics and Dynamics, Oxford University Press. 2. Bansal R. K., A Text Book of Engineering Mechanics, Laxmi Publications. **Reference Book(s):** 1. F. P. Beer, E. R. Johnston (Jr.), and J. T. De Wolf, "Mechanics for Engineers, Statics and Dynamics", McGraw-Hill, 2. Irving H. Shames, Engineering Mechanics, Prentice-Hall. **Web links:** 1. https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18 2. https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force						

Topics relevant to "SKILL DEVELOPMENT": Friction for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout.	
Catalogue prepared by	Dr. Udaya Ravi M
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC1006	**Course Title: Engineering Graphics** **Type of Course: Engineering Science Course**	**L-T-P-C**	2	0	0	2
Version No.	1.2					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is designed with the objective of giving an overview of engineering drawing with the help of software tools. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings with computerized drafting tools. Computerized drafting provides accurate and easily modifiable graphic entities, easy data storage, easy retrieval facility and it enhances creativity. It will expose students to the concept of engineering drawing and teach them to draw different views of planes and solids in different orientations. The course will teach students to use AutoCAD to produce engineering drawings. They will learn to create drawing layouts, dimensioning, the theory of projection, orthographic projection of points, lines, planes and solids, isometric projection and be introduced to the development of surfaces.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Engineering Graphics** " and attain **SKILL DEVELOPMENT** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Identify and interpret the basic principles, symbols, and conventions of engineering graphics, including lines, scales, lettering, and dimensioning. CO2. Construct basic geometrical shapes and engineering curves (such as ellipse, parabola, cycloid) using appropriate drawing instruments and techniques. CO3. Develop orthographic projections of points, lines, planes, and simple solids in various positions. CO4. Generate and interpret sectional views, true shapes, and developments of surfaces of simple objects and solids. CO5. Visualize and convert 3D objects into isometric views and vice versa from orthographic projections. CO6. Utilize freehand sketching and to communicate engineering ideas effectively through neat, standardized technical drawings.					
Course Content						
Module 1	Introduction to Drawing	Assignment	Standard technical drawing	02 Sessions		
Topics: Introduction, drawing instruments and their uses, relevant BIS conventions and standards, Lettering, Line conventions, dimensioning, Selection of drawing sheet size and scale. [02 Hours: Comprehension Level]						

Module 2	Orthographic projections of Points, Straight Lines and Plane Surfaces	Assignment	Projection methods Analysis	10 Sessions
Topics: Introduction, Definitions – Elements of projection and methods of projection, Planes of projection, reference line and conventions adopted. First angle and third angle projections. Projection of Points in all 4 quadrants. Projections of Straight Lines (located in first quadrant/first angle projection only): True and apparent lengths, true and apparent Inclinations to reference planes. (No application problems). Projection of Plane surfaces (First angle projection): Regular plane surfaces – triangle, square, rectangle, pentagon, hexagon and circle – in different positions inclined to both the planes using change of position method only. [10 Hours: Application Level]				
Module 3	Orthographic Projections of Solids	Assignment	Multi-view drawing Analysis	10 Sessions
Topics: Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron in different positions (Problems resting on HP only and First angle projection). [10 Hours: Application Level]				
Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	8 Sessions
Topics: Introduction, Isometric scale, Isometric projections of right regular prisms, cylinders, pyramids, cones and their frustums, spheres and hemispheres, hexahedron (cube), and combination of 2 solids, conversion of orthographic view to isometric projection of simple objects. [8 Hours: Application Level]				
Targeted Application & Tools that can be used: Application Area is in understanding and interpreting an object in various positions and converting it into a technical drawing which can be universally accepted. Professionally Used Software: AutoCAD				
Text Book: 1.N. D. Bhatt, "Engineering Drawing: Plane and Solid Geometry," Charotar Publishing House Pvt. Ltd**.**				
References: 1. K.R. Gopalakrishna, "Engineering Graphics", Subhash Publishers, Bangalore. 2. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall. 3. D. A. Jolhe, "Engineering Drawing with Introduction to AutoCAD," Tata McGraw Hill. 4. Engineering Graphics Manual provided by Instructor incharge. **Webresources :** Knimbus - Your Library. Anywhere, Anytime.				
Topics relevant to "SKILL DEVELOPMENT": Projection in first and third angle for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout.				
Catalogue prepared by	Dr.Yuvaraja Naik			

Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: ECE1511	**Course Title: Design Workshop** **Type of Course: Engineering Science Course**	**L-T-P-C**	1	0	2	2
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to provide an in-depth understanding of Arduino, microcontrollers Raspberry pi and their application in various real time projects involving sensors. Throughout the course, students will learn the fundamentals of Arduino and Raspberry Pi programming and gain hands-on experience with a wide range of sensors. Students will explore how to connect and interface sensors with Arduino and Raspberry Pi boards, read sensor data, and use it to control various output devices This course is suitable for beginners who are interested in exploring the world of electronics and developing practical applications using Arduino, Raspberry Pi and sensors.					
Course Objective	The objective of the course is **Employability Skills** of student by using **PARTICIPATIVE LEARNING** techniques.					
Course Outcomes	**On successful completion of the course the students shall be able to** CO1. Explain the main features of the Arduino & the Raspberry Pi prototype board. CO2. Demonstrate the hardware interfacing of the peripherals to Arduino and Raspberry Pi system. CO3. Understand the types of sensors and its functions CO4. Demonstrate the functioning of live projects carried out using Arduino and Raspberry Pi system**.**					
Course Content:						
Module 1	Basic concepts of Microcontrollers	Hands-on	Interfacing Task and Analysis	3 Sessions		

Topics:
Introduction to Arduino, ESP and Node MCU Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, API's , Introduction to Embedded C and Arduino platform, Arduino Datatypes and variables, Arduino i/o Functions, Arduino Communications, Arduino IDE, Various Cloud Platforms.

Module 2	Sensory Devices	Hands-on	Interfacing Task and Analysis	3 Sessions

Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switches and actuators, sensor interface with Arduino.
Introduction to 3D Printer: 3D Printer technology and its working Principles, Applications.
Introduction to online Simulators: Working with AutoCAD/Fusion 360 Simulator.

Module 3	Introduction to Micro python	Hands-on	Interfacing Task and Analysis	4 Sessions

Topics:
Introduction to MicroPython, Comparison with other programming languages, Setting up the MicroPython development environment, Basics of MicroPython syntax and structure.

Module 4	Working with Raspberry-pi	Hands-on	Interfacing Task and Analysis	5 Sessions

Introduction to raspberry pi boards, pin-diagram, different types of raspberry pi boards and its application, LED and switch control. Mastering Modules, Setup Raspberry - PuTTY SSH,VNC Viewer to interface with more complicated sensors and actuators. Various Libraries and its functions.

Lab: Name of the Experiments:

1. Introduction Lab 1:

Level 1: Overview on Arduino based Micro-controller, and sensors.

Level 2: Interfacing of Arduino and ESP boards with sensors and other components.

2. Lab 2: Smart Plant Monitoring

Level 1- Push button-controlled LED.
Level 2- Automatic Irrigation and monitoring System using Arduino

3. Lab 3: Robotics with Arduino.

Level 1- Servo Motor control using Arduino
Level 2: DC Motor Control Using Arduino for Robotics.

4. Lab 4: Environmental pollution using ESP.

Level 1 - IoT based air Pollution Monitoring System.
Level 2- IoT Based water pollution system

5. Introduction Lab for raspberry pi:

Level 1: Overview on Different Raspberry Pi Boards, and sensors.

Level 2: Configuring the Raspberry Pi and Interfacing with sensors and other components.

6. Lab 7: Raspberry Pi based Object Detection using TensorFlow and OpenCV.
7. Lab 8: Speech Recognition on Raspberry Pi for Voice Controlled Home Automation.
8. Lab 9: Design the website using HTML and CSS, and host the website on Raspberry Pi.
9. Introduction Lab for 3D printing:

Overview of 3D printing. Design of 3D structure using the CAD. Understand the steps of fabrication of simple rectangular box using 3D printer.

10. Lab 10: Design and print of Hollow Cylindrical structure using 3D CAD and 3D printer.
11. Lab 11 Demonstration of Jetson nano board and its capability. (OPTIONAL)
12. Lab 12: Revision
13. Lab 13: Revision
14. Lab 14: Mini Project
15. Lab 15: Mini Project Evaluation.

Topics: Types of Arduino boards, Thonny Python, Python IDLE, **sensors, 3D Printer**

Targeted Application & Tools that can be used:

Application Area:

Home Automation, Environmental Monitoring, Agriculture and Farming, Industrial Automation, Internet of Things (IoT), Robotics, Wearable Devices, Security Systems, Education and Learning. These are just a few examples of the many application areas where Arduino, Raspberry Pi and sensors can be applied. The flexibility and affordability of Arduino, and Raspberry Pi combined with the wide range of sensors available, allow for endless possibilities in creating innovative projects.

Professionally Used Software: Students can use open SOURCE Software's Arduino IDE and Tincker CAD, Thonny Python, Python IDLE etc.

Project work/Assignment:

1. Projects: At the end of the course students will be completing the project work on solving many real time issues.

2. Book/Article review: At the end of each module a book reference or an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format. Presidency University Library Link .

3. Presentation: There will be a presentation from interdisciplinary students group, where the students will be given a project on they have to demonstrate the working and discuss the applications for the same

Textbook(s):

1. Monk Simon "Programming Arduino: Getting Started with Sketches", Mc Graw Hill Publications Second Edition
2. Monk Simon "Raspberry Pi Cookbook: Software and Hardware Problems and Solutions", Publisher(s): O'Reilly Media, Inc. ISBN: 9781098130923 fourth Edition.

References

Reference Book(s)

1. Neerparaj Rai "Arduino Projects for Engineers" BPB publishers,first edition, 2016.
2. Ryan Turner "Arduino Programming " Nelly B.L. International Consulting Ltd. first edition,2019.
3. Charles Bell Micro Python for the Internet of Things: A Beginner's Guide to Programming with Python on Microcontrollers" by" Edition 1, 2017, ISBN 978-1-4842-3123-4
4. Stewart Watkiss "Learn Electronics with Raspberry Pi " Apress Berkeley, CA . second edition,2020. ISBN978-1-4842-6348-8
5. Jo Prusa, "Basic of 3D printing", Prusa Research, 3rd edition.
6. Volker Ziemann, "**A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors)**", CRC Press, 1st Edition. 2018.

Online Resources (e-books, notes, ppts, video lectures etc.):

1. Arduino trending Projects < https://www. https://projecthub.arduino.cc/>

2. Introduction to Arduino < https://onlinecourses.swayam2.ac.in/aic20_sp04/preview>
3. Case studies on Wearable technology< https://www.hticiitm.org/wearables>
4. Raspberry-pi Projects < https://magpi.raspberrypi.com/articles/category/tutorials/>
5. Introduction to internet of things< https://nptel.ac.in/courses/106105166>

E-content:

1. Cattle Health Monitoring System Using Arduino and IOT (April 2021| IJIRT | Volume 7 Issue 11 | ISSN: 2349-6002)
2. M H Hemanth Kumar, Ravi Pratap Singh, Nishu Sharma, Pragya Singh" IOT BASED SMART SECURITY SYSTEM USING ARDUINO" 2021 JETIR August 2021, Volume 8, Issue 8.

3. R. Maheswar, P. Jayarajan, S. Vimalraj, G. Sivagnanam, V. Sivasankaran and I. S. Amiri, "Energy Efficient Real Time Environmental Monitoring System Using Buffer Management Protocol," 2018, pp. 1-5, doi: 10.1109/ICCCNT.2018.8494144. https://ieeexplore.ieee.org/document/8494144.

4. Yaser S Shaheen,Hussam., " Arduino Mega Based Smart Traffic Control System ," December 2021 Asian Journal of Advanced Research and Reports 15(12): 43-52, 2021(15(12): 43-52, 2021):15(12): 43-52, 2021.

5. Basil, Eliza Sawant, S.D. "IoT based traffic light control system using Raspberry Pi " DOI 10.1109/ICECDS.2017.8389604

6. Supriya S, 2Dr. Aravinda " Green leaf disease detection and identification using Raspberry Pi https://www.irjet.net/archives/V9/i8/IRJET-V9I847.

7. Dr. E.N. Ganesh., "Health Monitoring System using Raspberry Pi and IOT" DOI : http://dx.doi.org/10.13005/ojcst12.01.03

Topics relevant to development of "SKILL": System design for achieving Sustainable Development Goals.

Catalogue prepared by	Dr Ashutosh Anand
Recommended by the Board of Studies on	BOS NO:
Date of Approval by the Academic Council	Academic Council Meeting No. ___ dated on _____

<table>
<tr><td>Course Code:
DES1146</td><td colspan="3">Course Title: Introduction to Design Thinking
Type of Course: Theory</td><td>L-T-P-C</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">The course aims to introduce concepts of Design thinking and orient the students towards importance of design thinking, its definition and applications keeping Human Centric Design as pivotal. Emphasizing how it can be applied to solve complex problems, innovate, and create user-centered solutions. Students will engage in hands-on learning through exercises, case studies, and projects, fostering creative problem-solving skills and an iterative approach to design. By the end of the course, students will be equipped to apply the design thinking process to various fields, including product development, service design, business innovation, and social entrepreneurship and will have gained the foundational knowledge and practical experience to approach real-world problems using design thinking.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is promoting Entrepreneurship for students by using PARTICIPATIVE LEARNING Techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of the course the students shall be able to:
CO1. Describe Design thinking essentials
CO2. Discover grey areas in chosen designs
CO3. Interpret design flaws with possible solutions</td></tr>
<tr><td>Course Content:</td><td colspan="8">All assignments and projects must be developed using the reference materials available from the PU e-resource database – JSTOR, EBSCO, Library OPAC, NPTEL Videos, etc.</td></tr>
<tr><td>Module 1</td><td>Introduction to Design Thinking</td><td colspan="2">Visual journal, Case studies, User research, context-specific assignment/project</td><td colspan="3">Visual output generation- Visual Journal and narrative and Prototype development.</td><td>3 Sessions</td></tr>
<tr><td colspan="9">Topic
1) Definition and introduction to Design Thinking (Evolution)
2) Understanding Design Thinking-Conceptual and contextual meaning of Design Thinking</td></tr>
<tr><td>Module 2</td><td>Design flaws and</td><td colspan="2">Visual journal. Documentation (Project reports)</td><td colspan="3">Visual output generation, narrative development &</td><td>12 Sessions</td></tr>
</table>

	Interpretations	Prototypes of Major & Minor Projects	Prototypes of Products/processes	

Topics:

1) Steps in Design Thinking (SCAMPER, Double Diamond)
2) IDEO tool kit- EDIPT
3) D-School HCD principles
4) Problems. Ill-defined, well defined
5) Definition of design flaw and its Identification-Discovering a bottleneck in process/Product/Understanding
6) Observational studies on design flaws in various areas of application with possible solutions - Two case studies (Major and Minor)
7) Purposeful designs

Targeted Application & Tools that can be used:

1) Design ideation and concept development for innovative projects—SCAMPER/EDIPT
2) Double diamond concept.

Text Book

Thinking Design by S Balaram. New Delhi [India]: Sage Publications Pvt. Ltd. 2010. eBook., Database: eBook Collection (EBSCOhost) https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=6&sid=18ab1f43-1f92-4d02-ae2e-a9c06dc06d8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=354920&db=nlebk

References

Design Thinking by Clarke, Rachel Ivy. Series: Library Futures, Vol. 4. Chicago: ALA Neal-Schuman. 2020. eBook., Database: eBook Collection (EBSCOhost)

Catalogue prepared by	Dr. Ashok A Itagi
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:

PPS1026</td><td colspan="4">Course Title: Industry Readiness Program – II (Audited Course)
Type of Course: Practical Only Course</td><td>L- T - P- C</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">• Students are expected to understand Basic English.
• Students should have desire and enthusiasm to involve, participate and learn.</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course is designed to enable students learn styles of communication, team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of “Industry Readiness for Young Professionals” and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="8">On successful completion of this course the students shall be able to:
CO 1 Apply different communication skills for success in workplace
CO 2 Practice team building skills for career success
CO3 Demonstrate ethical leadership skills in workplace</td></tr>
<tr><td>Course Content</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Effective Communication</td><td colspan="2">Classroom activities</td><td colspan="2"></td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="9">Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual)

Activity: Use social media prompts to prepare self-introduction videos</td></tr>
<tr><td>Module 2</td><td colspan="2">Team Building</td><td colspan="2">Group Activity</td><td colspan="2"></td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="9">Topics: Skills of an effective team player

Activity: Student group activity to build class networking</td></tr>
<tr><td>Module 3</td><td colspan="2">Leadership</td><td colspan="2">Case study</td><td colspan="2"></td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="9">Topics: Types of leadership, using empathy in leadership

Activity: Individual presentation by students on corporate leaders.</td></tr>
</table>

Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links Activities
Assignment proposed for this course Assignment 1: One minute reel Assignment 2: Team building assignment
Continuous Individual Assessment Module 1: L-S-R-W class assessment Module 2: Team Presentation Module 3: Individual Assessment
The topics related to skill development: Students acquire knowledge on effective communication skills, team building skills and how to prepare themselves to be leaders in workplace using empathy and implement various skill sets during the course of their time in the university.

Catalogue prepared by	Faculty of L&D
Recommended by the Board of Studies on	**BOS held on**
Date of Approval by the Academic Council	**Academic Council Meeting held on**

Course Code: CHE7601	**Environmental Studies** **Type of Course: MAC course**	**L- T- P- C**	**1**	**0**	**0**	**0**
		Contact hours	**-**	**-**	**-**	**-**
Course Pre-requisites	NIL					
Anti-requisites	**NIL**					
Course Description	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. **This course is designed to cater to Environment and Sustainability**					
Course Objective	The objective of the course is **'SKILL DEVELOPMENT'** of the student by using **'PARTICIPATIVE LEARNING'** techniques					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Describe the issues related to natural resources, ecosystems and biodiversity CO2. Identify environmental hazards affecting air, water and soil quality CO3. Recognize the importance of healthy environment and finding the sustainable methods to protect the environment CO4. Convert skills to address immediate environmental concerns through changes in environmental processes, policies, and decisions					
Course Content:						
Module 1	Understanding Environment, Natural Resources, and Sustainability					
Topics: Classification of natural resources, issues related to Population growth and their overutilization, and strategies for their conservation. Water, air, soil, mineral, energy and food source. Effect of human activities on natural resources. Concept of sustainability- Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs; Sustainable practices in managing resources, including deforestation, water conservation, Desalination – types, energy security, and food security issues, Life Cycle thinking and Circular Economy.						
Module 2	Ecosystems, Biodiversity, and Sustainable Practices					
Topics: **Ecosystems and ecosystem services:** Various natural ecosystems, Major ecosystem types in India and their basic characteristics; forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance. The importance of biodiversity, Types of biodiversity, Biodiversity and Climate Change, the threats it faces, hotspots, and the methods used for its conservation. Strategies for in situ and ex situ conservation, mega diverse nation.						
Module 3	Environmental Pollution, Waste Management, and Sustainable Development					
Topics: Types of pollution- Chemical, - Biological, Biomedical, noise, air, water, soil, thermal, radioactive and marine pollution, and their impacts on society. Urbanization and Urban environmental						

problems; effects, and mitigation.
Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management;

Sustainable Materials and Technologies: Biodegradable and compostable materials, Recycled and reclaimed materials (E-waste management), Sustainable manufacturing processes.

Module 4	Social Issues, Legislation, and Practical Applications			

Topics:
Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Hazardous waste Rule 1989, Biomedical Waste handling 1998, Fly Ash Rule 1999, Municipal Solid Waste Rule 2000, Battery Rules 2001, E- Waste Rules 2011, Plastic waste management Rules 2016, Construction Demolition waste Rules 2016 National Biodiversity Action Plan (NBAP)
Major International Environmental Agreements: Convention on Biological Diversity (CBD), The Biological Diversity (Amendment) Act, 2023, United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement.
Major International organisations and initiatives: United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC).

Targeted Application & Tools that can be used:
Application areas are Energy, Environment and sustainability
Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type
- Online exams (MCQs) will be conducted by the department of Chemistry

Online Link*:
1) Lecure by Dr. Samik Chowdhury, Dr. Sudha Goel, NPTEL course: Environmental Science, https://nptel.ac.in/courses/109105203, 2024.
2) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Text Book

1. G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA
2. Poonia, M.P. Environmental Studies (3rd ed.), Khanna Book Publishing Co.
3. Bharucha, E. Textbook of Environmental Studies (3rd ed.) Orient Blackswan Private Ltd.
4. Dave, D., & Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
5. Rajagopalan, R. Environmental studies: from crisis to cure (4th ed.). Oxford University Press.
6. Basu, M., & Xavier Savarimuthu, S. J. Fundamentals of environmental studies. Cambridge University Press.
7. Roy, M. G. Sustainable Development: Environment, Energy and Water Resources. Ane Books.
8. Pritwani, K. Sustainability of business in the context of environmental management. CRC Press.
9. Wright, R.T. & Boorse, D.F. Environmental Science: Toward A Sustainable Future (13th ed,). Pearson.

Reference Books

1. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022), Conservation through Sustainable Use: Lessons from India. Routledge.
2. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.
3. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.
4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238
5. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press

Resources:

1. https://nptel.ac.in/courses/109105203
2. https://archive.nptel.ac.in/courses/120/108/120108004/
3. https://nptel.ac.in/courses/127105018
4. https://onlinecourses.nptel.ac.in/noc23_lw06/preview
5. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
6. https://archive.nptel.ac.in/courses/120/108/120108002/
7. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
8. https://nptel.ac.in/courses/102104088
9. https://nptel.ac.in/courses/124107165
10. https://nptel.ac.in/courses/109106200
11. https://archive.nptel.ac.in/content/storage2/courses/120108004/module1/lecture1.pdf
12. https://onlinecourses.swayam2.ac.in/nou25_ge19/preview
13. https://onlinecourses.swayam2.ac.in/ini25_hs01/preview
14. http://kcl.digimat.in/nptel/courses/video/105105184/L32.html
15. https://nptel.ac.in/courses/105105169

Topics relevant to Skill Development:

1. An attitude of enquiry.
2. Write reports

The topics related to Environment and Sustainability:

topics in theory component are relevant to Environment and Sustainability.

Catalog prepared by	Faculty members of the Department of Chemistry
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: MAT2315	**Course Title: Laplace Transform, Complex Variables and Optimization Techniques for Mechanical Engineering** **Type of Course:1] School Core**	**L-T-P- C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces the fundamental concepts of Laplace transforms, complex variables, and operations research with emphasis on their applications in science and engineering. Students will learn Laplace transform techniques for solving linear differential equations and analyzing dynamic systems. The course covers analytic functions, conformal mappings, contour integration, and residue theory, which are widely used in fluid flow, heat transfer, and other engineering applications. It also introduces optimization techniques, including linear programming, transportation and assignment problems, and network analysis using CPM and PERT for effective resource allocation, logistics, and project scheduling. The course equips students with mathematical tools to formulate, analyze, and solve real-world engineering and industrial problems.					
Course Objective	This course aims to provide students with a strong foundation in advanced mathematical techniques and optimization methods used in engineering applications. It develops an understanding of complex variables, analytic functions, conformal mappings, and contour integration for solving problems related to fluid flow, heat transfer, and field analysis. The course equips students with the knowledge of Laplace transforms and Fourier transform concepts to model and analyze dynamic systems, vibrations, and electrical circuits. It also introduces Operations Research and Linear Programming techniques for optimizing resource allocation, production planning, and decision-making processes. Further, the course enables students to formulate and solve transportation, assignment, and network optimization problems, including project scheduling using CPM and PERT. Through these topics, students develop analytical, computational, and problem-solving skills required for addressing real-world engineering and industrial challenges.					

Course Out Comes	After successful completion of the course, students will be able to: **CO1:** Apply transformation methods to solve piecewise-defined mathematical models. (L3) **CO2:** Apply Laplace transformation techniques to solve differential equations. (L3) **CO3:** Apply the concepts of complex variables to determine the properties of complex functions and mappings. (L3) **CO4:** Apply methods of complex analysis to evaluate integrals and solve problems involving complex functions. (L3) **CO5:** Apply optimization techniques to obtain optimal solutions for decision-making and resource allocation problems. (L3) **CO6:** Apply network and optimization methods to solve transportation, assignment and project management problems. (L3)	
Course Content:		
Module 1	**Complex Variables**	**(14 + 5 = 19 Sessions)**
Introduction, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; Conformal mappings. Complex Integration: Contour integrals, Cauchy-Goursat theorem, Cauchy Integral formula, Liouville's theorem and Maximum-Modulus theorem, Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem, Analysis of fluid flow around obstacles and steady-state heat distribution**.**		
Module 2	**Laplace Transforms**	**(12 + 4 = 16 Sessions)**
Definition and Laplace transforms of elementary functions. Properties of Laplace transform, and Laplace transform of periodic function, unit-step function and Impulse function – related problems. Inverse Laplace transform of standard functions - problems, initial and final value theorem. Convolution theorem, Spring-Mass-Damper systems, Dynamic analysis of vibration systems and transient response of electrical circuits, Basics of Fourier Transform.		
Module 3	**Operations Research and Linear Programming**	**(8 + 3 = 11 Sessions)**
Introduction to OR: Evolution of OR, Definitions of OR, Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR, models used in OR Linear Programming Problem (LPP), graphical method. Simplex method, Big-M Method and Two-Phase Simplex Method, Degeneracy in LPP. Dual Simplex Method (Use software), Problems on Production planning and resource allocation**.**		
Module 4	**Applications of LPP**	**(11 + 3 = 14 Sessions)**
Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Least-cost cell method, Vogel's Approximation method. Optimality in Transportation problem by Modified Distribution (MODI) method, Degeneracy in transportation problems, Unbalanced T.P. Maximization T.P., application of transportation problem Assignment problem, Travelling Sales Problem. Network Analysis: CPM and PERT, Transportation and distribution planning and project scheduling and management using CPM and PERT		

Targeted Applications & Mathematical Tools:

- Analysis of fluid flow around obstacles, steady-state heat transfer, electrostatic and electromagnetic field modeling, conformal mapping for engineering design, and potential flow analysis.
- Modeling and solving differential equations in vibration systems, spring-mass-damper systems, transient analysis of electrical circuits, control system analysis, and signal processing applications.
- Optimization of production planning, resource allocation, inventory management, transportation planning, scheduling, and decision-making in engineering and industrial systems.
- Transportation and distribution planning, assignment problems, travelling salesman problem, supply chain optimization, project scheduling and management using CPM and PERT, and network optimization.

Software: MATLAB, Mathematica, Maple, Python, GeoGebra, Octave, R, Scilab.

Assignment:

Assignments will involve theoretical problem-solving and computational implementation using suitable programming tools. The assignments may be undertaken individually or in groups, as decided by the instructor.

Textbooks:

5. S. Lipschutz and M. L. Lipson, *Linear Algebra*, Schaum's Outline Series, 6th ed. New York, NY, USA: McGraw-Hill Education, 2017.
6. H. Anton and A. Kaul, *Elementary Linear Algebra: Applications Version*, 12th ed. Hoboken, NJ, USA: Wiley, 2019.
7. B. S. Grewal, *Higher Engineering Mathematics*, 45th ed. New Delhi, India: Khanna Publishers, 2022.

References:

1. E. Kreyszig, *Advanced Engineering Mathematics*, 10th ed. Hoboken, NJ, USA: John Wiley & Sons, 2011.
2. B. S. Grewal, *Higher Engineering Mathematics*, 45th ed. New Delhi, India: Khanna Publishers, 2023.
3. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 5th ed. New Delhi, India: Narosa Publishing House, 2016.
4. J. W. Brown and R. V. Churchill, *Complex Variables and Applications*, 9th ed. New York, NY, USA: McGraw-Hill Education, 2014.
5. M. R. Spiegel, J. J. Schiller, and R. A. Srinivasan, *Schaum's Outline of Complex Variables*, 2nd ed. New York, NY, USA: McGraw-Hill Education, 2009.
6. H. A. Taha, *Operations Research: An Introduction*, 10th ed. Boston, MA, USA: Pearson, 2017.
7. F. S. Hillier and G. J. Lieberman, *Introduction to Operations Research*, 11th ed. New York, NY, USA: McGraw-Hill Education, 2021.
8. P. K. Gupta and D. S. Hira, *Operations Research*, 7th ed. New Delhi, India: S. Chand Publishing, 2021.
9. S. D. Sharma, *Operations Research*, 18th ed. New Delhi, India: Kedar Nath Ram Nath & Co., 2020.

E-resources/ Web links:

1. https://presiuniv.knimbus.com/portal/v2/default/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueId=CUSTOM_PACKAGE_EBSCO_29052023_250177
2. https://presiuniv.knimbus.com/portal/v2/default/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueId=CUSTOM_PACKAGE_EBSCO_29052023_110983
3. https://research.ebsco.com/c/n5guci/ebook-viewer/pdf/zi6yglcvlr?location=https%25253A%25252F%25252Fresearch.ebsco.com%25252Fc%25252Fn5guci%25252Fsearch%25252Fdetails%25252Fzi6yglcvlr%25253Frequest-context%25253Dplink%252526db%25253Dnlebk
4. NPTEL Video Lectures Laplace Transforms: https://www.nptel.ac.in/courses/111106111
5. NPTEL Video Lectures Complex Variables: https://archive.nptel.ac.in/content/syllabus_pdf/111105035.pdf
6. NPTEL Operations Research & Linear Programming: https://nptel.ac.in/courses/110106062 https://nptel.ac.in/courses/126105663 https://www.scu.edu.au/study/units/math2002/2026/

Topics relevant to SKILL DEVELOPMENT: The course develops analytical, mathematical modelling, optimization, and problem-solving skills through the study of Laplace Transforms, Complex Variables, and Operations Research. Students learn to apply these techniques to engineering applications such as dynamic system analysis, logistics, resource allocation, transportation planning, and project scheduling through practical problem-solving.

Catalogue prepared by	**Dr. V Nagendramma**
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
MEC2501</td><td colspan="2">Course Title: Basic Thermodynamics
Type of Course:
1]Professional Core Course
2] Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">MAT1211</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">The course aims at learning the the fundamental principles of thermodynamics with an emphasis on engineering applications. Students will explore key concepts such as energy, work, heat, and the laws of thermodynamics. The course provides a solid foundation for understanding how thermal systems operate and how energy is transformed and conserved in mechanical and chemical processes.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with the concepts of "Basic Thermodynamics" and attain SKILL DEVELOPMENT through Problem solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">On successful completion of this course the students shall be able to:
CO1] Summarize the basic concepts of thermodynamics.
CO2] Compute the properties of pure substance with the help of steam tables.
CO3] Learn the first & second laws of thermodynamics and how to control mass and steady flow control volume system.
CO4] Predict feasibility of thermodynamic process and availability of maximum work.</td></tr>
<tr><td>Course Content:</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td>Introduction to Thermodynamics</td><td>Case Study</td><td>Data Analysis</td><td colspan="4">10 Sessions</td></tr>
<tr><td colspan="8">Topics:
Role of Thermodynamics in Engineering and Science, concepts of Thermodynamics: Systems and control volume, Surroundings, Macroscopic and Microscopic Analysis, Definition of Substance, Properties of Substance: Intensive and Extensive Properties, Thermodynamic Equilibrium, Concept of Quasi-Equilibrium, Process and Cycle, Fundamental Units, The Zeroth Law of Thermodynamics, Heat and forms of work, Temperature scales. Numericals.</td></tr>
<tr><td>Module 2</td><td>Properties of Pure Substances</td><td>Assignment</td><td>Data Collection and Analysis</td><td colspan="4">12 Sessions</td></tr>
<tr><td colspan="8">Topics:
Definition of Pure Substance, Facts about Pure Substances, Vapor, liquid, solid Phase Equilibrium, Equation of State for the Vapor Phase: Simple substance, Ideal Gases Characterization, Ideal Gas Equation, Real Gases.</td></tr>
</table>

Module 3	First Law of Thermodynamics	Assignment	Data Collection and Analysis	12 Sessions
Topics: Statement of First Law of Thermodynamics: First Law for Cyclic Process, First Law for Change of State of a System: Internal Energy, First Law as a Rate Equation, First Law Applied to a Control Volume. Numericals				
Module 4	Second Law of thermodynamics and entropy:	Assignment	Data Analysis through Programming	12 Sessions
Topics: Definition of Heat Engine and Reservoirs, Kelvin-Planck and Clausius Statements of the Second Law, Reversible and Irreversible Engines and processes, Internal and External Irreversibility, The Efficiency of a Carnot Cycle, The Ideal Gas Temperature Scale. Clausius Inequality, Entropy of a Property of a System, Calculation of Change in Entropy, Second Law Analysis of a Control Volume, Principle of Increase of Entropy, Definition of Exergy, Exergy Analysis of System and Control volume				
Targeted Application & Tools that can be used: Application area includes Power Plants (NTPC /BARC/NPCIL/BHEL), Automobile sector (Design – TATA/Hyundai/Bajaj etc.), Manufacturing Industries (Bosch/Irwin Tools/Casting Industries). Tools used: Matlab, Ansys				
Text Books: T1. Yunus A Cengel, Michael A, Boles, "Thermodynamics", McGraw Hill Education (India) Pvt Ltd.,5th edition, 2017				
References: R1. Nag P.K, "Engineering Thermodynamics", Tata Mc Graw-Hill Publishers. R2. Sonntag, Borgnakke, Van Wylen, "Fundamentals of Thermodynamics", John Wiley and Sons, New York. R3. Michael J Moran, Howard N Shapiro, Daisie D Boettner, Margaret B Bailey, "Principles of Engineering Thermodynamics" Wiley India Pvt. Ltd. Web Resources**:** William D Ennis, "Applied Thermodynamics for Engineers", 5th Edition. Link: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=BOOKYARDS_1_5255				
Topics relevant to "SKILL DEVELOPMENT": Thermodynamics laws, Refrigeration numerical for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout.				
Catalogue prepared by	Dr.Udaya Ravi M			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			

Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC2502**	**Course Title: Fluid Mechanics and Machinery** **Type of Course:** **Professional Core Course**	**L-T-P-C**	**3**	**1**	**0**	**4**
Version No.	1					
Course Pre-requisites	MAT1211					
Anti-requisites	NIL					
Course Description	This Course is designed to present the fundamental laws relating to the static and dynamic behaviour of fluids. It provides a basic knowledge in fluid properties and statics utilizing the principles developed in previous mechanics Courses and illustrates the basic fluid properties and fluid statics. Introduction to the fundamentals governing laws. The Course also discusses the basic concepts about Fundamentals of fluid kinematics, dimensional Analysis and flow through pipes and external surfaces.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Fluid Mechanics and Machinery**" and attain **SKILL DEVELOPMENT** through **Problem solving Methodologies.**					
Course Outcomes	CO1 Summarize the basic properties of fluids. CO2 Employ the concept of hydrostatics to various pressure measuring devices. CO3 Apply equations of motion to different types of fluid flows. CO4 Apply the principle of energy conservation to flow measuring devices. CO5 Interpret various energy losses for fluid flow through pipes.					
Course Content:						
Module 1	Introduction to Fluid Mechanics	Assignment	Data collection	8L + 2T Sessions		
Topics: Introduction to fluids and fluid mechanics, Concepts of velocity, acceleration, momentum, density, specific gravity, specific volume, viscosity, capillarity, surface tension, bulk modulus, compressibility.						
Module 2	Fluid Statics	Assignment	Mathematical	9L + 2T Sessions		
Topics: Pascal Law and application, Hydrostatic Law and its application, Types of pressures, Conservation of momentum, Pressure Measuring devices – Manometers, Buoyancy, Archimedes Principle, Stability conditions for floating bodies**.**						
Module 3	Fluid Kinematics	Assignment	Mathematical	10 L + 5T Sessions		

Topics:
Definition of fluid kinematics, Velocity, acceleration, change in momentum, law of conservation of mass, types of flows, concept of turbulence, Reynolds number and its importance, Continuity equation (1D & 3D), Velocity potential function and stream function and its significance in relevance to rotational and irrotational flows.

Module 4	Fluid Dynamics	Assignment	Mathematical	12L + 4T Sessions

Introduction to Fluid dynamics, Conservation of energy, Energy balance equation (Bernoulli's Equation), Flow measuring devices, Boundary Layer theory and basic definitions, Compressible fluid flows**.** Flow through pipes, Non dimensional number.

Module 5	Fluid Machines	Assignment	Mathematical	6 L + 2T Sessions

Topics:
Introduction to fluid machines, Hydraulic turbines (Pelton, Francis, Kaplan), Draft tube, Turbine governing, Centrifugal pumps, Reciprocating pumps.

Targeted Application & Tools that can be used:
Application Area is Geophysical phenomenon, Hydrology, Aerospace, Aerodynamics, Microfluidics, Pipe network, Turbo-machinery.
Industries using above applications and tools – Siemens, Quest Global, Simulent consulting, Triveni Engineering, TATA, GE etc

Textbook
T1. Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch, and Alric P. Rothmayer, Fundamentals of Fluid Mechanics, 7th Edition, John Wiley and Sons, 2013.
T2. Çengel, Yunus A., and John M. Cimbala. *Fluid mechanics: Fundamentals and applications*. Boston: McGraw-Hill Higher Education, 15th edition. 2006.

References
R1. White, Frank M., "Fluid Mechanics," McGraw Hill Education (India). 2011 7th Edition
R2. Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell, "Fluid Mechanics: SI Version," Wiley India.

Topics for Technology Enabled Learning:
Fluid Mechanics on NPTEL By Prof. Suman Chakravarti
NPTEL : Mechanical Engineering - Introduction to Fluid Mechanics and Fluid Engineering
Knimbus - Your Library. Anywhere, Anytime.

Topics relevant to "SKILL DEVELOPMENT": Newton's second law to fluid flow, Physical interpretations of Bernoulli equation, Static, stagnation, Dynamics and total pressure head, Venturi-meter, vertical orifice & orifice meter, Pitot tube Fluid flow fields for **SKILL DEVELOPMENT** through **Problem solving Methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

<table>
<tr><td>Course Code:
MEC2503</td><td>Course Title: Fluid Mechanics and Machinery Lab
Type of Course: Professional core & Laboratory only</td><td>L-T-P-C</td><td>0-0-2-1</td></tr>
<tr><td>Version No.</td><td colspan="3">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="3">MAT1211</td></tr>
<tr><td>Anti-requisites</td><td colspan="3">NIL</td></tr>
<tr><td>Course Description</td><td colspan="3">This is an introductory course where the flow behavior, fluid forces and analysis tools are introduced. The goals of the experiments include determination of forces generated when fluid flow takes place over a solid object, applications of the control volume approach, demonstration of the momentum and energy equations and engineering correlations. Intricate flow phenomena such as separations and transition to turbulence are demonstrated. Experimental setups such as flow through a tube, flow over a flat plate, wind tunnel and smoke tunnel are made available to the students. The lab experiments utilize U-tube manometer, stop watch and data acquisition.</td></tr>
<tr><td>Course Out Comes</td><td colspan="3">On successful completion of the course the students shall be able to:
CO1: Analyze the pipe flow and flow measurements in various channels.
CO2: Explain the procedure of performance analysis of turbines and pumps in various operating conditions
CO3: Describe the basics quantities of fluid flow phenomena
CO4: Find the head losses in various fluid machineries</td></tr>
<tr><td>Course Objective</td><td colspan="3">The objective of the course is to familiarize the learners with the concepts of "Fluid Mechanics and Machineries" and attain SKILL DEVELOPMENT through Experiential learning techniques.</td></tr>
<tr><td></td><td colspan="3"><table>
<tr><th>Session No.</th><th>Name of the Experiment</th></tr>
<tr><td>01</td><td>Verify the Bernoulli's Theorem and plot a graph of total energy vs. distance.</td></tr>
<tr><td>02</td><td>Study the transition zone using Reynold's Number.</td></tr>
<tr><td>03</td><td>Determine Coefficient of Discharge C_d</td></tr>
<tr><td>04</td><td>Determine coefficient of discharge C_d</td></tr>
<tr><td>05</td><td>To study and determine the fluid forces acting on the different types of vanes</td></tr>
<tr><td>06</td><td>Determine coefficient of Discharge C_d and Coefficient of Velocity C_v</td></tr>
<tr><td>07</td><td>Determine the friction factor for pipes</td></tr>
</table></td></tr>
</table>

	08	Determine head loss and loss coefficient for pipe fitting
	09	Determine coefficient of discharge C_d
	10	Study of rotameter
	11	Study of centrifugal pump
	12	Study of axial flow fan
	13	Study of Kaplan turbine
	14	Study of Pelton wheel turbine
	15	Study of francis turbine
	16	Study of wind tunnel

Targeted Application & Tools that can be used: Orifice Meter, Venturi Meter, Turbines and other flow measurement machines

Text Book

T1: "Fluid Mechanics and Machinery Laboratory Manural" Presidency University.

T2**:** P. N Modi and S. M. Seth, "Hydraulics and Fluid Mechanics, "Rajsons Publications Pvt. Limited.

References

R1 White, Frank M., "Fluid Mechanics" McGraw Hill Education (India).

R2 Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell, "Fluid Mechanics: SI Version" Wiley India.

R3 Fluid Mechanics and Hydraulic Machines by RK Banzal, Laxmi Publications Pvt Ltd.

(iii) Web-Resources:

https://presiuniv.linways.com/user#/searchresult?searchId=energy%20conversion&_t=1660731503338

Topics relevant to "SKILL DEVELOPMENT": Newton's second law to fluid flow, Physical interpretations of Bernoulli equation, Static, stagnation, Dynamics and total pressure head, Venturi-meter, vertical orifice & orifice meter, Pitot tube Fluid flow fields for **SKILL DEVELOPMENT** through **experimental Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2022	**Course Title: Production Technology Type of Course: Professional Core & Theory Only**		**L-T-P-C**	**4**	**0**	**0**	**4**
Version No.	3.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	This course helps students to develop the understanding of various manufacturing process like casting, welding, metal forming and sheet metal work. To comprehend the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, milling, Drilling, shaping and allied machines, Grinding and allied machines and to understand the behavior of tool under different environment.						
Course Objective	The objective of the course is **skill development** of student by using **Participative Learning techniques**						
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Classify metal casting process and its types, CO2: Elucidate Metal joining process and its types. CO3: Explain various metal forming and extrusion process. CO4: Describe the nomenclature of cutting tools and tool life. CO5: Discuss different machining operations using diverse machine tools						
Course Content:							
Module 1	Casting process	Case Study	Compare and analyze the microstructure obtained in different casting process .	12 sessions			
Topics: **Casting Process:** Sand Casting: Sand Mold – Type of patterns - Pattern Materials – Pattern allowances –Molding sand Properties and testing – Elements of Gating system-Principle of special casting processes : Shell - investment – Pressure die casting - Centrifugal Casting – Stir casting; Defects in Sand casting.							
Module 2	joining process	Assignment	Learning different welding process	12 sessions			
Topics: **Joining Process:** Classification of Welding process, Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding- Gas metal arc welding – Submerged arc welding –Electron beam welding: Operating principle and applications of Solid state welding: Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.							
Module 3	Metal working and sheet metal process.	Assignment	Simulate the open die forging process using Deform software.	12 sessions			
Topics: **Metal working process:** Hot working and cold working of metals – Forging processes – Open, impression and closed die Forging – forging operations. Rolling of metals– Types of Rolling – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and cold extrusion. **Sheet metal process:** Sheet metal characteristics – shearing, bending and drawing							

operations – Stretch forming operations– Formability of sheet metal –Special forming processes-Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming.

Module 4	Introduction to tools	Assignment	Cutting tool nomenclature & Tool wear	10 sessions

Topics:
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

Module 4	Introduction to Machine Tools	Assignment	Machine tools Operations	14 sessions

Lathe: Centre lathe, constructional features, specification, operations – taper turning methods. Milling Machine-Construction, types, operations, Gear generation method, construction of gear milling, hobbing Drilling Machine-constructional features, specification, operations, Shaper and planner Machine-Construction, operations. Grinding-Surface grinding, centreless grinding and internal grinding.

Targeted Application & Tools that can be used:
Casting is used in producing automobile engine, aircraft engine and other parts where higher order complexity is involved.
Joining is find its use in small products like electronic items to fabrication of large bridge structure.
Plastic deformation based is significantly used when small components is to be made in large numbers such as toys.
Sheet metal process is largely used in automobile and aerospace industry to make outer structure.
Machine tools are used in manufacturing industries to convert raw materials into finished products

Project work/Assignment: Mention the Type of Project /Assignment proposed for this course

Case study: Compare and analyze the microstructure (grain size) obtained in different casting process.
Assignment: Simulate the open die forging process using Deform software.
Assignment: Programming to calculate machining time on various machine tool in Python.

Text Book:
T1. Hajra Chouldhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology", Volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997
T2. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition.

References:
R1. Gowri P. Hariharan, A.Suresh Babu, "Manufacturing Technology I", Pearson Education.
R2.Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education.
R3.Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing" Eight Editions, Prentice – Hall of India, 1997.
R4.Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 2ndEdition, TMH-2003.
R5.Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2004.
Web-Resources:
W1: https://nptel.ac.in/courses/112104304
W2: Japanese Production technique, Roy L. Nersesian 2002
https://presiuniv.knimbus.com/user#/searchresult?searchId=metal%20forming&_t=1654838829754

W3**:** Implementation of sustainable manufacturing practices in Indian manufacturing companies, Sumit Gupta, G.S. Dangayach,A.K. Singh,M.L. Meena and P.N. Rao 2018 https://presiuniv.knimbus.com/user#/searchresult?searchId=Rao,%20P.N&_t=1654840680158	
Topics relevant to "SKILL DEVELOPMENT": Casting, Forging and different welding techniques for **SKILL DEVELOPMENT** through **Participative learning Techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Aravinda T Asst. Professor, Dept. of Mechanical Engineering, Presidency University.
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

<table>
<tr><td>Course Code:
MEC2023</td><td colspan="5">Course Title: Foundry Forging & Welding Lab
Type of Course: Professional Core/ Laboratory only</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="10">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="10">NIL</td></tr>
<tr><td>Course Description</td><td colspan="10">This course helps the students to experience the practical concepts in preparation of green sand moulds using single and multi-patterns, tests for analyzing the properties of green sand such as moisture content, clay content and permeability. It also includes manual forging operations involving preparation of square bar from cylindrical bar and bolt preparation. The students will have hands on experience of different welding operations which include arc welding, gas welding, the TIG and MIG welding processes.</td></tr>
<tr><td>Course Objective</td><td colspan="10">The objective of the course is to familiarize the learners with the concepts of "Foundry Forging & Welding Lab" and attain SKILL DEVELOPMENT through Experiential learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="10">After successful completion of the course the students shall be able to:
CO1. Prepare green sand molds using different patterns and produce casting.
CO2. Analyze different properties required in mold sand and core sand.
CO3. Demonstrate different forging operations
CO4. Demonstrate different welding operations</td></tr>
<tr><td>Course Content:</td><td colspan="10">Total Sessions-30
Exp. 01: Brief introduction to laboratory and its equipment's, devices, tools and safety instructions.-2 Sessions
Exp. 02: Sand Mold preparation using single piece pattern-2 Sessions
Exp. 03: Sand Mold preparation using multi-piece pattern. 2 Sessions
Exp. 04: Sand mold Preparation Without using a pattern -2 Sessions
Exp. 05: Shear strength test, Compression test -2 Sessions
Exp. 06: Tensile Test & Transverse test of core sand -2 Sessions
Exp. 07: Sieve Analysis on sample sand-2 Sessions
Exp. 08: Permeability Test -2 Sessions
Exp. 09: Forging Operation-1- 3 Sessions
Exp. 10: Forging Operation-2 -3 Sessions
Exp. 11: Welding Operation 1: Gas Welding, Spot Welding- 2 Sessions
Exp. 12: Welding operation 2: Tig Welding, Mig Welding- 2 Sessions</td></tr>
<tr><td colspan="11">Targeted Application & Tools that can be used: Manufacturing Industries, Automobile, Defense, Aerospace</td></tr>
<tr><td colspan="11">Text Book
T1: P N Rao, "Manufacturing Technology – Vol. 1", McGraw Hill Education.</td></tr>
</table>

References

[1] Nagendra Parashar B.S., Mittal R.K., "Elements of Manufacturing Processes", PHI publications.
[2] Kalpakjian and Steven Schmid," Manufacturing Engineering and Technology", Prentice Hall.

Web Resources:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueid=INTECH_1_2609

Topics relevant to "SKILL DEVELOPMENT": Casting, Forging and different welding techniques for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Aravinda T
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2020	**Course Title: Material Science and Metallurgy** **Type of Course: Professional Core Course**	**L-T-P-C**	3-0-0-3
Version No.			
Course Pre-requisites	NIL		
Anti-requisites	NIL		
Course Description	Material Science and Metallurgy Course provides basic concepts in materials structure and its relation to properties and application to engineering problems. The Course includes structure of metallic, ceramic, and polymeric materials. The Course discusses the type of bonding and crystal structure their effect on the mechanical, electrical, and chemical properties of materials.		
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Describe the crystal structure, crystal imperfections and diffusion process in solids CO2: Explain phase diagrams and various heat treatment processes. CO3: Classify various engineering materials and their applications. CO4: Conduct Hardness, tensile, shear and compression tests of metallic specimens. CO5: Identify the defects inside the body by using Non-Destructive testing methods.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Material Science and Metallurgy**" and attain **SKILL DEVELOPMENT** through Participative learning techniques.		
Course Content:			
Module 1	Introduction to crystal structures and diffusion:	12 Sessions	
Topics: Fundamental concepts, atomic structure, atomic bonding, crystal structure, defects and diffusion [Remember Level]			
Module 2	Phase diagram:	10 Sessions	
Topics: Solidification, Phase Equilibria, Phase transformation, Iron carbon system, Numericals [Understanding Level]			
Module 3	Heat treatment:	10 sessions	
Topics: TTT diagram, CC curve, Microstructures developed, Different Heat Treatment processes. [Understanding Level]			
Module 4	Engineering materials	13 Sessions	
Topics: Properties and applications of alloy steels, tool steels, cast iron, copper and Al base alloy, Ni base alloys, Composites, ceramics, Polymers. [Remember Level]			
Targeted Application & Tools that can be used: Materials scientists work with diverse types of materials (e.g., metals, polymers, ceramics, liquid crystals, composites) for a broad range of applications (e.g., energy, construction, electronics, biotechnology, nanotechnology) employing modern processing and discovery principles (e.g., casting, additive manufacturing, coating, evaporation, plasma and radiation processing, artificial intelligence, and computer simulations).			

Text Book T1: G.E. Dieter, "Mechanical Metallurgy", G. E. Dieter. Mechanical Metallurgy, Mc Graw Hill Book Co., New York 1986. T2: Metallography and Materials Testing Lab Manual", Presidency University	
References R1: W. D. Callister, "Material Science and Engineering: An Introduction", Wiley. R2: V. Raghavan, "Materials Science and Engineering", Fifth Edition (Kindle Edition), PHI.	
Topics relevant to "SKILL DEVELOPMENT": Atomic structure, atomic bonding, crystal structure and test on specimen for Fatigue, Bending, compression and shear for **SKILL DEVELOPMENT** through **Participative learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Vivek Kumar Pandey, Assistant Professor
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

<table>
<tr><td>Course Code:
MEC2021</td><td>Course Title: Material Science and Material Testing Lab
Type of Course: Professional core & Laboratory only</td><td>L-T-P-C</td><td>0-0-2-1</td></tr>
<tr><td>Version No.</td><td colspan="3">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="3">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="3">NIL</td></tr>
<tr><td>Course Description</td><td colspan="3">Materials and Metallurgy Lab course aims at learning the practical concepts in material testing, which includes destructive testing like Tensile, Compressive, Hardness, Impact and non-destructive testing like Ultrasonic, Dye penetration test and Magnetic test.</td></tr>
<tr><td>Course Out Comes</td><td colspan="3">On successful completion of the course the students shall be able to:
CO 1: Describe the crystal structure, crystal imperfections and diffusion process in solids
CO 2: Explain phase diagrams and various heat treatment processes.
CO 3: Classify various engineering materials and their applications.
CO 4: Conduct Hardness, tensile, shear and compression tests of metallic specimens.
CO 5: Identify the defects inside the body by using Non-Destructive testing methods.</td></tr>
<tr><td>Course Objective</td><td colspan="3">The objective of the course is to familiarize the learners with the concepts of "Materials and Material Testing Lab" and attain SKILL DEVELOPMENT through Experiential learning techniques.</td></tr>
<tr><td>Course Content:</td><td colspan="3"><table>
<tr><th>Experiment no.</th><th>Experiment Name</th></tr>
<tr><td>1</td><td>Study of Hardness of a given specimen using Rockwell Hardness Testing machine</td></tr>
<tr><td>2</td><td>Study of Hardness of a given specimen using Brinnel Hardness Testing machine</td></tr>
<tr><td>3</td><td>Study of Hardness of a given specimen using Vickers Hardness Testing machine</td></tr>
<tr><td>4</td><td>Izod and Charpy tests on Mild steel, Copper and Brass Specimen</td></tr>
<tr><td>5</td><td>Preparation of specimen for Metallographic examination of different Engineering materials. Identification of microstructures of plain carbon Steel, tool steel, Gray cast Iron, SG (Spheroidal Graphite) iron, Brass, Bronze & composites</td></tr>
<tr><td>6</td><td>Non-Destructive Test experiments like,
a) Ultrasonic flaw detection.
b) Magnetic crack detection.
c) Dye penetration testing
to study the defects of casted and welded specimens</td></tr>
<tr><td>7</td><td>Tensile test on metallic (Mild steel) specimens using a Universal testing machine.</td></tr>
</table></td></tr>
</table>

	8	Compression test on metallic (Mild steel) specimens using a Universal testing machine
	9	Shear test on metallic (Mild steel) specimens using a Universal testing machine
	10	Bending test on metallic (Mild steel) specimens using a Universal testing machine
	11	Torsion test on metallic (Mild steel) specimens using a Torsion testing machine
	12	Fatigue Test on metallic (Mild steel) specimens using a fatigue testing machine.

Targeted Application & Tools that can be used: Destructive testing is undertaken in order to understand a specimen's performance or material behaviour, these procedures are carried out to the test specimen's failure. Destructive testing procedures can either follow specific standards or can be tailored to reproduce set service conditions in automobile, aerospace, construction industries etc. The standardized Nondestructive test methods are used in almost all industrial sectors, whether it concerns motor vehicles, airplanes, ships, machines or the quality assurance of buildings.

Text Book

T1: "Materials and Metallurgy lab manual" Presidency University.

References

R1: W. D. Callister, "Material Science and Engineering: An Introduction", Wiley.

(iii) Web-Resources:

https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=ELSEVIER1_20983

Topics relevant to "SKILL DEVELOPMENT": Atomic structure, atomic bonding, crystal structure and test on specimen for Fatigue, Bending, compression and shear for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Vivek Kumar Pandey
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: FIN1005	**Course Title: Finance Essentials for Decision Making** **Type of Course: HSMC**		**L-T-P-C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	Nil						
Anti-requisites							
Course Description	This course is designed to provide non-commerce students with a fundamental understanding of finance and its applications in personal and professional contexts. It introduces students to the basic concepts of finance, financial decision-making, and the financial environment, including markets and institutions. The course also develops the ability to read and interpret basic financial statements, understand the concepts of risk and return, and apply time value of money principles to simple investment decisions. Special emphasis is placed on personal finance, financial literacy, and digital finance to enable students to make informed financial decisions in everyday life.						
Course Objective	Upon successful completion of this course, students will be able to: 1. Understand fundamental concepts, areas, and functions of finance. 2. Explain the role of financial markets, institutions, and banks in the economy. 3. Interpret basic financial statements for simple decision-making. 4. Apply time value of money concepts to evaluate investment alternatives. 5. Understand the relationship between risk and return in financial decisions. 6. Develop financial literacy skills for effective personal financial management.						
Course Outcomes	**On successful completion of this course the students shall be able to:** CO.1 **Explain the basic concepts of finance, finance functions, and the financial environment.** CO.2 **Use financial information for business decision making.** CO.3 **Apply time value of money techniques and investment appraisal methods to evaluate simple investment proposals.** CO.4 **Analyze personal finance choices related to savings, investments, insurance, and retirement planning.**						
Course Content:							
Module 1	**Fundamentals of Finance and Financial Environment**	Assignment/ Quiz	Case study	**8 Sessions**			

Topics: Meaning and importance of finance; Areas of finance: Personal, Corporate, and Public finance; Finance decisions; Finance functions; Forms of business organizations and basic financial implications; Goals of financial management: profit maximization vs. wealth maximization; Overview and types of financial markets: money market and capital market, Primary vs. Secondary Markets; Role of banks and financial institutions. Basic understanding taxes and its types.				
Module 2	**Financial Statements, Risk and Return**	Assignment/ Quiz	Numerical solving Task	**12 Sessions**
Topics: Purpose and importance of financial statements; Meaning of capital, assets, liabilities, income, and expenses; Basic financial statements: Income Statement; Balance Sheet (simple numerical); Introduction to ratio analysis: liquidity, profitability, solvency (basic level); Concept of return; Concept of risk: meaning and types; Risk–return relationship and diversification (conceptual).				
Module 3	**Time Value of Money and Investment Decisions**	Assignment/ Quiz	Numerical solving Task	**14 Sessions**
Topics: Concept and significance of time value of money; Future value and present value (single and multiple periods); Compounding and discounting (simple numerical); Doubling Period. Investment appraisal techniques: Payback Period, Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR); Introduction to cost of capital (conceptual): Equity, Debt, WACC.				
Module 4	**Personal Finance**	Assignment/ Quiz	Numerical solving Task	**11 Sessions**
Topics: Personal finance concepts: Budgeting and savings; Investment avenues: FDs, mutual funds, shares, bonds; Risk profiling and asset allocation; Insurance and retirement planning.				
Targeted Application & Tools that can be used: Spreadsheet software (Microsoft Excel / Google Sheets) for numerical problem-solving, Financial calculators (physical or mobile apps), Case studies and real-life financial scenarios, RBI and SEBI investor awareness materials, Online EMI, SIP, and retirement calculators, PPTs and visual financial models				
Project Work/ Assignment: 1. **Case Study Analysis:** Analysis of a simple business or personal finance case involving budgeting, investment choice, or loan decision. 2. **Numerical Assignment:** Problems on time value of money, investment appraisal (NPV, Payback, IRR), and ratio analysis. 3. **Group Presentation:** Topics related to financial markets, investment avenues, or financial decision-making in real-life professions.				
Text Book(s): 1. **Chandra, P.** – *Financial Management*, McGraw-Hill Education. 2. **Madura, J.** – *Personal Finance*, Pearson Education.				
Reference Book (s): 1. **Khan, M. Y. & Jain, P. K.** – *Financial Management*, McGraw-Hill Education (Selected Chapters).				

2. **Bhole, L.M., & Mahakud, J.** (Current Edition). *Financial Institutions and Markets: Structure, Growth and Innovations*. McGraw Hill Education India.
3. **Mehrotra, H.C., & Goyal, S.P.** (Latest Assessment Year Edition). *Income Tax Law & Practice*. Sahitya Bhawan Publications.
4. **Gordon, E., & Natarajan, K.** (Current Edition). *Financial Markets and Services*. Himalaya Publishing House.

Online Resources (e-books, notes, ppts, video lectures etc.):

1. https://presidencyuniversity.linways.com
2. https://onlinecourses.nptel.ac.in/noc24_ec01/preview
3. https://www.rbi.org.in
4. https://www.sebi.gov.in/

Topics relevant to "SKILL DEVELOPMENT": This course contributes to skill development by enabling students to: Perform **basic financial calculations** (interest, returns, NPV, Payback), Interpret **financial statements** for informed decision-making' Develop **budgeting and savings discipline,** Evaluate **investment options** based on risk and return, Use **digital financial tools** for personal finance planning, Enhance **analytical thinking and problem-solving skills,** Improve **financial literacy and decision-making confidence** for professional and personal life.

Catalogue prepared by	**Dr. Yusaf Harun K**
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: **CIV7601**	**Course Title:** **Universal Human Values and Ethics** **Type of Course:** **MAC course**	**L-T-P-C**	**1**	**0**	**0**	**0**
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of the course is to develop a holistic perspective in students' life. The course adopts a self-reflective methodology of teaching and is designed to equip the students to explore their role in all aspects of living as a part of the society. It presents a universal approach to value education by developing the right understanding of reality through the process of self-exploration. This self-exploration develops more confidence and commitment in students enabling them to critically evaluate their pre-conditioning and present beliefs. As an outcome of the holistic approach, the students will be able to practice the ethical conduct in the social and professional life. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information. This course is designed to cater to Human Values and Professional Ethics.					
Course Objective	The objective of the course is 'SKILL DEVELOPMENT' of the student by using 'SELF LEARNING' techniques					
Course Outcomes	On successful completion of this course the students shall be able to: CO.1 Recognize the importance of Value Education through the process of self-exploration CO.2 Explain the human being as the co-existence of the self and the body in harmony. CO.3 Describe the role of foundational values in building harmonious relationships. CO.4 Summarize the importance of a holistic perspective in developing ethical professional behavior.					
Course Content:						
Module 1	Introduction to Value Education	Online Assessment	MCQ Quiz	Sessions		
Topics: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.						
Module 2	Harmony in the Human Being	Online Assessment	MCQ Quiz	5 Sessions		
Topics: Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health						
Module 3	Harmony in the Family and Society	Online Assessment	MCQ Quiz	5 Sessions		
Topics: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.						
Module 4	Implications of the Holistic Understanding – A Look at Professional Ethics	Online Assessment	MCQ Quiz	5 Sessions		
Topics:						

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Strategies for Transition towards Value-based Life and Profession

Targeted Application & Tools that can be used:

Application areas are Personal life, Education and Career, Workplace , Society and Environmental Responsibility

Tools: Online Tools – NPTEL and Swayam.

Project work/Assignment:

Assessment Type

- Online exams (MCQs) will be conducted by the Department of Civil Engineering through Linways.

Online Link*:

1) UHV II - https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1KyqtezTbTjN1So&pp=0gcJCWMEOCosWNin
2) Lecture by Dr. Kumar Sambhav, NPTEL course: Universal Human Values, https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
3) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Text Book

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2019.
3. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.

Reference Books

1. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
2. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
3. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
4. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
5. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A N Tripathy, 2003, Human Values, New Age International Publishers.
7. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
8. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
9. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
10. William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.

Resources:

1. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
2. https://onlinecourses.nptel.ac.in/noc25_mg141/preview
3. https://onlinecourses.swayam2.ac.in/ini25_hs52/preview
4. https://onlinecourses.nptel.ac.in/noc25_hs219/preview
5. https://onlinecourses.swayam2.ac.in/cec25_mg14/preview
6. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
7. https://onlinecourses.swayam2.ac.in/imb25_mg196/preview

Topics relevant to Skill Development:

1. An attitude of enquiry.

2. Write reports The topics related to Human values and Professional ethics: All topics in are relevant to Human values and Professional ethics.	
Catalog prepared by	Mrs. Divya Nair
Recommended by the Board of Studies on	20th BoS dated 06 June 2025
Date of Approval by the Academic Council	Academic Council no. 26 dated __ June 2025

Course Code: APT4002	**Course Title: Introduction to Aptitude**		**L-T- P- C**	0	0	2	0
Version No.	1.0					
Course Pre-requisites	Students should know the basic Mathematics & aptitude along with understanding of English					
Anti-requisites	Nil					
Course Description	The objective of this course is to prepare the trainees to tackle the questions on various topics and various difficulty levels based on Quantitative Ability, and Logical Reasoning asked during the placement drives. There will be sufficient focus on building the fundamentals of all the topics, as well as on solving the higher order thinking questions. The focus of this course is to teach the students to not only get to the correct answers, but to get there faster than ever before, which will improve their employability factor.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1] **Recall** all the basic mathematical concepts they learnt in high school. CO2] **Identify** the principle concept needed in a question. CO3] **Solve** the quantitative and logical ability questions with the appropriate concept. CO4] **Analyze** the data given in complex problems. CO5] **Rearrange** the information to simplify the question					
Course Content:						
Module 1	Quantitative Ability	Assignment	Bloom's Level : Application			12 Sessions
Topics: Introduction to Aptitude, working of Tables, Squares, Cubes						
Module 2	Logical Reasoning	Assignment	Bloom's Level : Application			18 Sessions
Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars, Number Series, Wrong number series, Visual Reasoning						
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS						
Text Book 1. Quantitative Aptitude by R S Aggarwal 2. Verbal & Non-Verbal Reasoning by R S Aggarwal						
References 1. www.indiabix.com 2. www.youtube.com/c/TheAptitudeGuy/videos						

Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	L&D Department faculty members
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: **MEC3068**	**Course Title: Production and Operations Management** **Type of Course: Professional Core & Theory only**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to understand various components of Production management, Production planning, Production scheduling and model production management tools. The course is both conceptual and analytical in nature. The course develops the analytical, critical thinking, and decision making skills. The course also enhances the problem solving abilities through assignments.					
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies					
Course Outcomes	On successful completion of this course the students shall be able to: CO1) Recognize the importance of production management in industry. CO2) Describe Facility location problems and aggregate planning. CO3) Solve problems in sequencing and Scheduling in production environment. CO4) Summarize the various modern production management tools.					
Course Content:						
Module 1	Introduction to Production Management	Assignment	Data Collection and Analysis	10 sessions		
Topics: Introduction, Production Management, Scope of Production Management, Production System, Types of Production Systems - Flow Shop, Job Shop, Batch Manufacturing and the Project, Benefits of Production Management, Productivity, Decisions of Production Management.						
Module 2	Production Planning and Control	Case Study	Simulation and data analysis task	10 sessions		
Topics: Characteristics of Production Planning and Control, Objectives of Production Planning and Control, Facility Location, Factors Influencing Plant Location, Single Facility Location Problem, Minimax Location Problem, Gravity Location Problem, Classification of Layout, Aggregate Planning, MRP Concept, MRP Calculations.						
Module 3	Sequencing and Scheduling	Assignment	Data Collection and Analysis	12 sessions		
Topics: Concept of Single Machine Scheduling - Shortest Processing Time (SPT) Rule to Minimize Mean Flow Time, Weighted Mean Flow Time, Earliest Due Date (EDD) Rule to Minimize Maximum Lateness, Introduction						

to Branch and Bound Technique to Minimize Mean Tardiness. Flow Shop Scheduling - Introduction, Johnson's algorithm, Extension of Johnson's Rule, Branch and Bound Technique, CDS Heuristic.				
Module 4	Modern Production Management Tools	Case Study	Data collection and Programming	13 sessions
Topics: Just-In-Time Manufacturing, Computer Integrated Manufacturing and Flexible Manufacturing System, Total Quality Management, Poka Yoke, Kaizen, Business Process Reengineering, Supply Chain Management, Lean Manufacturing, Quality Function Deployment.				
Targeted Application & Tools that can be used: Application Area include almost all manufacturing organizations (Automotive – Suzulki, Toyota, Hyundai, KIA, Ford etc.,) Processing industries (Petroleum – Reliance, Shell, HP etc., Cement industries – Dalmiya, Ultra Tech), Professionally Used Software: DYNAMIC 3i Production Planning, IQMS, Fishbowl				
Project work/Assignment: Project: Assuming yourself as an entrepreneur, carryout the analysis facility location for your new project. Assignment: 1] Consider a flow shop environment and use the suitable algorithms to solve the problem considered. Assignment 2: From your perspective, which are the modern tools of production management will have huge impact in the transition to industry 4.0 from current setting.				
Text Book 1. Pannerselvam. R, Production and Operations Management, PHI. 2012 2. Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs, Production and Operations Management: Manufacturing and Services, Irwin/McGraw-Hill, 1998				
References 1. Chary, S. N. Production and operations management. McGraw Hill Education, 2017. 2. Singh S.P. Production and operations management. Vikas Publishing House Pvt. Ltd., 2014. **Website:** https://praxie.com/top-operations-management-tools-and- templates/ Journal of Production and Operations Management, Knimbus Open Journals. https://presiuniv.knimbus.com/openFullText.html?DP=http://uijs.ui.ac.ir/jpom/index.php?slc_lang=en&sid=1				
Catalogue prepared by	Dr. R. Jothi Basu			
Recommended by the Board of Studies On	BOS NO: 15th BOS held on 29/7/2022			
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.			

<table>
<tr><td>Course Code:
MEC2505</td><td colspan="3">Course Title: Mechanics of Solids
Type of Course:
1] Professional Core Course
2] Theory</td><td>L-T-P-C</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">MAT1211</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course is well designed to provide a fundamental understanding of the behavior of materials under different loading conditions, both static and dynamic. These materials are part of engineering structures and machines. It focuses on developing the skills to model and analyse the behavior of structural and machine components subjected to various loading and support conditions based on the principles of equilibrium and material constitutional relationships. It includes mechanics of rigid and deformable bodies in equilibrium and extends the depth of meaning contained in the basic principles of equilibrium to three dimensional continuous media including torsion, bending stresses and deflections.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of "Mechanics of Solids" and attain SKILL DEVELOPMENT through Problem solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">CO1 Compute the Normal and temperature Stress and Strain in Mechanical components.
CO2 Estimate Principal stresses and strains and draw Mohr's circle.
CO3 Resolve the Shearing and Bending forces and draw their diagrams.
CO4 Obtain the Bending and Shearing Stresses and draw their diagrams.
CO5 Illustrate twisting moment and Torsion in shafts
CO6 Evaluate Hoop stress in thin and thick cylinders
CO7 Predict deflection in beams by different techniques..</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Simple Stresses and Strains</td><td>Assignment</td><td colspan="2">Data collection</td><td colspan="2">13 Sessions</td></tr>
<tr><td colspan="8">Topics:
Brief Introduction, Stress and strain graphs and concepts, elastic constants, axial loads, statically indeterminate axially loaded members, thermal stress and strain. Numerical</td></tr>
<tr><td>Module 2</td><td colspan="2">Compound Stress and Strains Shear Force and Bending Moment diagrams</td><td>Assignment</td><td colspan="2">Mathematical</td><td colspan="2">13 Sessions</td></tr>
<tr><td colspan="8">Topics:
Stress at a point on different planes in 2-D, transformation of stresses, principal and maximum shear stresses, Mohr's Circle. Numerical. Shear Force and Bending moment diagrams for cantilever, simply supported and overhanging beams with all types of loads. Numerical on SFD & BMD.</td></tr>
<tr><td>Module 3</td><td colspan="2">Bending and Shear Stresses</td><td>Assignment</td><td colspan="2">Mathematical</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="8">Bending stresses in beams. Bending equation. Numerical. Shear stress distribution in beams. Numerical.</td></tr>
</table>

Module 4	Torsion and Thin & Thick Cylinders	Assignment	Mathematical	12 Sessions
Topics: Torsion, angle of twist, Torsion Equation. Numerical. Introduction to thick and thin cylinders. Hoop stress and tangential stress. Numerical.				
Module 5	Deflection of Beams	Assignment	Mathematical	12 Sessions
Topics: Introduction to deflection of Beams and method of Integration, Macaulay's method and Moment area methods for solution.				

Targeted Application & Tools that can be used:

Application Area is Geophysical phenomenon, Aerospace, Aerodynamics, Microfluidics, Pipe network, Turbo-machinery.

Industries using above applications and tools – Siemens, Quest Global, TATA, Simulent consulting, Triveni Engineering, GE etc

TEXTBOOKS:

1. E. P. Popov, "Engineering Mechanics of Solids", Prentice Hall,
2. S Ramamrutham, R Narayanan, "Strength of Materials 16/e", Dhanpath Rai Publishing Co Pvt Ltd.,

Reference Book(s):

1. F. P. Beer, E. R. Johnston (Jr.), and J. T. De Wolf, "Mechanics of Materials", Tata McGraw-Hill,
2. S. P. Timoshenko, "Strength of Materials", Volumes 1 and 2, CBS Publishers.

Web links:

1. https://www-sciencedirect-com-presiuniv.knimbus.com/journals
2. https://presiuniv.knimbus.com/user#/searchresult?searchId=mechatronics&t=1655961642518

Topics relevant to "SKILL DEVELOPMENT": Stress and strain in beams and columns for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course plan.

Catalogue prepared by	Dr. Udaya Ravi M
Recommended by the Board of Studies on	20th BOS Meeting held on 19th Dec 2024
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
MEC2515</td><td colspan="2">Course Title: Applied Thermodynamics
Type of Course:
1] Professional Core Course
2] Theory</td><td>L-T-P-C</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Version No.</td><td colspan="7">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">MEC2501</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">This course deals with the application of Thermodynamics - the science of applications of thermodynamics laws for different equipment. Different tools will be introduced to analyse energy systems from engines, power plants etc. The course is both conceptual and analytical in nature and needs basic knowledge of Mathematics. The course develops the critical thinking and analytical skills.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with the concepts of "Applied Thermodynamics" and attain SKILL DEVELOPMENT through Problem solving methodologies.</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">On successful completion of this course the students shall be able to:
CO1. Apply the first law and second law of thermodynamics to analyses the reciprocating internal combustion engine.
CO2. Apply the first law and second law of thermodynamics to analyses the gas turbine and Jet propulsion.
CO3. Apply the first law and second law of thermodynamics to analyses the vapor power cycle.
CO4. Apply the first law and second law of thermodynamics to analyses the refrigeration cycle.</td></tr>
<tr><td>Course Content:</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td colspan="2">Air standard cycles</td><td>Assign ment</td><td colspan="2">Data Collection/any other such associated activity</td><td>10 sessions</td></tr>
<tr><td colspan="8">Topics:
Air Standard cycles: Carnot, Otto, Diesel, Dual, P-V and T-S diagrams, Efficiencies and mean effective pressures, Comparison of Otto, Diesel and Dual cycles, Numerical.</td></tr>
<tr><td>Module 2</td><td colspan="2">Gas turbine and Jet propulsion</td><td>Assign ment</td><td colspan="2">Data Collection/any other such associated activity</td><td>10 Sessions</td></tr>
<tr><td colspan="8">Topics:
Classification of Gas turbines, Analysis of open cycle gas turbine cycle. Advantages and disadvantages of closed cycle. Methods to improve thermal efficiency. Numerical. Theory on Rocket Propulsion system, Turbo jet, Ram Jet Engine and Turbo propulsion.</td></tr>
</table>

Module 3	Vapour Power Cycles	Assign ment-Quiz	Data Collection/any other such associated activity	15 Sessions
Topics: Carnot cycle, Rankine cycle, reheat cycle, regenerative cycle, steam cycles for nuclear power plant, back-pressure and extraction turbines and cogeneration. Numerical.				
Module 4	Reciprocating Air Compressors	Assign ment – Quiz	Data Collection/any other such associated activity	15 Sessions
Topics: Working principle, Classification of compressors, Single-stage and multi-stage compression, Isothermal, adiabatic, and polytropic compression processes, p-V diagrams, Work input calculations, Volumetric efficiency, Clearance volume effect, intercooling in multi-stage compression, Ideal vs. actual cycles, Effect of pressure ratio, Mechanical efficiency, Applications of reciprocating compressors. Numerical.				
Module 5	Refriger ation and Air conditio ning	Assignment - Quiz	Data Collection/any other such associated activity	10 Sessions
Refrigerating effect, capacity, power required, units of refrigeration, COP, Reversed Carnot cycle, Air cycle refrigeration; Reversed Brayton cycle Vapour compression refrigeration system; description, analysis, Principle of working of Vapour absorption Refrigeration and steam jet refrigeration. Refrigerants and their desirable properties, Numerical. Psychrometry. Basic definitions. Psychrometric processes. Numerical.				
Targeted Application & Tools that can be used: Application Area is Alternate energy resources – data collection related to IC engines and Electric vehicles. Professionally Used Software: C programming/ Python/ MATLAB				
Textbook: 1. T. D. Eastop, "Applied Thermodynamics for Engineering Technologists", 5th Edition, Pearson Education (India), 2002. **Reference:** 2. P.K. Nag, "Engineering Thermodynamics" 5th Edition, McGraw-Hill Education, 2013. 3. Michael J Moran, Howard N Shapiro, Daisie D Boettner, Margaret B Bailey, "Principles of Engineering Thermodynamics" Wiley India Pvt. Ltd. 4. Web Resources**:** William D Ennis, "Applied Thermodynamics for Engineers", 5th Edition. Link: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=BOOKYARDS_1_5255				
Topics relevant to "SKILL DEVELOPMENT": Reversed Carnot cycle, Vapour compression refrigeration system, analysis, capacity and power required for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course plan.				

Catalogue prepared by	Dr. Udaya Ravi Mannar
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2024	**Course Title: Metrology and Measurements** **Type of Course: Professional Core Course**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of science of measurement and its applications. This Course is aimed at teaching basic concepts of measurement sciences for mechanical engineering students. The student can learn the art of measurement and calibration of instruments. The lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Metrology And Measurement**" and attain **SKILL DEVELOPMENT** through Participative learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Explain the purpose, parameters, and error sources in measurement systems, including accuracy, precision, and regression analysis. CO2. Apply calibration principles, measurement techniques, and comparator-based systems for linear and angular measurements. CO3. Analyze and design limits, fits, tolerances, and apply geometric dimensioning and tolerancing (GD&T) for manufacturing applications. CO4. Utilize mechanical and surface metrology tools for assessing dimensional and surface characteristics of components. CO5. Evaluate thermal and flow parameters using advanced measurement systems and transducers.					
Course Content:						
Module 1	Measurement Purpose and Parameters	Assignment	Data Collection	8 sessions		
Topics: Parameters: Geometry (straightness, flatness, roundness), displacement, force, speed, torque, flow, pressure, temperature, acceleration. Definitions: Accuracy, precision, range, resolution, uncertainty, and error sources. Regression analysis: Applications in measurement and data evaluation.						
Module 2	Measurement Principles	Case Study	Lab based activity	8 sessions		
Topics: Structure and examples of measurement systems. Calibration principles: Importance and techniques.Linear measurements: Vernier calipers, micrometers, and slip gauges. Angular measurements: Sine bar, bevel protractor, and taper gauges. Comparators: Mechanical, electrical (LVDT), and pneumatic comparators.						
Module 3	Limits, Fits, Tolerances, and GD&T	Case Study	CMM study in lab	10 sessions		
Topics: Definitions: Tolerance zones, grades, and geometric tolerances.Hole and shaft systems: IT grades and applications in assembly.Taylor's principle of gauging and gauge design. Geometric dimensioning and tolerancing (GD&T): Symbols, datums, and tolerances.						

Case studies: GD&T in industrial applications				
Module 4	Mechanical and Surface Metrology	Assignment	Awareness of different software for surface texture.	10 sessions
Topics: Dimensional metrology: Form tester, CMM, and 3D scanning tools.Surface metrology: Surface roughness parameters and their significance.Tools for surface measurement: Stylus system, optical microscopes, and laser scanning.Process metrology: Tool wear, work piece quality, and process monitoring				
Module 5	Thermal and Flow Measurements	Assignment	Lab based activity.	09 sessions
Topics: Thermal measurement: Devices for measuring temperature, thermal conductivity, and diffusivity. Examples: Thermocouples, RTDs, thermistors, pyrometers. Flow measurement: Obstruction methods, magnetic flow meters, and ultrasonic flow meters. Transducers: Types (strain gauges, displacement transducers), working principles, and industrial applications. Digital data acquisition: Interfacing transducers with electronic control systems.				
Targeted Applications: Legal ***Metrology***. Industrial ***Metrology***. Aerospace. Construction. Communications. Energy. Health Care. Other ***job*** titles might include calibration engineers, calibration technicians, quality engineers, quality technicians, process control technicians, and safety engineers.				
Text Book 1]Metrology and Measurement: Bewoor Anand K, Kulkarni Vinay A., 1st Edition, Tata McGraw Hill,New Delhi, 2009 2] R. K. Jain, 'Engineering Metrology', Khanna Publishers, 1999.				
References 1] "Metrology and Measurements Lab Manual", Presidency University. 2) Frank R Spellman, " The handbook of Meterology",				
Topics relevant to "SKILL DEVELOPMENT": Screw Thread Measurement, Bevel Protractor for **SKILL DEVELOPMENT** through **Participative learning techniques** . This is attained through the assessment component mentioned in the course handout				
Catalogue prepared by	Dr. Sandeep G M			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025			

Course Code: MEC2025	Course Title: Metrology and Measurements Lab Type of Course: Professional Core/ Laboratory only	L-T-P-C	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of science of measurement and its applications. This Course is aimed at teaching basic concepts of measurement sciences for mechanical engineering students. The student can learn the art of measurement and calibration of instruments. The lab introduces the students to the theory and methods for conducting experimental work in the laboratory and calibration of various instruments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Metrology And Mechanical Measurement**" and attain **SKILL DEVELOPMENT** through Experiential learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Demonstrate basic knowledge of measurement systems and their components. CO2. Operate various instruments for measuring mechanical and electrical parameters accurately. CO3. Integrate measurement systems for process monitoring and control. CO4. Design and apply limits, fits, and tolerances for practical applications.					
Course Content:						

List of Experiments: Total sessions-30

Dimensional Metrology

1. Calibration of Vernier calipers and micrometers for dimensional accuracy.
2. Measurement of angles using sine bar, sine center, and bevel protractor.
3. Verification of dimensions and tolerances using slip gauges and gauge blocks.

Form Metrology

4. Measurement of gear tooth profiles using gear tooth Vernier and micrometer.
5. Measurement of screw thread parameters using floating carriage micrometer.

Surface Metrology

6. Surface finish measurement using a surface profiler or optical microscope.
7. Use of autocollimators for angular measurement and alignment.

Mechanical Measurements

8. Calibration and testing of strain gauges for stress and strain measurements.
9. Calibration of linear variable differential transformers (LVDT) for displacement measurement.

Data Acquisition and Advanced Metrology

10. Coordinate measuring machine (CMM) for dimensional analysis and 3D scanning.
11. Calibration of pressure transducers and thermocouples.

12. Study and implementation of digital data acquisition systems: interfacing transducers with control and measurement systems.

Targeted Applications:

Legal ***Metrology***. Industrial ***Metrology***. Aerospace. Construction. Communications. Energy. Health Care. Other ***job*** titles might include calibration engineers, calibration technicians, quality engineers, quality technicians, process control technicians, and safety engineers.

Applications: Quality assurance, process control, aerospace, automotive, and industrial metrology.

Tools and Software: CMM & MCOSMOS.

Text Book

1]Metrology and Measurement: Bewoor Anand K, Kulkarni Vinay A., 1st Edition, Tata McGraw Hill,New Delhi, 2009

2] R. K. Jain, 'Engineering Metrology', Khanna Publishers, 1999.

References

1] "Metrology and Mechanical Measurements Lab Manual", Presidency University.

2] Anand K Bewoor and Vinay Kulkarni, 'Metrology and Measurement', 2009.

3) Frank R Spellman, " The handbook of Meterology",

Topics relevant to "SKILL DEVELOPMENT": Screw Thread Measurement, Bevel Protractor for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through the assessment component mentioned in the course plan

Catalogue prepared by	Dr. Sandeep G M
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **CSE2282**	**Course Title:** **Computational Thinking and AI Programming** **Type of Course: Theory**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites						
Anti-requisites	NIL					
Course Description	This course provides a solid foundation in Computational Thinking and basic Artificial Intelligence concepts. AI segment introduces various search methods for problem-solving and knowledge-based logic representations. Students explore uncertainty handling using models such as the Naïve Bayes Classifier and Hidden Markov Models. The course bridges fundamental coding skills with intelligent system development for practical problem-solving.					
Course Object	The objective of the course is to familiarize the learners with the concepts Computational Thinking and AI Programming and attain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: **CO1: Explain** algorithms to solve fundamental computational problem. (Understand) **CO2: Demonstrate** conditional loops, functions and structures to address problem-solving tasks. (Apply) **CO3: Apply** various uninformed and heuristic search algorithms to solve real-world state space problems..(Apply) **CO4: Analyze** constraint satisfaction problems and logic-based representations using resolution techniques for effective problem-solving in AI applications. (Apply)					
Course Content:						
Module 1	Fundamentals of Computing & Programming	Assignment		7 Sessions		
Topics: Fundamentals of Computing– Identification of Computational Problems Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language). Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if else),chained conditional (if-elif-else), Illustrative programs						
Module 2	Control Flow, Data Structures & Files	Assignment		14 Sessions		
Topics: Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability. List, Tuple, Sets, Dictionaries and their operations. Files: Illustrative Programs file operations.						
Module 3	Search Algorithms &	Assignment		12 Sessions		

	Problem Solving			

Topics:

Introduction – State Space Search; General Formulation of Search Problems; Data Structures used in Searching. **Uninformed Search Algorithms** – Breadth First Search, Depth First Search, Uniform Cost Search, Generalized Uniform Cost Search, Iterative Deepening Depth-First Search, Time and Space Complexity Analysis of Uninformed Search Algorithms. **Heuristic Search Algorithms** – Heuristics and Admissibility, Greedy Best-First Search, A* Search and weighted A* Search, **Local Search** – Local Search, Hill Climbing, Genetic Algorithms, Gradient Descent. **Adversarial Search** – Minimax Search, Alpha-Beta Pruning, Ideal Ordering.

Module 4	Knowledge-Based Logic Representation	Assignment		12 Sessions

Topics:

Constraint Satisfaction – Constraint Satisfaction Problems Definitions and Examples – Map Colouring, N Queens, Cryptarithmetic, Generalized CSP; Back-tracking Heuristics; Arc Consistency and Path Consistency. **Propositional Logic** – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **First Order Logic** – Syntax and Semantics of Propositional Logic. Logical connectives. Inference Rules. Conjunctive and Disjunctive Normal Forms. **Resolution** – Resolution Principle. Propositional and First Order Resolution. Applications for solving story problems using Resolution.

Project work/Assignment:

1. Assignment 1 on (Module 1 and Module 2)
2. Assignment 2 on (Module 3 and Module 4)

Text Books

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021
2. Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2022.
4. Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024

References

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
3. Nils J. Nilsson, Fundamentals of Artificial Intelligence, Morgan Kaufmann, 2021
4. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education, 3rd Edition, 2008.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
2. NPTEL Courses: Mausam (IIT Delhi), "An Introduction to Artificial Intelligence" Link: https://nptel.ac.in/courses/106102220.
3. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence".
   Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
4. Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving".
   Link: https://nptel.ac.in/courses/106106226. Useful for Module 3 and 4

Topics relevant to development of "Employability": Data structures using python., Kowledge Based Logic representation

Topics relevant to "PROFESSIONAL ETHICS": Involves using algorithms

responsibly to ensure fairness, transparency, accountability, and the well-being of society.						
Course Code: **CSE2283**	**Course Title:** **Computational Thinking and AI Programming Lab** **Type of Course: Lab**	**L-T-P-C**	0	0	2	1
Version No.	)					
Course Pre-requisites						
Anti-requisites	-					
Course Description	This course offers a foundational introduction to Computational Thinking and basic Artificial Intelligence (AI) concepts, emphasizing hands-on experimentation and practical implementation. Students engage in a series of guided lab sessions designed to bridge core programming skills with real-world intelligent system development.					
Course Objective	The objective of the course is to familiarize the learners with the concepts Computational Thinking and AI Programming lab and attain **Skill Development** through **Experiential Learning** techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: **CO1: Apply** algorithms to solve fundamental computational problem. (Apply) **CO2: Utilize** conditional loops, functions , structures and files to implement effective solutions to problem-solving tasks. (Apply) **CO3:** A**pply** uninformed and heuristic search algorithms to address real-world scenarios.(Apply) **CO4: Apply** resolution techniques to analyze constraint satisfaction and logic-based problems in AI. (Apply)					
Course Content:						
Module 1	Fundamentals of Computing & Programming	Assignment		Sessions : 7		
Lab sheet : Introduction to Python Programming. Demonstration of Colabs or Jupiter environment. **BMI Calculator with Health Classification** Accept height (in meters) and weight (in kilograms) from the user, calculate BMI, and classify into Underweight, Normal, Overweight, or Obese. **Loan Eligibility Checker** Determine loan eligibility based on income, age, credit score, and employment status. **Basic ATM Simulation** **Simulate ATM operations: check balance, deposit, withdraw (with checks for sufficient balance), and exit.** **Online Shopping Cart Total** Create a system that takes multiple items with their quantities and unit prices, applies GST or discounts, and prints a bill summary. **Password Strength Checker** Check if a password entered by the user is strong (contains uppercase, lowercase, digit, special character, and is of minimum length).						
Module 2	Control Flow, Data Structures & Files	Assignment		**14 Sessions**		

Topics:

Number Analyzer

Accept a list of numbers from the user and use a loop to calculate the count, sum, and average. Use break if a negative number is entered.

ATM Pin Retry System

Allow the user 3 attempts to enter the correct PIN. Use while and break to lock the user out after 3 failed attempts.

Tax Calculator

Write a function that takes income as input and returns the amount of tax payable using slab rates. Demonstrate local vs. global scope with variables.

Factorial Using Recursion

Use a recursive function to compute factorial of a number.

Email Validator

Check if a string contains "@" and "." in valid positions. Use slicing to extract the username and domain.

Palindrome Checker

Use string slicing to check if the input string is a palindrome.

☐ **tudent Score Tracker**

Store student names and their marks using a dictionary. Allow searching, updating, and deleting records.

Unique Words Extractor

Read a sentence and extract unique words using sets.

Tuple-Based Weekly Planner

Use a tuple to store fixed schedule entries for the week. Display the activity for a given day.

Shopping List Manager

Create a dynamic list that adds, removes, and updates grocery items with their quantities.

Attendance Logger

Write names of students present today into a text file. Append new entries each time the program is run.

Student Record Reader

Read student data from a file, calculate total and average marks, and print formatted results.

Word Counter from File

Read a paragraph from a file and count the number of words, lines, and characters.

Module 3	Search Algorithms & Problem Solving	Assignment		12 Sessions

Topics:

State Space Search & Problem Formulation

Lab 1: Missionaries and Cannibals Problem

- Objective: Model the state space and use BFS and DFS to find a valid sequence of moves that ensures safe river crossing.

Uninformed Search Algorithms

Lab 2: Maze Solver

- **Objective**: Represent a maze as a grid and use BFS and DFS to find the shortest or any valid path from start to goal.

Lab 3: Puzzle Solver (8-puzzle / 15-puzzle)

- **Objective**: Solve the sliding puzzle using Iterative Deepening DFS.

Heuristic Search Algorithms

Lab 4: Informed Search for Puzzle Solving

- **Objective**: Solve the 8-puzzle using Greedy Best-First and A* Search. Compare heuristics like Manhattan Distance vs Misplaced Tiles.

Lab 5: Optimal Route Planning

- **Objective**: Simulate a map with cities and distances. Implement A* Search for route optimization using straight-line distance as heuristic.

Local Search

Lab 6: N-Queens Problem with Hill Climbing

- **Objective**: Solve the N-Queens problem using local search with sideway moves and random restarts.

Lab 7: Genetic Algorithm for String Matching

- **Objective**: Use genetic algorithms to evolve a string to match a target phrase.

Adversarial Search

Lab 10: Tic-Tac-Toe with Minimax Algorithm

- **Objective**: Implement a two-player Tic-Tac-Toe game using the Minimax algorithm.

Module 4	Knowledge-Based Logic Representation	Assignment		12 Sessions

Constraint Satisfaction Problems (CSP)

Lab 1: Map Coloring Problem

Lab 2: N-Queens Solver Using CSP

- **Write a program that places N queens on an N×N chessboard so that no two queens attack each other.**

Lab 3: Propositional Logic Formula Evaluator

Lab 4: Conversion to CNF and DNF

- **Implement algorithms to convert propositional logic formulas to Conjunctive Normal Form (CNF) and Disjunctive Normal Form (DNF).**

Lab 5: First Order Logic Representation

- **Translate English statements about students and courses into First Order Logic expressions.**

Project work/Assignment:

3. **Assignment 1 on (Module 1 and Module 2)**
4. **Assignment 2 on (Module 3 and Module 4)**

Text Books

1) Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021

2) Eric Matthes, Python Crash Course,: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, 2023

3) Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2022.

4) Elaine Rich, Kevin Knight and Shivashankar B Nair. *Artificial Intelligence*. 4th Edition. MedTech Science Press. 2024

References

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

3. Nils J. Nilsson, Fundamentals of Artificial Intelligence, Morgan Kaufmann, 2021

4. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, Artificial Intelligence, McGraw Hill Education, 3rd Edition, 2008.

Web Resources

5. https://onlinecourses.nptel.ac.in/noc20_cs70/preview
6. NPTEL Courses: Mausam (IIT Delhi), "An Introduction to Artificial Intelligence" Link: https://nptel.ac.in/courses/106102220.
7. Shyamanta M. Hazarika (IIT Guwahati), "Fundamentals of Artificial Intelligence".
Link: https://nptel.ac.in/courses/112103280. Useful for the full course.
8. Deepak Khemani (IIT Madras), "Artificial Intelligence: Search Methods for Problem-Solving".
Link: https://nptel.ac.in/courses/106106226. Useful for Module 3 and 4

Topics relevant to development of "Employability": Data structures using python., Knowledge Based Logic representation

Topics relevant to "PROFESSIONAL ETHICS": Involves using algorithms responsibly to ensure fairness, transparency, accountability, and the well-being of society.

Course Code: MEC2507	**Course Title: Computer Aided Engineering Drawing** **Type of Course: Professional Core/ Laboratory only**	**L- T-P- C**	**0**	**0**	**2**	**1**
Version No.	1.0					
Course Pre-requisites	MEC1006					
Anti-requisites	NIL					
Course Description	This course introduces the role of computers in engineering design, focusing on computer-aided design (CAD) and solid modeling techniques. Through hands-on experience with CAD software, students will learn to create 3D models, prepare technical drawings, and use data exchange standards for design applications.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Computer Aided Engineering Drawing**" and attain **SKILL DEVELOPMENT** through Experiential learning techniques.					
Course Out Comes	Upon completion of this course, students will be able to: CO1. Explain the role of computers in design processes and CAD standards for data exchange. CO2. Create solid models and assemblies using industry-standard CAD software. CO3. Interpret boundary and constructive solid geometry (CSG) models and apply them to technical drawings.					
Course Content:	**Module 1:** Introduction to CAD and Standards Role of computers in design, analysis, and manufacturing processes. Overview of popular CAD software and input/output devices. Exchange standards: IGES, DXF, STEP, STL, and their applications in CAD.-10 sessions **Module 2:** Solid Modeling Techniques Solid modeling techniques: Sweep (linear and curved) and Boolean operations. Representation of solid models: Boundary and Constructive Solid Geometry (CSG). Practical exercises: Creating and modifying solid models using CAD software.10 sessions **Module 3:** Assemblies and Visualization Creating assemblies from individual parts in CAD software. Generating sectional, exploded, and detailed views for technical documentation. Interpreting complex assembly drawings and visualizations.10 sessions					
Targeted Application & Tools that can be used: Applications: Design engineers, CAD specialists, manufacturing engineers. **Tools:** Industry-standard CAD software such as SolidWorks, CATIA, or Autodesk Inventor.						
Text Book • Ibrahim Zeid, Mastering CAD CAM, Tata McGraw Hill Publishing Co., 2007.						

<table>
<tr><td colspan="2">

- C. McMohan and J. Browne, CAD/CAM Principles, Pearson Education, 2nd Edition, 1999.
- Michael E. Mortenson, Geometric Modeling, Tata McGraw Hill, 2013.
- W. M. Neumann and R.F. Sproul, Principles of Computer Graphics, McGraw Hill, 1989.
- D. Hearn and M.P. Baker, Computer Graphics, Prentice Hall Inc., 1992.

</td></tr>
<tr><td colspan="2">Topics relevant to "SKILL DEVELOPMENT": Analyzing the views of the component and Assembly of machine components for SKILL DEVELOPMENT through Experiential Learning techniques. This is attained through assessment component mentioned in course handout.</td></tr>
<tr><td>Catalogue prepared by</td><td>Dr. Sandeep G M</td></tr>
<tr><td>Recommended by the Board of Studies on</td><td>20th BOS Meeting held on 19th Dec 2024</td></tr>
<tr><td>Date of Approval by the Academic Council</td><td></td></tr>
</table>

Course Code: MAT2503	**Course Title: Calculus, Differential Equations and Vector Analysis** **Type of Course: Basic Science Course**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	MAT1211 & MAT1214					
Anti-requisites	NIL					
Course Description	This course aims to introduce various transform techniques such as Laplace transform, Fourier transform and Z-transform in addition to expressing functions in terms of Fourier series. The course covers applications of Laplace transform to LCR circuits and solutions of different equations using Z-transform. The course also deals with the analytical methods for solving partial differential equations and the classical applications of partial differential equations. Complex variables studies function where both the independent and dependent variables are complex numbers, exploring concepts like differentiation, integration, power series, contour integration, and singularities within the complex plane.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Calculus, Differential Equations and Vector Analysis" and attain Skill Development through Problem Solving Techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 - Express functions in terms of uniformly convergent Fourier series. CO2 - Apply Laplace transform technique to solve differential equations. CO3 - Employ Z-transform techniques to solve difference equations. CO4 - Solve a variety of partial differential equations analytically.					
Course Content:						
Module 1	Laplace Transforms					08 Sessions
Definition and Laplace transforms of elementary functions. Properties of Laplace transform, and Laplace transform of periodic function, unit-step function and Impulse function – related problems. Inverse Laplace transform of standard functions - problems, initial and final value theorem. Convolution theorem, solution of linear and simultaneous differential equations and LCR Circuit.						
Module 2	Fourier Series					06 Sessions
Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.						
Module 3	Fourier Transforms and Z - Transforms	Assignment				09 Sessions
Fourier Transforms: Definitions, infinite Fourier transforms, Fourier sine and cosine transforms, inverse Fourier transforms, Problems. **Difference equations and Z-transforms:** Z-transforms – Basic definitions, Standard Z-transforms, Linearity property, Damping rule, Shifting rule, Initial value theorem, Final value theorem, Inverse Z-transforms. Difference equations – Basic definitions, Application of Z-transforms to solve difference equations.						
Module 4	Partial Differential Equations					09 Sessions

Formation of PDE, Solution of non-homogeneous PDE by direct integration, Solution of homogeneous PDE involving derivative with respect to one independent variable only (Both types with given set of conditions) Method of separation of variables. (First and second order equations) Solution of Lagrange's linear PDE. of the type P p + Q q = R.
Applications of PDE: Derivation of one-dimensional wave and heat equations. Various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two-dimensional Laplace's equation – various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems).

Module 5	Complex Variables	Assignment	12 Sessions

Introduction, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; Conformal mappings.
Complex Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof).

Targeted Application & Tools that can be used:
The objective of the course is to familiarize students with a variety of numerical techniques and the theoretical concepts of probability and statistics to equip them with the necessary numerical approaches and basic statistical tools to tackle engineering and real-life problems.

Assignment:

Newton-Raphson Methods, Gauss-Seidel Method, LU Decomposition, Trapezoidal Rule, Simpson's rule, Runge-Kutta 4th Order.

Text Book

1. Erwin Kreyzig, Advanced Engineering Mathematics, John Wiley and sons, Inc.10th Edition
2. B. S. Grewal (2017), Higher Engineering Mathematics by, 44th Edition, Khanna Publishers.

References:

1. Victor Henner, Tatyana Belozerova, Mickhail Khenner, Ordinary and Partial Differential Equations, CRC Press, Edition, 2013.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, Computations, 6th Edition, New age Publishing House, 2015.
3. Walter Ledermann, Multiple integrals, Springer, 1st edition.
4. C. Ray Wylie and Louis C Barrett, "Advanced Engineering Mathematics", 6th Ed, McGraw-Hill, 2012.

E-resources/ Web links:

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_140238
2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_233298
3. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_204892
4. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_246791
5. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_223548
6. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_134719

1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=EBSCO95_30102024_32614 2. https://www.math.hkust.edu.hk/~maqian/ma006_0607F.html 3. https://www.scu.edu.au/study-at-scu/units/math1005/2022/
Topics relevant to SKILL DEVELOPMENT: This course aims to introduce various transform techniques such as Laplace transform, Fourier transform, and Z transform in addition to expressing functions in terms of Fourier series. The course covers applications of Laplace transform to LCR circuits and solution of difference equations using z-transform. The course also deals with the analytical methods for solving partial differential equations and the classical applications of partial differential equations. Overall, this course provides the knowledge of transform techniques and partial differential equations for **Skill Development through Problem Solving methodologies**. This is attained through assessment component.

Catalogue prepared by	**Dr. Veeresh Sajjanavar**
Recommended by the Board of Studies on	**13th BOS held on 04/01/2025**
Date of Approval by the Academic Council	**24th ACM held in 3rd August 2024**

Course Code: MAT2325	**Course Title: Partial Differential Equations and Numerical Methods for Mechanical Systems** **Type of Course:1] School Core**	**L-T- P-C**	**3**	**1**	**0**	**4**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces fundamental and advanced numerical techniques for solving algebraic, transcendental, and differential equations. Students will learn direct and iterative methods for linear systems, root-finding algorithms, interpolation, numerical differentiation and integration, and numerical solutions of ordinary and partial differential equations. Emphasis is placed on both theoretical foundations and practical applications in engineering and applied sciences, with attention to accuracy, stability, and convergence of methods.					
Course Objective	The objective of this course is to equip students with a solid foundation in numerical methods and their applications to algebraic, transcendental, and differential equations. It aims to develop an understanding of direct and iterative techniques for solving systems of linear equations, root-finding algorithms for nonlinear problems, and interpolation methods for data approximation. Students will gain proficiency in numerical differentiation and integration schemes, as well as in single-step and multi-step approaches for ordinary differential equations. The course further emphasizes the application of finite difference and other numerical schemes to partial differential equations, including parabolic, hyperbolic, and elliptic types, with attention to boundary value problems. By integrating theory with practical computation, the course fosters analytical skills to evaluate accuracy, stability, and convergence, preparing students to apply numerical techniques effectively in engineering, applied sciences, and mathematical modeling contexts.					
Course Outcomes	On successful completion of the course the students shall be able to: **CO1:** Apply the method of separation of variables and Lagrange's method to obtain solutions of partial differential equations. (L3) **CO2:** Apply appropriate techniques to solve one-dimensional heat and wave equations under prescribed initial and boundary conditions. (L3) **CO3:** Employ iterative numerical methods to determine the roots of algebraic and transcendental equations. (L3) **CO4:** Apply numerical differentiation and integration techniques to evaluate derivatives and integrals of given functions. (L3) **CO5:** Apply numerical methods to obtain approximate solutions of ordinary differential equations and systems of nonlinear equations. (L3) **CO6:** Employ finite difference and iterative methods to obtain numerical solutions of engineering problems modelled by partial differential equations. (L3)					
Course Content:						

Module 1	**Numerical Methods for Algebraic Equations and Linear Systems**	**(12L+4T=16 Sessions)**
Introduction, Jacobi iteration method, Gauss-Seidel iteration method. Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method, Newton-Raphson method, secant method, fixed point iteration method. Determination of Forces in a Truss Structure Using Iteration Methods.		
Module 2	**Numerical Interpolation, Integration, Differentiation and ODEs**	**(12L+4T=16 Sessions)**
Interpolation, Newton's method, Divided difference method, Lagrange's method, Numerical differentiation-Velocity, Accelaration, Numerical integration: Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Gaussian quadrature rule. Solution of ordinary differential equations: Taylor series method, modified Euler's method, Newton-Raphson method for system of nonlinear equations, Runge-Kutta Method for system of first order ODEs, Velocity, Acceleration and Work Done of a Moving Piston from Experimental Data Using Numerical Methods.		
Module 3	**Partial Differential Equations and Their Applications**	**(12L+4T=16 Sessions)**
Formation of PDE, Solution of non-homogeneous PDE by direct integration, Solution of homogeneous PDE involving derivative with respect to one independent variable only (Both types with given set of conditions) Method of separation of variables. (First and second order equations) Solution of Lagrange's linear PDE. of the type P p + Q q = R. Applications of PDE: Derivation of one-dimensional wave and heat equations. Various possible solutions of these by the method of separation of variables, Cooling of a Hot Metal Rod.		
Module 4	**Numerical Methods for PDEs**	**(9L+3T =12 Sessions)**
Finite difference method for PDEs, Scmidt explicit formula, Crank-Nicolson method for parabolic PDEs, explicit finite difference method for hyperbolic PDEs, Gauss-Seidel iteration method for elliptical PDEs. Reservoir Pressure Distribution Using Finite Difference Method, Seismic Wave Propagation Using Explicit Finite Difference Method.		
Targeted Application & Tools that can be used: • Bubble point pressure estimation, reservoir pressure distribution, well performance analysis, nonlinear flow equations, gas compressibility factor calculations, production optimization problems. • Reservoir pressure estimation using interpolation, production rate forecasting, velocity and acceleration calculations in pipelines, cumulative production estimation, pressure decline analysis, fluid flow prediction. • Heat transfer during steam injection, heat loss in oil pipelines, groundwater flow, temperature distribution in reservoirs, enhanced oil recovery processes, contaminant transport modeling. • Reservoir pressure distribution using finite differences, seismic wave propagation, thermal recovery simulation, hydraulic fracturing studies, fluid flow in porous media, reservoir simulation and forecasting. Software: MATLAB, Mathematica, Maple, Python, GeoGebra, Octave, R, Scilab.		
Assignment:		

Assignments will involve theoretical problem-solving and computational implementation using suitable programming tools. The assignments may be undertaken individually or in groups, as decided by the instructor.

Text Book

3. E. Kreyszig, Advanced Engineering Mathematics, 11th ed. Hoboken, NJ, USA: John Wiley & Sons, 2025.
4. B. S. Grewal, *Higher Engineering Mathematics*, 45th ed. New Delhi, India: Khanna Publishers, 2022.
5. M. K. Jain, S. R. K. Iyengar, and R. K. Jain, Numerical Methods for Scientific and Engineering Computations, 8th ed. New Delhi, India: New Age International Publishers, 2022.

References:

1. V. Henner, T. Belozerova, and M. Khenner, Ordinary and Partial Differential Equations. Boca Raton, FL, USA: CRC Press, 2013.
2. W. Ledermann, Multiple Integrals, 1st ed. Cham, Switzerland: Springer.
3. G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry, 9th ed. Noida, India: Pearson Education, 2002.
4. T. Veerarajan, Engineering Mathematics for First Year. New Delhi, India: Tata McGraw-Hill, 2008.

E-resources/ Web links:

4. https://presiuniv.knimbus.com/portal/v2/default/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueId=EBSCO95_10122025_221436
5. https://presiuniv.knimbus.com/portal/v2/default/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueId=DOAB_1_06082022_9595
6. https://projecteuclid.org/ebooks/institute-of-mathematical-statistics-lecture-notes-monograph-series/multivariate-statistics/toc/10.1214/lnms/1196285102
7. https://www.mdpi.com/books/reprint/1360-advanced-numerical-methods-in-applied-sciences
8. https://www.gutenberg.org/ebooks/33283

Topics relevant to SKILL DEVELOPMENT: The course develops computational modeling, problem-solving, and numerical simulation skills essential for petroleum engineering applications. Students learn to apply numerical methods for approximation, interpolation, integration, and differential equations in real-world engineering applications and integrate mathematical techniques with modern computational tools for reservoir analysis, production optimization, and decision-making in the energy sector.

Catalogue prepared by	**Dr. Meenakshi K**
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: **MEC2028**	**Course Title: Machine Shop Practice Lab** **Type of Course:** **1] Professional Core** **2] Laboratory only**	**L-T-P-C**	0	0	2	1
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is designed with an objective of giving an overview of basic manufacturing processes like machining process for converting raw material to finished products. It is a practical oriented course detailing about Machine tools such as lathe, milling machine, shaping machine, Surface grinding, Slotting machine, drilling machines and CNC Machine with allied operations. The course also provides hands on approach on different machining operations such as thread cutting, Taper turning, Knurling, Internal threading, Gear generation, key way generation, surface finishing, Drilling operations and also to give an exposure to CNC programming.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Machine Shop Practice Lab**" and attain **SKILL DEVELOPMENT** through Experiential learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Understand working of Lathe, Shaper, Drilling and Milling CO2] Select the fixture, cutting tools and machine tools according to drawing. CO3] Produce physical models by using different Machine tools. CO4] Learn and implement safety work practice and work environment. CO5] Understand programming on CNC lathe and Milling machine.					
Course Content:	1]Turning operation on a given mild steel workpiece on a lathe machine Level:01 2] Facing and chamfering operation on a given mild steel workpiece on a lathe machine Level:01 & 02 3] Step turning and grooving operation on a given mild steel workpiece on a lathe machine Level:01 4] Taper turning operation on a given mild steel workpiece on a lathe machine Level: 02 5] Drilling and boring operation on a given mild steel workpiece on a lathe machine Level: 01 6] Knurling and thread cutting operation on a given mild steel workpiece on a lathe machine Level:01 & 02 7] Key way milling operation on a given mild steel workpiece on a universal milling machine Level:01 8] End milling operation on a given mild steel workpiece by using vertical milling machine					

	Level:01 9] Gear Cutting operation on a given aluminium blank by using Horizontal milling machine Level:02 10] Drilling, Counter sinking and tapping operation by using drilling machine Level:01 11] V groove cutting on a given mild steel workpiece by using shaper machine Level:01 12] Key way slotting on a given mild steel workpiece using Milling machine. Level: 01 13] Basic CNC programming demonstration. Level: 02 14] Basic Grinding Operation demonstration. Level: 02
Targeted Application & Tools that can be used: Preparing physical models by using different machine tools in the manufacturing sector.	
Text Book 1. P N Rao, "Manufacturing Technology – Vol. 2", McGraw Hill Education. 2. A Text Book of Engineering Metrology: R.K. Jain, Khanna Publishers.	
References 1. P N Rao, "Manufacturing Technology – Vol 1", McGraw Hill Education. 2. Nagendra Parashar B.S, Mittal R.K., "Elements of Manufacturing Processes", PHI publications. Web Resources: https://presiuniv.knimbus.com/user#/searchresult?searchId=elements%20of%20Mechanical%20Engineering&_t=1659588753433	
Topics relevant to "SKILL DEVELOPMENT": Lathe machine, Shaper Machine operations for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through the assessment component mentioned in the course plan.	
Catalogue prepared by	Dr.Aravinda T Asst. Professor, Dept. of Mechanical Engg.
Recommended by the Board of Studies on	20th BOS Meeting held on 19th Dec 2024
Date of Approval by the Academic Council	

Course Code: **APT4004**	**Course Title: Aptitude Training-Intermediate** **Type of Course:** Practical Only Course	**L- T - P- C**	0	0	2	0
Version No.	1.0					
Course Pre-requisites	Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.					
Anti-requisites	NIL					
Course Description	This is a skill-based training program for the students. This course is designed to enable the students to enhance their skills in Quantitative Aptitude.					
Course Objective	**The objective of the course is to familiarize the learners with the concepts of Aptitude and attain Skill Development through Problem Solving techniques.**					
Course Out Comes	**On successful completion of this course the students shall be able to:** CO1: Recall all the basic mathematical concepts. CO2: Identify the principle concept needed in a question. CO3: Solve the quantitative and logical ability questions with the appropriate concept. CO4: Analyze the data given in complex problems.					
Course Content:						
Module 1	Quantitative Ability 1	Assignment	16 Sessions			
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss						
Module 2	Quantitative Ability 2	Assignment	14 Sessions			
Topics: Time Speed and Distance, Boats and Streams, Simple Interest, Compound Interest, Probability, Permutation and Combination						
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS						
Continuous Evaluation:						
CA1 – Online Test CA2 – Online Test CA3 – Online Test Assignment						

Text Book:

1. Fast Track Objective by Rajesh Verma
2. R S Aggarwal
3. Rakesh Yadav

References:

1. **www.indiabix.com**
2. **www.testbook.com**
3. **www.youtube.com/c/TheAptitudeGuy/videos**

Topics relevant to Skill Development: Quantitative aptitude for Skill Development through Problem solving Techniques. This is attained through components mentioned in course handout.

Catalogue prepared by	Faculty of L&D
Recommended by the Board of Studies on	**BOS held on**
Date of Approval by the Academic Council	**Academic Council Meeting held on**

Course Code: MEC2508	**Course Title: Design of Machine Elements-I** **Type of Course: Program Core & Theory only**	**L- T -P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	[MEC2505] Mechanics of Solids					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of designing appropriate machine transmission components and their applications. Develops students' competence and self-confidence as design engineers. Emphasis on the creative design process bolstered by application of physical laws. Robustness and manufacturability are emphasized. Subject relies on active learning via a minor design-and-build project. Lecture topics include idea generation, estimation, concept selection, visual thinking, computer-aided design (CAD).					
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Analyze machine components against static and dynamic loads using theories of failure CO2. Determine machine parts for withstanding static and fatigue loads CO3. Examine welded, riveted and bolted joints for general applications CO4. Determine dimensions of keys, cotter and knuckle joints for motion transmission. CO5. Calculate diameter of shafts used in various application.					
Course Content:						
Module 1	Introduction to Design Process	Assignment	Programming Task		10 sessions	
Topics: Introduction to Design process – Factors – Materials selection - direct - Bending and Torsional stress equation - Impact and Shock loading - Factor of safety - Design stress - Theories of failures – Problems.						
Module 2	Fatigue strength	Case Study	Simulation and data analysis task		10 sessions	
Topics: Stress concentration - theoretical stress concentration factor - Size factor - Surface limits factor - fatigue stress concentration factor - notch sensitivity - Variable and cyclic loads – Fatigue strength – S-N curve – Continued cyclic stress – Soderberg and Goodman equations.						
Module 3	Design of Shafts	Assignment	Simulation/Data Analysis		09	

				sessions
Topics: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes. Computer aided design of shafts and analysis				
Module 4	Design of Riveted, Welded and Bolted Joints	Assignment	Modelling	08 sessions
Topics: Riveted, Welded and Bolted Joints, Computer aided design of joints.				
Module 5	Design of Keys, cotters and knuckle joints	Assignment	Simulation/Data Analysis	08 sessions
Topics: Design of keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter Joints- knuckle joints.				
Targeted Application & Tools that can be used: Contemporary issues: Knowledge of DME can help students in becoming Design engineer, CAD release engineer, Dimensional engineer where various employability opportunities are available at all automotive industries, OEM's, Tier 1 and Tier 2 organizations Professionally Used Software: SolidWorks.				
Project work/Assignment:				
Project Assignment: Carry out a directional stress analysis on different stress concentration geometry. Assignment: 1] Collect the data for types of shafts used in an automobile and compute the stresses encountered. Assignment 2] Prepare a compressive report on the types of Pistons used by Audi in their cars.				
Textbooks: V.B. Bhandari, Design of Machine elements, Tata Mc Graw Hill, 3rd Edition, 2010.				
References 1. P.C.Sharma & D.K.Aggarwal, A Text Book of Machine Design, S.K.Kataria & Sons, New Delhi,12th edition, 2012. 2. Jack A.Collins, Henry Busby, George Staab, Mechanical Design of Machine Elements and Machines, 2nd Edition, Wiley India Pvt. Limited, 2011. 3. Steven R. Schmid, Bernard J. Hamrock, Bo. O. Jacobson, Fundamentals of Machine Elements, CRC Press, Third Edition, 2014. 4. Juvinal, R.C and Kurt M.Marshek, Machine component design, John Wiley, 2012. 5. Design Data – K. Lingaiah, 2012. 6. E learning https://nptel.ac.in/courses/112/105/112105125/				
Topics relevant to development of " PROBLEM SOLVING SKILL": Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes. Computer aided design of shafts and analysis etc Topics relevant to " HUMAN VALUES &PROFESSIONAL ETHICS": NIL				
Catalogue prepared by	Dr. Sandeep G M			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic	Academic Council Meeting No. 26, Dated 25/07/2025			

Council	

Course Code: MEC2504	Course Title: Theory of Machines Type of Course: 1] Professional Core Course 2] Theory	L- T-P-C	3	1	0	4
Version No.	2.0					
Course Pre-requisites	MEC2500					
Anti-requisites	NIL					
Course Description	The course is designed with an objective of giving an overview of the methods for analyzing the motion of mechanisms used in engineering applications. It includes the concepts and methods for determining the mobility and performing kinematic analysis of planar mechanisms. The course emphasizes on Kinematic links, Kinematic pairs, and Degree of Freedom of simple mechanisms, Kinematic chain, basic mechanisms and their Inversions. The velocity and acceleration analysis of basic mechanisms such as four bar mechanism, Slider – crank mechanism and their inversions are discussed using graphical methods. The course also discusses the concepts involved in the design and kinematic analysis of cam and follower pair, gears and gear trains, balancing, gyroscope and governors.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Theory of Machines**" and attain **SKILL DEVELOPMENT** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1)To help students comprehend the basic ideas of mechanism CO2) To help students comprehend how cams, gears, and flywheels work. CO3) To impart understanding of mechanism design and the dynamic loads that affect the mechanism. CO4) Construct the velocity and acceleration profile of kinematic analysis on planar mechanisms CO5)To give an insight on the concepts of balancing, vibration and speed governing devices					
Course Content:						
Module 1	Mechanisms	Assignment	Programming Task, Data Analysis task		10 sessions+03T	
Introduction, Link, Kinematic Pair, Kinematic Constraints, Kinematic Chain, Mechanism, DoF, Grashoff's law, Inversion of Mechanism, Quick Return Motion Mechanism, Intermittent Motion Mechanism, Hook's Joint. Other Mechanisms, Velocity by IC Method, Relative Velocity and Acceleration, Corioli's Component of Acceleration, Velocity and Acceleration by Analytical Method.						
Module 2	Gear and Gear Trains	Quiz	Analytical thinking		10 sessions+03T	

Gear Terminology, Involute and Cycloidal gear profile, Types of Gears, Minimum Number of Teeth to Avoid Interference, Beam Strength of a Gear, Gear Lubrication, Types of Gear Trains, Design of an Epicyclical Gear Train				
Module 3	Cams and Gyroscopes	Assignment	Data Collection and Analysis	10 sessions+05T
Classification of Follower, Types of Cam, Terminology Associated with Cam, Displacement, Velocity, Acceleration and Jerk of a Follower [SHM, UV], Cam Profile, Gyroscope and its Applications.				
Module 4	Flywheels and Governors	Assignment	Data Collection and Analysis	10 sessions+05T
Turning Moment Diagram, Coefficient of Fluctuation of Speed and Energy, Design of a Flywheel, Watt Governor, Porter Governor, Hartnell Governor, Controlling Force Diagram and Stability of a Governor, Other Types of Governors				
Module 5	Balancing of Masses	Assignment	Data Collection and Analysis	09 sessions+03T
Static and Dynamic Balancing, Balancing of Rotating Masses, Balancing of Reciprocating Masses- Single Cylinder Engine, Balancing of V Engine, Partial Balancing of Locomotive				

Targeted Application & Tools that can be used:

Application Area is collision of vehicles, aerospace, automobile kinematics and dynamics, vibration of machines.

Text Books

1. Meriam, J. L., and L. G. Kraige. *Engineering Mechanics: Dynamics*. 6th ed. New York, NY: Wiley, 2006. ISBN: 9780471739319.
2. J. R. Taylor, *Classical mechanics*, University Science Books, 2005.
3. S. S. Rattan, "Theory of Machines", Tata McGraw Hill,2019

References

1.A. Ghosh and A. K. Mallik, "*Theory of Mechanisms, and Machines"*, East West Press Pvt Ltd..

2). K. J. Waldron and G. L Kinzel, "*Kinematics, Dynamics and Design of Machinery"*, Wiley Student Edition.

3.The resources from the Engineering Kinematics Course from MIT Open Course Ware from Fall,2011, are available here: Link.

4.The resources from the Kinematics of Machines Course from SWAYAM-NPTEL from December, 2009 are available here: Link.
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_2609

Topics relevant to "SKILL DEVELOPMENT": Cams design, Velocity, acceleration diagram for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout.	
Catalogue prepared by	Dr Yuvaraja Naik
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2509	**Course Title: Heat and Mass Transfer** **Type of Course: Program core & Theory only**	**L-T-P-C**	3-1-0-4
Version No.	1.0		
Course Pre-requisites	MEC2501		
Anti-requisites	NIL		
Course Description	This Course provides an introduction to the fundamental concepts of heat transfer; Thermal conductivity steady-state and unsteady-state heat conduction multilayer conduction, heat transfer through a composite wall, critical insulation thickness, analytical and empirical relations for forced and free convection heat transfer; empirical relations used for pipe and tube flow, boundary layer and its thickness, heat exchanger analysis and design; to design and analyse the performance of heat exchangers and evaporators. The Course also involves Radiative heat transfer, Emissivity, Stefan Boltzmann constant, solar radiation and radiation properties of an environment, heat transfer between black surfaces, shape factor formula for open ends of cylinders and effective emissivity of finned surface, condensation and boiling, principles of mass transfer.		
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Apply the concept of steady state conduction heat transfer in solids. CO2. Employ the methods of lumped heat capacity to solve unsteady-state conduction problems. CO3. Compute the heat transfer coefficient for natural and forced convection. CO4. Apply the concept of radiation heat transfer between surfaces. CO5. Compute the effectiveness of a specific heat exchanger.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Heat and Mass Transfer**" and attain SKILL DEVELOPMENT through Problem solving Methodologies.		
Course Content:			
Module 1	Conduction	15 sessions	
Topics: Introduction - basic modes of heat transfer and governing laws– conduction – general heat conduction equation in Cartesian – one dimensional steady state conduction with and without heat generation – concept of thermal resistance – concept of composite wall – overall heat transfer coefficient – critical thickness of insulation – Fins and its types, Numerical. [Apply level]			
Module 2	Transient Conduction	09 sessions	
Topics: Unsteady state conduction in one dimension – significance of Biot and Fourier's number – classification and identification of the given transient case – lumped heat capacity system, Heisler charts, Numerical. [Apply level]			
Module 3	Convection	12 sessions	

Topics: Newton's law – concept of boundary layer – significance of Prandtl number – boundary layer equations – flat plate heat transfer– laminar and turbulent flow – Reynolds analogy – empirical relations in forced convection – internal flow – boundary conditions – laminar flow – heat transfer coefficients – empirical correlations. Natural convection – heat transfer from vertical plate– empirical relation in free convection. **,** Flow through Pipes [Apply level]		
Module 4	Radiation	12 sessions
Topics: Fundamentals of radiation – radiation spectrum – thermal radiation – concept of black body and grey body – monochromatic and total emissive power – absorptivity, reflectivity and transmissivity - laws of radiation – radiation between two surfaces – geometrical factors for simple configuration – radiation shields. [Apply level]		
Module 5	Heat exchangers	12 Sessions
Classification – Log mean temperature difference – overall heat transfer coefficient – fouling and scaling of heat exchangers – LMTD and NTU method of performance evaluation of heat exchangers. Numerical. Mass Transfer-Definition, Concentration, Fick's Law of diffusion, Numerical. [Apply level]		
Targeted Application & Tools that can be used: Conductions Heat Transfer, convection heat transfer, radiation heat transfer, heat exchangers.		
Text Book T1: J P Holman, Souvik Bhattacharyya, "Heat Transfer" McGraw Hill Education (India) Pvt Ltd. T2**:**https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_264		
References 1. S. P. Sukhatme, "A text book on heat transfer", Universities press (India) private limited. 2. F. P. Incropera and D.P.Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons. **(iii) Web-Resources:** https://presiuniv.knimbus.com/user#/searchresult?searchId=energy%20conversion&_t=1660731503338		
Topics relevant to "SKILL DEVELOPMENT": Determination of conductions Heat Transfer, convection heat transfer, radiation heat transfer, efficiency of heat exchangers through Problem solving Methodologies. This is attained through assessment component mentioned in course plan.		
Catalogue prepared by	Dr. Udaya Ravi Mannar	
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025	
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025	

<table>
<tr><td>Course Code: MEC2510</td><td>Course Title: Heat and Mass Transfer Lab
Type of Course: Professional core & Laboratory only</td><td>L-T-P-C</td><td>0-0-2-1</td></tr>
<tr><td>Version No.</td><td colspan="3">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="3">MEC2501</td></tr>
<tr><td>Anti-requisites</td><td colspan="3">NIL</td></tr>
<tr><td>Course Description</td><td colspan="3">The Course aims at learning the practical concepts in different modes of heat transfer like, conduction, convection and radiation. It also includes experiments on heat exchangers, condensation, boiling and mass transfer.</td></tr>
<tr><td>Course Out Comes</td><td colspan="3">On successful completion of the course the students shall be able to:
CO.1 Calculate the thermal conductivity of substance.
CO.2 Employ the methods of lumped heat capacity to calculate the heat transfer coefficient.
CO.3 Calculate the heat transfer coefficient in forced and natural convection.
CO.4 Compute the heat transfer by radiation mode between 2 surfaces.
CO.5 Calculate the rate of heat transfer taking place in parallel and counter flow heat exchangers.</td></tr>
<tr><td>Course Objective</td><td colspan="3">The objective of the course is to familiarize the learners with the concepts of “Heat and Mass Transfer Lab” and attain SKILL DEVELOPMENT through Experiential learning techniques.</td></tr>
<tr><td>Course Content:</td><td colspan="3"><table>
<tr><th>Experiment no</th><th>Experiment Name</th></tr>
<tr><td>1</td><td>To calculate the thermal conductivity of metal rod and to plot temperature distribution along the length of rod</td></tr>
<tr><td>2</td><td>To calculate the thermal conductivity of insulating powder</td></tr>
<tr><td>3</td><td>To study heat transfer through insulating medium.</td></tr>
<tr><td>4</td><td>To study the heat transfer through conduction in composite wall</td></tr>
</table></td></tr>
</table>

	5	To study the unsteady state heat transfer by the lumped capacitance.	
	6	To study heat transfer in forced convection.	
	7	To study the heat transfer in natural convection.	
	8	To study the heat transfer in a pin fin apparatus by forced convection	
	9	To calculate value of Stefan Boltzmann's constant of hemisphere temperature on it.	
	10	To calculate the emissivity of test plate.	
	11	To study the heat transfer phenomena in parallel flow heat exchanger	
	12	To study the heat transfer phenomena in counter flow heat exchanger	

Targeted Application & Tools that can be used: Conductions Heat Transfer, convection heat transfer, radiation heat transfer, heat exchangers.	
Text Book **T1:** "Heat and mass transfer lab manual" Presidency University. **T2:**https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_264	
References **R1:** "Heat and mass transfer", by J P Holman. **(iii) Web-Resources:** https://presiuniv.knimbus.com/user#/searchresult?searchId=energy%20conversion&_t=1660731503338	
Topics relevant to "SKILL DEVELOPMENT": Determination of conductions Heat Transfer, convection heat transfer, radiation heat transfer, efficiency of heat exchangers through **Experiential Learning techniques**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	Basavaraj Devakki
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by	Academic Council Meeting No. 26, Dated 25/07/2025

the Academic Council	

Course Code: **MEC2017**	**Course Title:** **Computer Aided Machine Drawing** **Type of Course:** **Professional Core Course/ Laboratory only**	**L- T-P- C**	0	0	4	2
Version No.	2.0					
Course Pre-requisites	MEC1006					
Anti-requisites	Nil					
Course Description	This course covers key concepts and practical skills in computer-aided machine drawing, focusing on sheet metal design, mold design, technical drawing, and proficiency in advanced design techniques. It begins with an introduction to sheet metal design and progresses to advanced methods for creating complex parts and assemblies. The mold design section includes both basic and advanced topics, such as core/cavity design and material flow analysis. The technical drawing module emphasizes 2D drafting, detailing, and advanced techniques like exploded views. The course also includes rigorous practice sessions to enhance students' expertise in computer-aided drafting and design for real-world applications in machine drawing.					
Course Out Comes	On successful completion of this course the students shall be able to: CO1. Develop detailed machine components using computer-aided design tools, ensuring accuracy and adherence to engineering standards. CO2. Apply principles of sheet metal design to create machine parts with accurate flat patterns and ensure manufacturability. CO3. Design mold components with a focus on assembly integration and performance optimization for machine applications. CO4. Prepare precise 2D machine drawings with advanced annotations, bill of materials (BOM), and exploded views for effective communication of design intent.					
Course Content:	Here's the syllabus with module topics: Module 01: Sheet Metal Design and Analysis-8 Sessions • Introduction to sheet metal design and manufacturing techniques. • Material properties and flat pattern creation. • Advanced methods for designing and assembling sheet metal parts. Module 02: Mold Design Fundamentals-8 Sessions • Basic concepts of mold design: core, cavity, and parting lines. • Types of molds and their applications. • Advanced techniques for designing mold components and optimizing performance. Module 03: Technical Drawing Tools and Techniques-8 Sessions • Fundamentals of 2D drawing creation, views, and detailing. • Annotation tools for dimensions, tolerances, and notes.					

	• Advanced techniques for exploded views and BOM preparation. Module 04: Design and Assembly of Machine Components-8 Sessions • Design and assembly of a chuck. • Design and assembly of a gearbox. • Design and assembly of a shaft-bearing system.
Targeted Application & Tools that can be used: Design engineer, draftsmen and Solid works	
Text Book 1. N.D. Bhatt, Machine Drawing, Charotar Book Stall, Anand, 1996 2. GodFrey C. Onwubolu, Introduction to SolidWorks A Comprehensive Guide with Applications in 3D Printing, CRC Press, 2022 3. K.L.Narayana, Production drawing, New Age International Pvt. Ltd. New Delhi, 2003.	
References 1. S Trayambak Murthy, "Text book of Computer Aided Machine Drawing", CBS 2. K.R.Gopalakrishna, Machine Drawing, Subhas Stores, Bangalore, 2002	
Topics relevant to "SKILL DEVELOPMENT": Course uses Solid works software to design sheet metal model design concepts, machine components, mould design, technical drawing for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Sandeep G M
Recommended by the Board of Studies on	BOS No: 20th BOS held on 19/12/2024
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
APT4006</td><td colspan="2">Course Title: Logical and Critical Thinking
Type of Course: Audited</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">Nil</td></tr>
<tr><td>Course Description</td><td colspan="7">This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with concepts in in Logical reasoning and Critical thinking through problem solving techniques suitable for their career development.</td></tr>
<tr><td rowspan="4">Course Outcomes</td><td colspan="7">On successful completion of the course the students shall be able to:</td></tr>
<tr><td colspan="7">CO1] Understand all the concepts.</td></tr>
<tr><td colspan="7">CO2] Apply the concepts in problem solving (Bloom’s taxonomy Level 3)</td></tr>
<tr><td colspan="7">CO3] Analyze and structure the reasoning techniques and spatial visualization skills</td></tr>
<tr><td colspan="8">Course Content:</td></tr>
<tr><td>Module 1</td><td colspan="2">Logical Thinking</td><td colspan="2">Assignment</td><td colspan="2"></td><td>16 Sessions</td></tr>
<tr><td colspan="8">Topics:
Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency</td></tr>
<tr><td>Module 2</td><td colspan="2">Critical Thinking</td><td colspan="2">Assignment</td><td colspan="2"></td><td>14 Sessions</td></tr>
<tr><td colspan="8">Topics:
Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles</td></tr>
<tr><td colspan="8">Targeted Application & Tools that can be used:
Application area: Placement activities and Competitive examinations.
Tools: LMS</td></tr>
<tr><td>Evaluation</td><td colspan="7">Continuous Evaluation
· Topic wise evaluation
· Internal Assessments</td></tr>
</table>

Text Book

1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali
2. R S Aggarwal
3. Kiran publications

References

1. www.indiabix.com
2. www.testbook.com
3. www.youtube.com/c/TheAptitudeGuy/videos

Topics relevant to Skill Development Logical reasoning and Critical thinking for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	L&D Department Faculty Member
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: MEC2512	**Course Title: Finite Element Analysis** **Type of Course:** **1] Professional Core Course**	**L- T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	MAT1211,MEC2505					
Anti-requisites	NIL					
Course Description	The course is designed with the objective of giving an overview of the basics of finite element modelling of structures. It deals with the finite element formulation of one-dimensional problems, like trusses and beams, two dimensional problems with constant triangles, axisymmetric solids subjected to axisymmetric loading, two dimensional isoperimetric elements and time dependent problems.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Finite Element Analysis**" and attain **SKILL DEVELOPMENT** through **participative** learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Apply the principle of variational techniques to different machine/structural elements. **CO2:** Analyze the structural integrity of a machine with rods and bars. **CO3:** Analyze the structural integrity of a concrete building with beams and columns. **CO4:** Analyze the structural integrity of a steel reinforced skywalk.					
Course Content:						
Module 1	Introduction to Finite Element Method	Case Study	Mathematical			13 sessions
Topics: General description of Finite Element Method – Historical development – Comparison with classical methods – Other numerical methods such as FDM, BEM, etc. - General procedure of FEM – Application software's in FEM. General field problems - GDE formulation - discrete and continuous models – approximate solution as a polynomial - minimization of residue – Weighted residual methods –Galerkin method - Variational formulation Ritz method - numerical problems.						
Module 2	Analysis of Bars	Case Study	Mathematical			12 sessions
Topics: II order problems - Bar Problem – Formulation for the whole domain computing element matrices - Assembly of element matrices – Application of B.Cs – solution – post processing.						

Module 3	Analysis of Beams	Case Study	Mathematical	10 sessions
Topics: (IV order problems) – B.Cs & loading conditions on to nodes – element matrices - solution and post processing of results – I Dimension problems such as Heat transfer problems, Vibration problems in bar and beams.				
Module 4	Analysis of Trusses	Case Study	Mathematical	10 sessions
Topics: Discretization: Geometrical approximations – Simplification through symmetry – Element shapes and behaviour – Choice of element types – Simplex - Complex and Multiplex elements – Selection of interpolation polynomials (shape functions) - Convergence requirements – Element shape and distortion – Location of nodes – Node and Element numbering, B.Cs & loading conditions on to nodes – element matrices - solution and post processing of results				

Targeted Application & Tools that can be used:

Application

- Automation and Robotics
- Automobile design and fabrication
- Construction and housing
- Machine Design and Analysis

Tools

- MATLAB
- Python
- Ansys

Text Book's

1. Introduction to finite elements in engineering by Chandrupatla, Tirupathi Belegundu, Ashok D. 4th Edition, Publications: New Delhi Pearson 2015.
2. Finite Element Analysis Theory and Application with Ansys by Saeed Moaveni, 4th Edition, Pearson Publications 2015.
3. Finite Element Analysis with Ansys Workbench by Pramote Dachaumphai, 1st Edition, Oxford Press, 2018.
4. Modelling and Simulation Lab manual – Presidency University, Bangalore.

References

1. Finite Element Method in Engineering, by Rao, Singiresu S. 5th Edition Publisher: Amsterdam; Elsevier/Butterworth-Heinemann; 2014.
2. Introduction to the finite element method by Reddy, J N. Edition: 3, Publisher: New Delhi McGraw Hill Education 2005.
3. Finite element methods for engineers by Dixit, U S. Publisher: Andover Cengage Learning 2009.
4. Finite Element Analysis: Theory and Programming by C Krishnamoorthy second edition, McGraw Publications, 2017.
5. Web Resources: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_1105.

Topics relevant to "SKILL DEVELOPMENT": Finite Element Method (FEM) – Application software's, General field problems - GDE formulation, discrete and continuous models for

SKILL DEVELOPMENT through **Participative learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2513	**Course Title: Finite element analysis Lab Type of Course: Professional core & Laboratory only**	**L-T-P- C**	**0-0-2-1**
rsion No.	1.0		
Course Pre-requisites	MAT1211, MEC2505		
Anti-requisites	Nil		
Course Description	This lab course introduces students to the practical application of Finite Element Analysis techniques using industry-standard software tools. The primary focus is on building and analyzing models to solve real-world engineering problems in structural mechanics, heat transfer, and vibrations. Students will gain hands-on experience in creating geometries, applying boundary conditions, meshing, and interpreting results to make data-driven design decisions.		
Course Out Comes	On successful completion of the course the students shall be able to: CO1: Develop a strong foundation in the principles and methodologies of Finite Element Analysis CO2: Gain proficiency in using industry-standard FEA software for creating models, applying loads, and running simulations for structural, thermal, and vibrational analyses. CO3: Enhance the ability to interpret simulation results, validate them against theoretical or experimental data, and apply these insights to optimize designs. CO4: Apply FEA techniques to solve real-world engineering challenges, fostering critical thinking and effective decision-making in design and analysis processes.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Finite element analysis**" and attain SKILL DEVELOPMENT through Experiential learning techniques.		
Course Content:	**Module 1: Fundamentals of FEA and Preprocessing** 1. Introduction to FEA and Software Interface 2. Geometry Creation and Assigning Material Properties 3. Meshing Fundamentals: Element Types and Quality Analysis 4. Static Structural Analysis: Beam and Truss Structures 5. Thermal Analysis: Steady-State Heat Conduction **Module 2: Advanced Analysis Techniques** 6. Transient Thermal Analysis: Heat Transfer Over Time 7. Modal Analysis: Determining Natural Frequencies 8. Harmonic Analysis: Vibrational Response of a Structure 9. Nonlinear Analysis: Plastic Deformation of a Component 10. Contact Analysis: Bolted Joint Simulation **Module 3: Life Estimation, Optimization & Applications** 11. Fatigue Analysis: Life Estimation of a Structural Member 12. Optimization Techniques: Weight Reduction in a Design 13. Case Study: Multi-Physics Analysis (Thermal-Structural) 14. Final Project: Real-World Problem Solving and Report Writing		

Targeted Application & Tools that can be used:

Application

- Automation and Robotics
- Automobile design and fabrication
- Construction and housing
- Machine Design and Analysis

Tools

- MATLAB
- Python
- Ansys

Text Book's

1. Introduction to finite elements in engineering by Chandrupatla, Tirupathi Belegundu, Ashok D. 4th Edition, Publications: New Delhi Pearson 2015.
2. Finite Element Analysis Theory and Application with Ansys by Saeed Moaveni, 4th Edition, Pearson Publications 2015.
3. Finite Element Analysis with Ansys Workbench by Pramote Dachaumphai, 1st Edition, Oxford Press, 2018.
4. Modelling and Simulation Lab manual – Presidency University, Bangalore.

References

1. Finite Element Method in Engineering, by Rao, Singiresu S. 5th Edition Publisher: Amsterdam; Elsevier/Butterworth-Heinemann; 2014.
2. Introduction to the finite element method by Reddy, J N. Edition: 3, Publisher: New Delhi McGraw Hill Education 2005.
3. Finite element methods for engineers by Dixit, U S. Publisher: Andover Cengage Learning 2009.
4. Finite Element Analysis: Theory and Programming by C Krishnamoorthy second edition, McGraw Publications, 2017.

Web Resources:

https://presiuniv.linways.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_1105.

Topics relevant to "SKILL DEVELOPMENT": Finite Element Method (FEM) – Application software's, General field problems - GDE formulation, discrete and continuous models for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2516	**Course Title: IC Engine and Fuels Type of Course: Program Core**	**L- T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	MEC2501 Basic Thermodynamics					
Anti-requisites	**NIL**					
Course Description	This course reviews the basic principles of physics for analysis of performance of IC engines. This course also includes fuels that are used for combustion, alternate fuels and different injection systems (mechanical and electronic). The course covers: Thermodynamic analysis of SI and CI engine combustion, Comparison of knocking in SI and CI engine. Fuels and Alternative fuels for I.C. engines, Formation and Control of Engine Emissions.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**IC Engines and Fuels**" and attain **SKILL DEVELOPMENT** through Participative learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1- Describe basic concepts of Internal Combustion Engines and evaluate their performance. .CO2- Understand the necessity of different conventional and alternate fuels. CO3- Select appropriate injection systems for the given Engine. CO4- Explain the stages of combustion in both SI and CI Engines and their Knocking processes. CO5-Discuss different Emission Control packages and Emission Norms.					
Course Content:						
Module 1	Introduction to I. C. Engines	Assignment	Data Analysis Task	10 Sessions		
Topics: **Introduction to I. C. Engines**: Heat engines. Types of heat engines, Difference between engines and turbines. Engine Nomenclature, IC engine classification, Engine performance Parameters. Numerical**.**						
Module 2	Conventional and Alternate Fuels	Assignment	Data Analysis Task	8 Sessions		
Topics: **Conventional Fuels:** About fuels, Types of fuels (Solid, liquid, gaseous), , Petroleum Refining process, important qualities of Engine fuels. Chemical Structure of Petrol and Diesel **Alternate fuels** - Need for alternate fuels, Liquid fuels- methanol & ethanol for SI and CI Engines, Gaseous Fuels - Hydrogen, CNG, Biogas. Biodiesels – Production, Characterisation and testing						
Module 3	Carburetion and injection Systems	Assignment	Data Analysis Task	8 Sessions		

Introduction, Definition, Air-Fuel mixtures, Principle of carburetion, Simple carburetor-working principle.
Mechanical injection system –. Introduction. Functional requirement of an injection system, Classification of injection systems.
Electronic Injection System **–** Introduction, Electronic fuel injection systems. MPFI systems, Functional divisions of MPFI systems, Electronic control system (ECU).

Module 4	Combustion in IC Engines	Assignment	Data Analysis Task	10 Sessions

Topics
About combustion, Homogenous and Heterogeneous mixtures, Combustion in SI Engines, Stages of Combustion in SI engines, Flame front propagation, factors influencing Flame Speed, Rate of pressure rise, Abnormal combustion, The phenomenon of Knock in SI engines, Effect of Engine variables on Knock. Combustion in CI engines, Stages of Combustion in CI Engine, Factors affecting the delay period, The Phenomenon of Knocking, Comparison of Knock in SI and CI Engines.

Module 5	Engine Emissions and their Control	Assignment	Data Analysis Task	9 Sessions

Topics:
Pollutant from emissions - Carbon Monoxide, Carbon dioxide, Unburnt hydrocarbon, Oxides of Nitrogen, Smoke and Particulate matter. Emission Control packages – Catalytic converter Package, Thermal reactor package, Exhaust gas recirculation (EGR), Emission Norms, Bharath and Euro norms.

Targeted Application & Tools that can be used:
Application area are Indian Railways and power generation sector.
Tools used: CFD software

References

R1: V**.**Ganesan, "*Internal Combustion Engines*", Tata McGraw Hill Pub. Co. Ltd
R2: Pundir B.P, "IC Engines combustions and Emissions", Narosa Publishers.
R3: John B. Heywood: "*Internal Combustion Engines Fundamentals*", McGraw Hill International
Edition.
R4: M.L. Mathur and R.P Sharma: "*A Course in Internal Combustion Engines*", D. Rai and Sons

e- learning:
https://presiuniv.knimbus.com/user#/searchresult?searchId=machine%20elements&_t=1656917902483
https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=124896850&site=ehost-live

Topics relevant to "SKILL DEVELOPMENT": The phenomenon of Knock in SI engines, Effect of Engine variables on Knock. Combustion in CI engines, Phenomenon of Knocking, Comparison of Knock in SI and CI Engines for **SKILL DEVELOPMENT** through **Participative Learning** techniques. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Udaya Ravi Mannar

Recommended by the Board of Studies on	11th BoS held on 05/09/2020
Date of Approval by the Academic Council	14th Meeting of the Academic Council held on 24/12/2020

Course Code: MEC2514	**Course Title: Design of Machine Elements II** **Type of Course: Program Core & Theory**	**L- T-P- C**	**3**	**1**	**0**	**4**
Version No.	3.0					
Course Pre-requisites	MEC2508					
Anti-requisites	**NIL**					
Course Description	The Course is designed with an objective of giving an overview of designing appropriate machine transmission components and their applications. The Course covers: Design of Gears; Lubrication and Wear consideration in Design; Design and selection of Bearings: Hydrodynamic lubrication theory, Hydrostatic and Hydrodynamic bearings, Rolling Element Bearings; belts chains and Clutches Systems Approach to Design: Decision Making, Simulation of mechanical systems using CAD tools, Sensitivity analysis of design parameters, Value Analysis and Value Addition to design components and systems					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Design of Machine Elements-II**" and attain **SKILL DEVELOPMENT** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1 Select belts, ropes and chains for different engineering applications, CO2 Compute dimensions and stresses in different types of springs for different applications, CO3 Compute gear specifications for various engineering applications, CO4 Determine specifications for brakes and clutches used in practice, CO5 Analyse mechanical vibration systems and apply vibration principles in the design and optimization of dynamic machine components.					
Course Content:						
Module 1	Belts, Ropes and Chains	Assignment	Data collection		10 Sessions	
Topics: Flat Belts, Length & Cross Section, and Selection of V-belts, Ropes and Chains for Different Applications.						
Module 2	Springs	Assignment	Mathematical		10 Sessions	
Types of springs - stresses in helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, leaf springs: stresses in leaf springs & equalized stresses.						
Module 3	Gears	Assignment	Mathematical		20 Sessions	

definitions, stresses in gear tooth, Lewis equation and form factor, design for strength, dynamic load and wear load. Helical Gears: Definitions, formative number of teeth, design based on strength, dynamic and wear loads. Bevel Gear: Definitions, formative number of teeth, design based on strength, dynamic and wear loads. Worm Gears: Definitions, design based on strength, dynamic, wear load and efficiency of worm gear drives.				
Module 4	Clutches and Brakes	Assignment	Mathematical	10 Sessions
Topics: Design of clutches: single plate, multi plate and cone clutches. Design of brakes, block and band brakes: self-locking of brakes: heat generation in brakes.				
Module 5	Mechanical Vibrations	Assignment	Mathematical	10 Sessions
Topics: Free Vibrations of SDOF systems (undamped and damped) Natural frequency and logarithmic decrement Forced vibrations with harmonic excitation Resonance and quality factor Vibration isolation and transmissibility Introduction to MDOF systems: natural frequencies and mode shapes Vibration in rotating machinery and dynamic balancing Use of ANSYS and MATLAB/Simulink for vibration simulation				
Targeted Application & Tools that can be used: Application Area is Geophysical phenomenon, Hydrology, Aerospace, Aerodynamics, Microfluidics, Pipe network, Turbo-machinery. Industries using above applications and tools – Siemens, Quest Global, Simulent consulting, Triveni Engineering, TATA, GE etc				
TEXTBOOKS: 1.Design of Machine Elements: V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition 2007. 2.Mechanical Engineering Design: Joseph E Shigley and Charles R. Mischke McGraw Hill International Edition, 6th Edition 2003. **Reference Book(s):** 1.Machine Design: Robert L. Norton, Pearson Education Asia, 2001. 2.Design of Machine Elements: M.F.Spotts, T.E. Shoup, L.E. Hornberger, S.R. Jayram and C.V. Venkatesh, Pearson Education, 2006. 3.Machine Design: Hall, Holowenko, Laughlin (Schaum's Outlines Series) Adapted by S.K. Somani, Tata McGraw Hill Publishing Company Ltd., New Delhi, Special Indian Edition, 2008. 4.Fundamentals of Machine Component Design: Robert C. Juvinall and Kurt M Marshek, Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2007. Web links: https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=OAL1_7920				

Topics relevant to "SKILL DEVELOPMENT": Ropes, belts, clutches design for **SKILL DEVELOPMENT** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout.	
Catalogue prepared by	Dr. Sandeep G M
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC4008**	**Course Title: Mechanisms, Machines and Design Lab** **Type of Course: 1] Professional Core Course 2] Laboratory only**	**L-T-P-C**	**0**	**0**	**2**	**1**
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	It is a new state of the art facility for experimental design research the Design Lab is providing facilities for students to learn different courses related to Mechanical Vibrations, Kinematics of Machines, Design of Machine Elements, Dynamics of Machines etc., and the concepts are demonstrated for better understanding to explore towards research and industrial engineering design field.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Mechanisms, Machines and Design Lab**" and attain **SKILL DEVELOPMENT** through Experiential learning techniques.					
Course Outcomes	**On successful completion of the course the students shall be able to:** CO1. To practically relate to concepts discussed in Design of Machine Mechanical Vibrations & Dynamics of Machines courses. CO2. To identify forces and moments in mechanical system components anc vibrations in machine elements and design appropriate damping methods. CO3. To understand the working Principles of machine elements such as Go Gyroscopes and measure strain in various machine elements using strain ga CO4. Perform the journal bearing experiments and record the observation.					
Course Content						

Syllabus: **Total Sessions-30**

PART-A

1. Determine the natural frequency of the given Simple Pendulum
2. Determine the radius of gyration 'k' of given compound pendulum
3. Determination of natural frequency, logarithmic decrement, damping ratio and damping coefficient in a single degree of freedom vibrating systems (longitudinal and torsional).
4. Determination of critical speed of a rotating shaft.

PART-B

5. Determination of equilibrium speed, sensitiveness, power and effort of Porter/Proell / watt Governor (Only one or more).
6. Determination of Principal Stresses and strains in a member subjected to combined loading using Strain rosettes.
7. Determination of stresses in Curved beam using strain gauge.
8. Determination of Pressure distribution in Journal bearing.
9. Gyroscope

Targeted Application & Tools that can be used:	
References R1: "Shigley's Mechanical Engineering Design", Richards G. Budynas and J. Keith Nisbett, McGraw-Hill Education, 10th Edition, 2015. R2: "Design of Machine Elements", V.B. Bhandari, TMH publishing company Ltd. New Delhi, 2nd Edition 2007. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_8920.	
Topics relevant to "SKILL DEVELOPMENT": Determination of Principal Stresses and strains in a member subjected to combined loading, Curved beam, rotating shaft for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	**Dr. Yuvaraja Naik**
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 29/7/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

<table>
<tr><td>Course Code:
MEC3032</td><td colspan="2">Course Title: Energy Conversion Lab
Type of Course: Professional core & Laboratory only</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="7">2.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">The course aims at learning the practical concepts in different working cycles and operation of two stroke, four stroke SI and CI Engine cycles. Ignition, combustion, alternative fuels, emission and their control.</td></tr>
<tr><td>Course Out Comes</td><td colspan="7">On successful completion of the course the students shall be able to:
CO1: Differentiate among different internal combustion engine designs.
CO2: Identify the various properties of fuels and lubricating oils.
CO3: Evaluate the engines performance characteristics of various engines.
CO4: Analyze the performance of the engine with computerized set up which enables the understanding of pressure variation with crank angle during a cycle of operation</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with the concepts of "Energy Conversion Engineering Lab" and attain SKILL DEVELOPMENT through Experiential learning techniques.</td></tr>
<tr><td rowspan="12">Course Content:</td><td>Experiment No</td><td colspan="6">Experiment Name</td></tr>
<tr><td>1</td><td colspan="6">Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for Four stroke Diesel Engine
Determination of Flash point and Fire point using:
Cleveland Open cup apparatus (Kerosene)</td></tr>
<tr><td>2</td><td colspan="6">Abel's - Closed cup (Light oil – Kerosene)Pensky Martin - Closed cup (Diesel)</td></tr>
<tr><td>3</td><td colspan="6">Valve Timing Diagram of 4-stroke Petrol Engine</td></tr>
<tr><td>4</td><td colspan="6">Performance test on 4 – Stroke Petrol Engine with Eddy current dynamometer</td></tr>
<tr><td>5</td><td colspan="6">Performance test on 4 – stroke Diesel engine with eddy current dynamometer.</td></tr>
<tr><td>6</td><td colspan="6">Performance test on 4 – Stroke twin cylinder Diesel Engine with resistance loading test rig.</td></tr>
<tr><td>7</td><td colspan="6">Performance test on 4 – Stroke 4 cylinder Petrol Engine with hydraulic loading test rig</td></tr>
<tr><td>8</td><td colspan="6">Performance test on 4-Stroke 4 Cylinder Diesel Engine for Morse Test.</td></tr>
<tr><td>9</td><td colspan="6">Variable compression ratio for diesel engine with constant speed</td></tr>
<tr><td>10</td><td colspan="6">Performance test on 4-Stroke 4 Cylinder Petrol Engine for Morse</td></tr>
</table>

		Test
Targeted Application & Tools that can be used: Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency, Mechanical efficiency, SFC, FP, A:F Ratio heat balance sheet for Four stroke Diesel Engine		
Text Book T1: "Energy Conversion Engineering Laboratory Manual", Presidency University. T2**:** https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_264		
References R1**:** Internal Combustion Engine Fundamental by John B Heywood – Indian Edition, Tata McGraw-Hill R2: Internal Combustion Engines by V Ganesan – 4th edition, Tata McGraw-Hill publication. R3: Internal Combustion Engines by R.P Mathur & M L & Sharma – Dhanpat Rai publication. **(iii) Web-Resources:** https://presiuniv.knimbus.com/user#/searchresult?searchId=energy%20conversion&_t=1660731503338		
Topics relevant to "SKILL DEVELOPMENT": Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiencies, Volumetric efficiency and Mechanical efficiency for **SKILL DEVELOPMENT** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.		
Catalogue prepared by	Narendra Singh , Asst. Professor, Dept. of Mechanical Engg.	
Recommended by the Board of Studies on	**BOS No:** 15th BOS held on 29/07/2022	
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022	

<table>
<tr><td>Course Code: APT4005</td><td colspan="2">Course Title: Aptitude For Employability Type of Course: Practical Only</td><td>L- T-P- C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">Students should have the basic concepts of Quantitative aptitude, Verbal ability along with its applications in real life problems.</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">Nil</td></tr>
<tr><td>Course Description</td><td colspan="7">This course is designed to enable the students to enhance their skills in quantitative aptitude and verbal ability skills.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with concepts in Quantitative Aptitude and Verbal ability through problem solving techniques suitable for their career development.</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">On successful completion of the course the students shall be able to:
CO1] Recall all the basic mathematical concepts
CO2] Identify the principle concept needed in a question
CO3] Solve the quantitative and logical ability questions with the appropriate concept.</td></tr>
<tr><td>Course Content:</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td>Quantitative Ability</td><td>Lab-10hrs</td><td></td><td colspan="2">Platform Assessment-10hrs</td><td colspan="2">20 Sessions</td></tr>
<tr><td colspan="8">Topics:
Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss, Time Speed and Distance, Simple Interest and Compound Interest, Probability, Permutation and Combination.</td></tr>
<tr><td>Module 2</td><td>Verbal Ability</td><td>Lab-5hrs</td><td></td><td colspan="2">Platform Assessment-5hrs</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="8">Topics: - Parts of Speech, Subject Verb Agreement, Spotting Error, Cloze Test, Verbal Analogies, Reading Comprehension, Idioms & Phrases, Para Jumbles</td></tr>
<tr><td colspan="8">Targeted Application & Tools that can be used:
Application area: Placement activities and Competitive examinations. Tools:
LMS</td></tr>
<tr><td>Evaluation</td><td colspan="7">Continuous Evaluation
• Topic wise evaluation</td></tr>
<tr><td colspan="8">Text Book
1. Fast track objective by Rajesh Verma
2. R S Aggarwal
3. S.P Bakshi</td></tr>
</table>

References 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos	
Topics relevant to Skill development: Quantitative and reasoning aptitude for Skill Development through Problem solving Techniques. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: MEC2026	**Course Title: Mechatronics** **Type of Course: Professional Core Course**	**L-T-P-C**	3-0-0-3
Version No.	1.0		
Course Pre-requisites	NIL		
Anti-requisites	NIL		
Course Description	The course is designed with an objective of giving an overview of designing mechatronic systems, which require integration of the mechanical and electrical engineering disciplines within a unified framework. The course includes: System modelling, Sensors and Transducers, Actuators, Digital logic, Microprocessors and Advanced application in Mechatronics. It deals with Hall and pitch sensors, DC motors, Stepper motors, Guide ways, Architecture of Microprocessor, Logic Gates and Pin diagrams. The course aims at learning the practical concepts in Mechatronics. It also includes Hydraulic and Pneumatic system along with the simulation software.		
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Describe the fundamentals of mechatronic system and its applications. CO2] Identify the types of sensors, transducers and signal conditioning processes used in automated machines. CO3] Recognize sequencing schedule for a specific process using various actuating systems. CO4] Describe logic gates and working of controllers.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Mechatronics** " and attain **SKILL DEVELOPMENT** through Participative learning techniques.		
Course Content:			

Module 1	Introduction to Mechatronics	10 Sessions
Topics: Multi-disciplinary Scenario, Origins, Evolution of Mechatronics, Elements of mechatronic system, system, measurement systems, control systems - open loop, closed loop systems, feedback and feed forward control systems, servomechanisms, advanced applications of mechatronic.		
Module 2	Sensors Transducers and Signal Conditioning	15 Sessions
Topics: Introduction and background, difference between transducer and sensor, transducers types, transduction principle, photoelectric transducers, thermistors, thermo devices, thermo couple, inductive transducers, capacitive transducers, pyro electric transducers, piezoelectric transducers, Hall-effect transducers, Fiber optic transducers. Light sensors, Thermal sensors, Touch sensors, Pressure sensors, Magnetic sensors.		
Module 3	Actuation Systems	10 Sessions
Topics: Pneumatic and hydraulic systems, overview of components of hydraulic system, overview of components of pneumatic system, basic hydraulic circuits-single acting cylinder, double acting cylinder, sequencing circuit. Mechanical systems & Electrical systems-sequencing, all types of electrical motors. Sequencing of double and single acting cylinders.		
Module 4	Digital Electronics, Microprocessors, and Controllers	10 Sessions

Topics: Digital Electronics, Microprocessors, and Controllers: Programmable logic controllers - Basic structure, programming and ladder diagram.	
Targeted Application & Tools that can be used: Digital Electronics, Microprocessors, and Controllers	
Text Book W. Bolton," Mechatronics ", Pearson Publication	
References 1. HMT, "Mechatronics and Machine Tools", Tata McGraw Hill Education. 2. Mahalik," Mechatronics-Principals, concepts and Applications", Tata Mc Graw Hill Publication 3. https://nptel.ac.in/courses/112/107/112107298/	
Topics relevant to "SKILL DEVELOPMENT": Elements of mechatronic system, system, measurement systems, control systems - open loop, closed loop systems, feedback and feed forward control systems for **SKILL DEVELOPMENT** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout	
Catalogue prepared by	Basavaraj Devakki
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC2027	Course Title: Mechatronics Lab Type of Course: Professional core & Laboratory only	L-T-P-C	0-0-2-1
Version No.	1.0		
Course Pre-requisites	NIL		
Anti-requisites	NIL		
Course Description	This course involves the design and testing of fluid power circuits to control velocity, direction and force on single and double acting actuators, design of circuits with logic sequence using Electro-Pneumatic trainer kits, Simulation of basic Hydraulic, Pneumatic and Electric circuits with the help of software tool. It also involves hand-on approach on modelling and analysis of basic electrical, hydraulic and pneumatic systems, computerized data logging system with control for process variables like pressure flow and temperature..		
Course Out Comes	On successful completion of the course the students shall be able to: CO1. To Practically use the hydraulic and pneumatic circuits for given application. CO2. To identify the correct sequencing of pneumatic circuits and simulate in AUTOSIM-200 software. CO3. To understand the working principles of electric motors.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Mechatronics Lab**" and attain SKILL DEVELOPMENT through Experiential learning techniques.		
Course Content:			
	Experiment N0 1: Operation of a single acting & double acting cylinder in pneumatic trainer kit Level 1: Understand the various parts of pneumatic system, direction control valves, hose pipe connections and circuit diagrams. Level 2: Simulation of the circuit in AUTOSIM-200 software and control the movement of single and double acting cylinders. Experiment No. 2: Operation of single acting cylinder using Pneumatic Dual pressure valve and Shuttle valve Level 1: Understand the various parts of pneumatic system, direction control valves, hose pipe connections, pneumatic dual pressure valve & shuttle valve working and circuit diagrams. Level 2: Simulation of the circuit in AUTOSIM-200 software and control the movement of single acting cylinders, and knowthe applications in safety systems. Experiment No. 3: Simulation and operation of single cycle automation of multiple cylinders using cascading method in A+B+A-B-and A+B+B-A-sequence of motions. Level 1: Understand the various parts of pneumatic system, direction control valves, roller DCV's, cascading types, working, applications and circuit diagrams. Level 2: Simulation of the circuit in AUTOSIM-200 software and control the movement multiple double acting cylinders, and know the applications in automations. Experiment No. 4: To perform the time delay and counting operation		

	using pneumatic trainer kits Level 1: Understand the various parts of pneumatic system, direction control valves, time delay valve and its working, working of counters, applications and circuit diagrams. NO: PU/AC-16/EEE/2021-2025/2021 Level 2: Simulation of the circuit in AUTOSIM-200 software and control the movement multiple double acting cylinders, and know the applications in automations. Experiment No. 5: Speed control of AC and DC motors Level 1: Understand the working principle of AC, DC Motors and its circuit diagram. Level 2: Control the AC and DC motor by varying inputs (current/voltage) and plot the graph to know the relationship between speed or load characteristics. Experiment No. 6: Operation of double acting cylinders using Electro-pneumatic and PLC based Pneumatic kits Level 1: Understand the concept of relays, solenoids, sensors and its working, Programmable logical controllers, ladder logics. Level 2: Simulate the double acting in AUTOSIM-200 software to know the working of electro-pneumatic and PLC. Later Control the double acting using Push-buttons, PLC software & computer.
Targeted Application & Tools that can be used: This course finds applications mainly in automobile, space, defense, medical, consumer goods etc.	
Text Book T1: "Mechatronics lab manual" Presidency University.	
References R1. W. Bolton," Mechatronics ", Pearson Publication **(iii) Web-Resources:**	
Topics relevant to "SKILL DEVELOPMENT": Operation of single and double acting cylinder through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Basavaraj Devakki
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC3062	**Course Title: Hydraulics and Pneumatics** **Type of Course:** **1] Professional Core Course** **2] Theory**		**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	Automobiles, missiles, machine tools, aero planes etc. extensively use fluid power technology. This course deals with the fundamental aspects of hydraulics and pneumatics, the two fields of relevance to fluid power engineering.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of "**Hydraulics and Pneumatics**" and attain **Skill Development** through Problem solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Describe the fundamentals of Hydraulic Power Pumps, Actuators and Motors. CO2] Explain control components in Hydraulic Systems. CO3] Solve the numerical problems related to hydraulic efficiency of motors. CO4] Describe the fundamentals of pneumatic system, Actuators, Valves, Pneumatic circuits and logic circuits.					
Course Content:						
Module 1	Introduction to Hydraulic System	Assignment	Data collection	10 sessions		
Topics: Introduction to Hydraulic Power and Pumps: Review of fluid mechanics, Pascal's Law, structure of hydraulic control system. pumps: pumping theory, pump classification, gear pumps- external and internal type, vane pumps- simple, balanced, pressure compensated types, piston pumps- radial and axial (both swash plate and bent axis type), pump performances. Hydraulic Actuators and Motors: Linear hydraulic actuators - single acting, double acting, tandem cylinder, telescopic rod cylinder, mechanics of hydraulic cylinder loading, cylinder cushioning, hydraulic rotary actuators, hydrostatic transmission – open and close circuit, performance of hydraulic motor.						
Module 2	Energy transfer in hydraulic actuators and motors	Case study	Identify various valves considering a hydraulic system.	12 sessions		
Topics: Directional control valves (DCV), Constructional features, 2/2,3/2,4/2,4/3 DCV, Center configuration in 4/3 DCV- open, closed, tandem, regenerative, floating center configuration, Actuation of DCVs- manual, mechanical, solenoid, and indirect actuation, Relays for the solenoid operation, Check valve, Pilot check valve, Pressure control valves – Direct and Pilot operated types, Pressure reducing valve, Flow control valves- fixed throttle, and variable throttle, Throttle check valve, Pressure compensated flow control valve- relief and reducing types						

Module 3	Introduction to Pneumatic System and its control	Assignment	Data Collection	12 sessions
Topics: Choice of working medium, Characteristics of compressed air, structure of pneumatic control system, supply, signal generators, signal processor, final control elements , actuators, production of compressed air – compressors - reciprocating and rotary type, preparation of compressed air – driers, filters, regulators, lubricators, distribution of compressed air – piping layout. Pneumatic memory valve, time delay valve. Pneumatic circuits and logic circuits: supply air and exhaust air throttling, will dependent circuits, travel dependent controls – types – construction – practical applications, cylinder sequencing circuits, travel step diagrams, practical examples involving two or three cylinders, use of logic functions in pneumatic manufacturing applications, practical examples involving the use of logic functions.				
Module 4	Electro-Pneumatic control	Assignment	Data Collection	11 sessions
Topics: Principles-signal input and output pilot assisted solenoid control of directional control valves, use of relay and contactors. Control circuitry for simple single cylinder applications.				
Targeted Application & Tools that can be used: This course finds applications mainly in automobile, space, defense, medical, consumer goods etc. J*ob* titles might include Hydraulic or Pneumatic Design engineer, Maintenance engineer, Quality engineer, Service Engineer, Application engineer.				
Text Book T1: Fluid Power with applications, Anthony Esposito, Fifth edition Pearson education, Inc. 2000. T2: Pneumatics and Hydraulics, Andrew Parr. Jaico Publishing Co. 2000. T3: Hydraulics and Pneumatics, Dr.Niranjan Murthy and Dr.R.K.Hegde, Sapna Publications, 2013				
References R1: Oil Hydraulic Systems - Principles and Maintenance, S.R. Majumdar, Tata Mc Graw Hill Publishing company Ltd. 2001. R2: Pneumatic Systems, S.R. Majumdar, Tata Mc Graw Hill publishing Co., 1995. R3: Industrial Hydraulics, Pippenger, Hicks, McGraw Hill, New York, 2009				
Web Links: https://nptel.ac.in/courses/112/106/112106300/ W1: https://presiuniv.knimbus.com/user#/searchresult?searchId=hydraulics%20and%20pnumatics&_t=1656929386018 Hydraulics and Pnumatics				
Topics relevant to "EMPLOYABILITY SKILLS": Signal input and output pilot assisted solenoid control of directional control valves, use of relay and contactors for developing **SKILLS DEVELOPMENT** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by	Mr. Basavaraj Devakki Assistant Professor, Department of Mechanical Engineering, Presidency University			
Recommended by the Board of Studies on	14th BoS held on 25/03/2022			

Date of Approval by the Academic Council	18th Meeting of the Academic Council held on 03rd August, 2022

Course Code: PPS3018	**Course Title: Preparedness for Interview** **Type of Course**: Practical Only Course	**L- T- P- C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.					
Anti-requisites	NIL					
Course Description	This course is designed to enable students to understand soft skills concepts to be corporate ready. The modules are set to improve self-confidence, communicate effectively and Prepare for the Interview to assist in employability. It helps the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment and helps in crafting different types of resumes. The pedagogy used will be group discussions, flipped classrooms, continuous feedback, role-play and mentoring.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "Preparing for Interview" and attain SKILL DEVELOPMENT through PARTICIPATIVE LEARNING techniques.					
Course Out Comes	**On successful completion of this course the students shall be able to:** CO1: **Develop** professional Resumes CO2: **Illustrate** Resumes effectively CO3: **Apply** skills and knowledge learnt for active and effective Group Discussions and Interview					
Course Content:						
Module 1	Resume Building	Classroom activity			10 Sessions	
Topics: Resume structure, use of templates, Do's and Don'ts, ATS methods, Cover Letter and Video Resume **Activity:** Real world scenarios						
Module 2	Group Discussion	Mock G D			9 Sessions	
Topics: -Group discussion as a placement process, GD techniques like Keyword. SPELT & POV of affected parties. Do & Don't of GD, Case-lets and topics for GD, practice session and evaluation **Activity:-** Real world scenarios						
Module 3	Personal Interview	Grooming checks + Evaluation + Mock Interview+ Role Play			9 Sessions	

<table>
<tr><td colspan="4">Topics: Placement process, Different interview rounds, HR interviews, Interview questions and desired answers, Different types of interviews, Do’s and Don'ts.

Activity: - Role Play & Real-world scenario</td></tr>
<tr><td>Module 4</td><td>Recap/Revision /Feedback Session</td><td>Practice sessions</td><td>2 Sessions</td></tr>
<tr><td colspan="4">Targeted Application & Tools that can be used:
1. TED Talks
2. You Tube Links

Role Play activities</td></tr>
<tr><td colspan="4">Project work/Assignment: Mention the Type of Project /Assignment proposed for this course</td></tr>
<tr><td colspan="4">Continuous Individual Assessment</td></tr>
<tr><td colspan="4">The Topics related to Skill Development:

Art Of Presentation and Group Discussion for Skill Development through Participative Learning Tech- niques. This is attained through assessment Component mentioned in course handout.</td></tr>
<tr><td colspan="2">Catalogue prepared by</td><td colspan="2">Faculty of L&D</td></tr>
<tr><td colspan="2">Recommended by the Board of Studies on</td><td colspan="2">BOS held on</td></tr>
<tr><td colspan="2">Date of Approval by the Academic Council</td><td colspan="2">Academic Council Meeting held on</td></tr>
</table>

Discipline Elective Courses:

Course Code: **MEC3034**	**Course Title: Computer Integrated Manufacturing** **Type of Course:** **1] Professional Elective Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces computer assisted modern manufacturing technologies. The course includes basics of automation, NC programming (manual and APT), concepts of group technology, Flexible Manufacturing system and CIM. This course relates to the important theoretical concepts, and the state-of-the-art technological developments in the area of modern manufacturing.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Computer Integrated Manufacturing**" and attain EMPLOYABILITY SKILL through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1] Describe various types of automation and production concept CO2] Distinguish various automated flow line and Assembly line. CO3] Outline Flexible manufacture system and group technology. CO4] Apply CNC Part Programming and inspection principles. CO5] Explain the Computer aided process planning and concurrent engineering					
Course Content:						
Module 1	Introduction and Scope of CIM in Industry	Assignment	Automation	08 sessions		
Topics: Introduction, Evolution of CIM, CIM Hardware and software, Elements of CIM system, Types of automation, Manufacturing Systems, Types of Manufacturing Systems, , Machine Tools and related equipment"s, Computer monitoring and control, Manufacturing support systems, , Benefits of Computer integrated Manufacturing Systems.						
Module 2	NC/ CNC Machine Tools	Assignment & Case study	Machine tools	09 sessions		
Topics**:** General architecture of CNC Machine, Components of the CNC Systems: Machine Control Unit, CNC Driving system components: Hydraulic, Servo Motors, Stepper Motors, Feedback Devices: Encoder, Resolver, Induction Tachometers, Counting devices. Constructional Features of CNC Machines						
Module 3	Constructional Features of CNC Machines	Seminar	CNC system	10 sessions		
Topics: Design considerations of CNC machines for improving machining accuracy, Structural Members, Slide ways, bearings, Re-circulating ball Screws, Spindle drives, Work holding devices and tool holding devices, Automatic tool changers						
Module 4	Adaptive Control	Assignment	Application of Adaptive Control System	12 sessions		
Topics: Machining systems. Adaptive control optimization system, adaptive control constraint						

system, applications to machining processes, Benefits of Adaptive control Machining, Typical production planning and control system, Material planning systems, Capacity planning, Shop Floor Control, Automatic identification, Automated data collection systems				
Module 5	Computer Aided Planning & Concurrent Engineering	Case study	CAPP	06 sessions
Topics: Topics: Introduction of Process planning, Retrieval CAPP system, Generative CAPP system, Computer managed Process plan (CMPP), Advanced Process Planning, Concurrent Engineering.				
Targeted Application & Tools that can be used: Application area: Manufacturing sector, Automobile and assembly sectors, military and aerospace sector.				
Text Book 1] Mikell P Groover, "Automation, Production Systems and Computer-Integrated Manufacturing", Pearson Education. 2] CAD, CAM, CIM by P.Radhakrishnan and S.Subramanyan, New Age International Publishers.				
References 1] Dr. A. John Rajan, Dr. S Ramachandran & M L Moorthy, "Computer Integrated Manufacturing", Air Walk Publications. 2] Computer Integrated Manufacturing by Paul G. Rankey, Prentice Hall. 3] A. Alavudeen, "Computer Integrated Manufacturing", PHI 4] Automation CIM Groover 4th Edition.pdf- By www.EasyEngineering.net.pdf - Google Drive, https://drive.google.com/file/d/1ONOWDFfbj65FF-_pTSmfZ3UVVYFrktHb/view 5] CADCAMCIM Radhakrishnan Subramanyan and Raju- By EasyEngineering.net.pdf - Google Drive. https://drive.google.com/file/d/1JaPTdFgJlky3yMGz88vsHqlkM-aklZ96/view 6]https://presiuniv.knimbus.com/openFullText.html?DP=https://search-ebscohost-com-presiuniv.knimbus.com/login.aspx?direct=true&db=iih&jid=DIJ				
Topics relevant to "EMPLOYABILITY SKILLS": CNC part Programming exercises, Computer aided part programming: concept & need of CAP – CNC languages and APT language structure for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course plan.				

Catalogue prepared by	Dr. Aravinda T
Recommended by the Board of Studies on	BOS NO: 19th BOS held on 05/7/2024
Date of Approval by the Academic Council	Academic Council Meeting No. 24, dated 03/08/2024

Course Code: **MEC3038**	**Course Title: Smart Manufacturing** **Type of Course:** **1] Professional Elective Course 2] Theory**		**L-T- P- C**	3	0	0	3
Version No.	2.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	Smart Manufacturing is an amalgamation of Information Technology, Cloud Computing & traditional Mechanical, Production Engineering towards achieving excellence in manufacturing. Maximum results with minimum resources being used. concepts of Smart Manufacturing, how various technologies can be leveraged to achieve minimum breakdowns, First Time Right Production, 100% Delivery on Time with minimum turnaround time. Nine Pillars of Smart Manufacturing will be explained to the Students developments in Technology those are going to alter the Traditional Manufacturing scenario. The following topics may be broadly covered in the classroom. The practical will be in the form of Group Discussion based on Case Study.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Smart Manufacturing**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.						
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1] Explain the different areas of Industrial Internet CO2] Outline the designing industrial internet systems CO3] Explain the security of the Industrial Internet CO4] Outline the active part of industry 4.0 CO5] Explain the economic aspects and applications of day to day life smart factories						
Course Content:							
Module 1	Introduction to the Industrial Internet	Assignment	A report on use of IoT in common applications	10 sessions			
Topics: The Internet of Things: An overview; Horizontal and vertical aspects of the Internet of Things, What Is the Industrial Internet?, Innovation and the IoT, Intelligent Devices, Introduction to Industry 4.0 , Industry 4.0 Reference assembly line, lean Manufacturing							
Module 2	Designing Industrial Internet Systems	Case Study	On IIoT	08 sessions			
Topics: The Concept of the IIoT, Modern Communication Protocols, Wireless Communication Technologies, Building Blocks of Industry 4.0, AI&ML							
Module 3	Securing the Industrial Internet	Case Study	Report on system Security	08 sessions			
Topics:							

Security in Manufacturing, PLC, Securing the OT, Network Level: Potential Security Issues, System Level: Potential Security Issues, Smart Factories in current trends and its impact				
Module 4	Introducing Industry 4.0	Assignment	Industrial revolution	10 sessions
Topics: Defining Industry 4.0, Why Industry 4.0 and Why Now?, Four Main Characteristics of Industry 4.0, The Value Chain, Industry 4.0 Design Principles, Building Blocks of Industry 4.0, Big Data and Analytics, Autonomous Robots, Simulation, The Industrial Internet of Things (IoT), Industry 4.0 Reference Architecture, Smart Manufacturing, Equipment, Redefine the Workforce, Products, Business Processes, Application Area is any manufacturing/processing industries				
Module 5	Smart Factories	Case study	Identification of areas where Smart Manufacturing can flourish	09 sessions
Topics: Introducing the Smart Factory, Smart Factories in Action, Why Smart Manufacturing Is Important, Real-World Smart Factories, Siemens' Amberg Electronics Plant (EWA), Industry 4.0: The Way Forward, Adopt Smart Architectures and Technologies, Industry 4.0 Design Principles, design principles of Industry 4.0				
Targeted Application & Tools that can be used: Application Area is any manufacturing/processing industries Professionally Used Software: PLC and IoT.				
References 1. OEE Guide to Smart Manufacturing, Dr. Jill A O'Sullivan, ISBN – 97809912142-4-2, Library of Congress, IMAE Business & Academic ERP Implementation Series 2. E learning https://nptel.ac.in/courses/112/105/112105125/ https://presiuniv.knimbus.com/user#/searchresult?searchId=machine%20elements&_t=1656917902483				
Topics relevant to "EMPLOYABILITY SKILLS": Industry 4.0: The Way Forward, Adopt Smart Architectures and Technologies, Industry 4.0 Design Principles, design principles of Industry 4.0 for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr. Sachidananda K B			
Recommended by the Board of Studies on	15th BOS held on 22/07/2022			
Date of Approval by the Academic Council	Academic Council Meeting No. 18, dated 03/08/2022			

<table>
<tr><td>Course Code:
MEC3009</td><td colspan="2">Course Title:
Nanotechnology
Type of Course:
1] Professional Elective Course
2] Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">The Course is designed with an objective of giving an overview of study of materials at molecular level and its properties. The Course will also discuss specific applications of nanotechnology in electronic devices, biomedical fields, environmental solutions, and energy production. It also gives fundamental knowledge of nanoscience, in understanding current applications of nanotechnology, and in learning about future prospects in this field.</td></tr>
<tr><td>Course Objectives</td><td colspan="7">The objective of the course is to familiarize the learners with the concepts of "Nanotechnology" and attain EMPLOYABILITY SKILL through Participative learning techniques.</td></tr>
<tr><td>Course Out Comes</td><td colspan="7">On successful completion of the course the students shall be able to:
CO1.Recognize the basic properties of Nano materials.
CO2. Distinguish between various Nano material perspectives applicable to Nano technology.
CO3. Summarize the effect of Nano fluids on the boiling heat transfer.
CO4. Identify the processing techniques involved in investigation of Nano technology.</td></tr>
<tr><td>Course Content:</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td>Nanotechnology and over view</td><td>Term paper</td><td colspan="2">Data Collection/any other such associated activity</td><td colspan="2">04 sessions</td></tr>
<tr><td colspan="8">Topics: Introduction to Nanoscience & Nanotechnology. History of Nano materials, Natural & Man-made nanomaterials. Benefits of nanotechnology. Applications – latest trends</td></tr>
<tr><td>Module 2</td><td>Structure & Synthesis of Nanomaterials</td><td>Term paper</td><td colspan="2">Data Collection/any other such associated activity</td><td colspan="2">14 sessions</td></tr>
<tr><td colspan="8">Topics: Material class structure, Nano scale and dimensions, Top down method: Lithography, High energy ball milling, Electrodeposition. Bottom up Method: Sol-Gel Process, CVD, PVD, Self Assembly etc,
Synthetic nanomaterials: Carbon nanotube, fullerene, quantum dots, Graphene, metal & ceramic nanomaterials, composite Nanomaterials</td></tr>
<tr><td>Module 3</td><td>Investigation techniques</td><td>Term paper</td><td colspan="2">Data Collection/any other such associated activity</td><td colspan="2">10 sessions</td></tr>
<tr><td colspan="8">Topics: Scanning probe microscopes, Electron microscopes – SEM, TEM, Optical microscopes, x ray photoelectron spectroscopy, Energy dispersive spectroscopy.</td></tr>
</table>

Module 4	Properties of Nanomaterials	Assignment	Data Collection/any other such associated activity	10 sessions
Topics: Mechanical property, Electrical property, Chemical property, Magnetic properties, Characterization of Nano materials.				
Module 5	Nanofluids & Composites	Assignment/Case Study	Data Collection/any other such associated activity	06 sessions
Topics: Introduction to Micro and Nano fluids. Properties of Nano fluids. Heat transfer in Nano fluids. Advance cooling device development using Nano fluids, Nano added Composites & Applications.				
Targeted Application & Tools that can be used: **Material Characterization, Material Development etc**				
Text Book 1. T.Pradeep, "NANO: The Essentials: Understanding Nanoscience and Nanotechnology", McGraw HillEducation. (Not available in Library. Available online)				
References 1. Charles P. Poole Jr, Frank J. Owens, "*Introduction to Nanotechnology",* Wiley and Sons. 2. Bharat Bhushan, "*Handbook of Nanotechnology",* Spinger. 3. Curtines, Dixon, "**Nanotechnology: Nanofabrication, Patterning, and Self Assembly",** **https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=340093&site=ehost-live** **Weblinks:** W1.https://nptel.ac.in/courses/112/106/112106065/ W2:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2123 "**Nano Applications,** Materials Engineering, Engineering and Technology, Science Direct," W3:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2315 **"Nano - The Begining",** Science Direct				
Topics relevant to "EMPLOYABILITY SKILLS": Electron Microscope, Micro and macro fluids study for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.				
Catalogue prepared by	Mr. Prashanth S P			
Recommended by the Board of Studies on	14th BoS held on 25/03/2022			
Date of Approval by the Academic Council	18th Meeting of the Academic Council held on 03rd August, 2022			

Course Code: **MEC3036**	**Course Title: Flexible Manufacturing Systems** **Type of Course:** **1]Professional Elective Course** **2] Theory**		**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview on Computer Aided Design and Manufacturing (CAD/CAM) systems, Flexible Manufacturing Systems (FMS), system hardware and general functions, material handling system, work holding systems, cutting tools and tool management, physical planning of system, software structure functions and description, cleaning and automated inspection, communications and computer networks for manufacturing, quantification of flexibility, human factors in manufacturing, justification of FMS, planning and operation of FMS.					
Course objectives	The objective of the course is to familiarize the learners with the concepts of "**Flexible Manufacturing Systems**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1] Understand the function of NC, CNC and DNC machines CO2] Analyze the Quantitative aspects of FMS. CO3] Explain the Machine cell design and part families. CO4] Outline the various production control issues and tool management. CO5] Analyze the economic aspects and justification of FMS.					
Course Content:						
Module 1	Introduction to manufacturing systems, Part programming	Assignment	Programming simple machined components	12 Session		
Topics: Introduction to manufacturing system, Automation in production systems, types of automation, reason for automation, advantages and disadvantages, Costs involved in manufacturing, mathematical model of production performance, Computer controlled manufacturing systems. Review of NC, CNC, DNC, Adaptive control and robotics in manufacturing. Advantages, disadvantages and applications. Part Programming: Manual and APT part programming for simple objects						
Module 2	Introduction to FMS, Group Technology	Assignment	Solving numerical to form ideal cells	10 sessions		

	and Cellular manufacturing			
Topics: Flexibility, types of flexibility, types of FMS, FMS components, Quantitative analysis, advantages and disadvantages of FMS. Group Technology, part family, cell formation, simple cell formation techniques such as array-based method, similarity coefficient methods, and simple examples, scheduling in FMS.				
Module 3	Material Handling systems, Production Planning and Control in FMS	Assignment	Justification of using FMS in manufacturing systems	10 sessions
Introduction to material handling, principles of material handling, different material handling equipment such as industrial truck, conveyors etc. Application and selection of material handling equipment's, economics justification, simple examples. Production planning and Control in FMS Need for different PPC methods in FMS environment				
Module 4	Tooling and system planning in FMS	Case study	Control of cutting tools and its practices in Machine Shop Lab	07 sessions
Introduction to tool management, Tool magazine, Tool management, Fault sensing, Tool strategies, control of cutting tools and its practices, design of flexible fixtures, modular fixtures, economics of fixtures System planning in FMS, supervisory control in FMS, software system in FMS				
Module 5	Planning and implementation of FMS	Assignment	Behavioral issues in implementing FMS	06 sessions
Planning, integration, system configuration, FMS layout and implementation. Organizational and behavioral issues in the implementation of FMS, economic justification of FMS Toyota production systems, Lean manufacturing and Kanban system. Introduction to simulation of FMS and data base design for FMS.				
Targeted Application & Tools that can be used: Application Area is manufacturing systems involved in shop floor, automobile assembly and manufacturing systems involving rapid product changes in design and variety (Toyota Production Systems, Bidadi) Professionally Used Software: For part programming, SEIMENS CNC PART PROGRAMMING.				
Text books: [1] Mikell P Groover, "Automation, Production systems and CIM", Pearson Education, Second edition 2016.				
References [1] Talavage J, "FMS in practice, Applications, Design and Simulation" Marcel Dekker Inc, 1988. [2] Nagendra Parashar B S, "Cellular Manufacturing System-An integrated Approach" PHI 2008, 2008.				

https://nptel.ac.in/courses/112/106/112106065/ **Weblinks:** W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2123 "Flexible Manufacturing systems, Materials Engineering, Engineering and Technology, Science Direct," W2:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2315 "Advance flexible manufacturing systems", Science Direct	
Topics relevant to "EMPLOYABILITY SKILLS": Planning Integration, group Technology for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.	
Catalogue prepared by	Mr. Prashanth S P
Recommended by the Board of Studies on	11th BoS held on 05/09/2020
Date of Approval by the Academic Council	14th Meeting of the Academic Council held on 24/12/2020

<table>
<tr><td>Course Code:
MEC3055</td><td colspan="3">Course Title: Product Design for Manufacturing and Assembly
Type of Course:
1] Professional Elective Course
2] Theory</td><td>L-T-P-C</td><td>3-0-0-3</td></tr>
<tr><td>Version No.</td><td colspan="5">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="5">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="5">NIL</td></tr>
<tr><td>Course Description</td><td colspan="5">The purpose of this course is to enable the students to appreciate the need for influence the design of parts and part systems. Students will be introduced to the Design for Manufacturability (DFM) methodology, and will be motivated to understand infeasible or impractical designs. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments.</td></tr>
<tr><td>Course Objective</td><td colspan="5">The objective of the course is to familiarize the learners with the concepts of ": Product Design for Manufacturing and Assembly" and attain EMPLOYABILITY SKILL through Participative learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">On successful completion of this course the students shall be able to:
CO1] Understand constraints of manufacturing processes that limit design possibilities with respect to cycle time, material handling, and other factory costs.
CO2]Apply casting considerations in machining
CO3]Apply principles of DFA to make efficient patterns and moulds
CO4]Select proper materials and manufacturing processes Die casting</td></tr>
<tr><td>Course Content:</td><td colspan="5"></td></tr>
<tr><td>Module 1</td><td>Material and process selection</td><td>Assignment</td><td>Demonstration of the Experiment</td><td colspan="2">12 sessions</td></tr>
<tr><td colspan="6">Topics:
Introduction, Advantages of applying DFMA, General requirements of early materials and process selection, Selection of Manufacturing processes, Selection of materials. Engineering Design features. – Dimensioning, Tolerances, General Tolerance, Geometric Tolerances, Assembly limits, achieving larger machining tolerances, Datum features.</td></tr>
<tr><td>Module 2</td><td>Machining Considerations</td><td>Assignment</td><td>Case study</td><td colspan="2">10 sessions</td></tr>
<tr><td colspan="6">Topics:
Machining Considerations – Drills, Milling cutters, Drilling, Keyways, Dowels, Screws, Reduction in machining areas, Simplification by separation and amalgamation, work piece holding, surface grinding, Examples</td></tr>
<tr><td>Module 3</td><td>Casting Procedures</td><td>Assignment</td><td>Design of molds using AutoCAD</td><td colspan="2">12 sessions</td></tr>
<tr><td colspan="6">Topics:
Pattern, Mould, parting line, cast holes, machined holes, identifying parting line, special sand cores, designing to obviate sand cores. Examples. Injection molding materials, Molding cycle, Systems, molds, machine size, cycle time, Cost estimation, Insert molding,</td></tr>
<tr><td>Module 4</td><td>Design for Die casting and Powder metal processing –</td><td>Assignment</td><td>Seminar</td><td colspan="2">10 sessions</td></tr>
</table>

Topics:
Die casting alloys, cycle, machines, dies, finishing, Assembly techniques, Design principles, Powder metallurgy processing, stages, compaction characteristics, Tooling, Sintering, Design guidelines

Targeted Application & Tools that can be used:
Finding the various fits and tolerances of components experimentally using gauges and analyzing the same using Autodesk invent software

Text Books

1.Product Design for Manufacture and Assembly – Geoffrey Boothroyd - Peter Dewhurst - Winston Knight – Marcel Dekker, Inc. – Newyork - Second Revison, ISBN 0-8247-0584-X.

References

1. Designing for Manufacturing – Harry Peck - Pitman Publications –1983.
2. Dimensioning and Tolerancing for Quantity Production – Merhyle F Spotts –Inc. Englewood Cliffs - New Jersey - Prentice Hall, 5thedition.

Web links

1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=553239&site=ehost-live
2. https://presiuniv.knimbus.com/user#/searchresult?searchId=Product%20Design%20for%20Manufacturing%20and%20Assembly&_t=1657343468338.

Topics relevant to "EMPLOYABILITY SKILLS": Work piece holding, Handling machining parameters and its features, selection of parameters for different operations on machines for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Madhusudhan M
Recommended by the Board of Studies on	19th BOS dated 05/07/2024
Date of Approval by the Academic Council	24th Academic Council Meeting dated 03/08/2024

Course Code: MEC3035	**Course Title: Production Planning and Control** **Type of Course:** **1] Professional Elective Course** **2] Theory**		**L-T- P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	Nil					
Course Description	The Course is designed with an objective of giving an overview of planning, control and inventory systems. The Course discusses about the generalized model of production systems, types of production flows, life cycle concepts, facilities location and layout planning, aggregate and batch production planning, inventory systems, materials requirements planning, elements of monitoring and production control.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1 Explain the function of Production, Planning and control CO2 Analyze the scope of forecasting principles and techniques CO3 Explain the function of inventories and its relevant cost techniques method. CO4 Outline the procedural activities of routing and scheduling CO5 Explain the functions of dispatching and follow-up activities.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Production planning and Control**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Content:						
Module 1	Introduction to Production Planning and Control	Assignment	Industrial application	07 sessions		
Topics: Objectives and benefits of planning and control-Functions of production control-Types of production-job- batch and continuous-Product development and design-Marketing aspect – Functional aspects-Operational aspect-Durability and dependability aspect aesthetic aspect. Profit consideration-Standardization, Simplification & specialization- Break even analysis-Economics of a new design **Assignment**: Break Even analysis						
Module 2	Product Planning and Process Planning	Assignment	Data analysis	08 sessions		
Topics: Product Planning-Extending the original product Information-Value Analysis-Problems in lack of product Planning-Process planning and routing-Pre requisite information needed for process Planning-Steps in process Planning-Quantity determination in batch Production-Machine capacity, Balancing-Analysis of process capabilities in a multi-product system. **Assignment**: Study on value analysis of product with respect to process capabilities.						

Module 3	Production Scheduling	Assignment	Data analysis	10 sessions
Production Control Systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems – Line of balance – Flow production scheduling-Batch production scheduling-Product sequencing – Production Control systems-Periodic batch control-Material requirement planning kanban – Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates				
Module 4	Inventory control and recent trends in PPC	Presentation	Data analysis	10 sessions
Inventory control -Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system -Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTEMS-Fundamentals of MRP II and ERP				
Module 5	Quality Control Methods in PPC	Presentation	Data analysis	10 sessions
Quality process, the Juran trilogy, improvement strategies, types of problems, the PDSA Cycle, problem-solving methods, Kaizen, reengineering, six sigma, case studies. Statistical Process Control : Pareto diagram, process flow diagram, cause and effect diagram, check sheets, histograms, statistical fundamentals, Control charts, state of control, out of control process, control charts for variables, control charts for attributes, scatter diagrams, case studies				
Targeted Application & Tools that can be used: Contemporary issues: Knowledge of PPC can help students in planning the product design with less inventory and product cost. Professionally Used Software: PPC softwares online .				
Textbooks: T1.Stefan N. Chapman, "*Fundamentals of Production Planning and Control"*, Pearson Education India				
References R1.Prof. L. C. Jhamb, "*Production Planning and Control",* Everest Publishing house. R2.S. K. Mukhopadhyay, "*Production Planning and Control: Text and Cases",* PH R3.Samson Eilon, "Elements of Production Planning and Control", Universal Book Corpn.1984 R4.Elwood S.Buffa, and Rakesh K.Sarin, "Modern Production / Operations Management", 8th Edition, John Wiley and Sons, 2000 **Web resources:** W1: https://nptel.ac.in/courses/112107143 W2: https://presiuniv.knimbus.com/user#/searchresult?searchId=product%20planning%20and%20control&_t=1662448273401				
Topics relevant to "EMPLOYABILITY SKILLS": Kaizen, reengineering, six sigma, Statistical Process Control: Pareto diagram, process flow diagram, cause and effect diagram, check sheets, histograms, statistical fundamentals, Control charts for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. Aravinda T			

Recommended by the Board of Studies on	BOS NO: 15th BOS held on 27/08/2022
Date of Approval by the Academic Council	Academic Council Meeting No.18, dated: 3/8/22

Course Code: **MEC3019**	**Course Title:** **Additive manufacturing & Its Applications** **Type of Course:** **Professional Elective & Theory only**	**L-T-P-C**	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	Students will be able to decide between the various trade-offs when selecting AM processes, devices and materials to suit particular engineering requirements. Students will have in-depth knowledge in latest trends and opportunities in AM, including distributed and direct digital manufacturing, mass customization, and how to commercialize their ideas**.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Additive manufacturing & Its Applications**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1. Identify the different AM techniques. CO2. Explain the Design considerations in AM. CO3. Illustrate the post processing for AM parts. CO4. Summarize the AM process selection and its applications.					
Course Content:						
Module 1	Introduction to Manufacturing Process & Additive Manufacturing	Assignment	AM techniques	10 Sessions		
Topics: Introduction to Manufacturing Technology: Introduction, Prototyping fundamentals, Historical development, Advantages of MT, Commonly used terms, process chain, modelling, Classification of Manufacturing process, Applications to various fields. Introduction to Additive Manufacturing: Introduction to AM, AM evolution, Distinction between AM & CNC machining, Advantages of AM, AM process chain: Conceptualization, CAD, conversion to STL, Transfer to AM, STL file,Machine setup, build, removal and clean up, post processing. Classification of AM processes: Liquid polymer system, discrete particle system, molten material systems, and solid sheet system.						
Module 2	Design of AM	Case Study	Design Tools of AM	14 Sessions		
Topics: Motivation, DFMA concepts and objectives, AM unique capabilities, Exploring design freedoms, Design tools for AM, Part Orientation, Removal of Supports, Hollowing out parts, Inclusion of Undercuts and Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of markings/ numbers etc.						

Module 3	Post Processing of AM parts	Assignment	Post processing of AM components	10 Sessions
Topics: Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern,				
Module 4	Processing selection of AM and Applications	Case Study	Future productions of AM	10 Sessions
Topics: Introduction, selection methods for a part, challenges of selection, example system for preliminary selection, production planning and control.AM Applications: Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models, Rapid tooling, new materials development, Bi-metallic parts, Re-manufacturing. Application examples for Aerospace, defense, automobile, Bio-medical and general engineering industries				

Targeted Application & Tools that can be used:

Application Area include almost all manufacturing organizations (Automotive, Aerospace, Army, Medical equipment's etc.,)

Professionally Used Software: AutoCAD, Solid works

Text Book

1. Jing Zhang; Yeon-Gil Jung, "Additive manufacturing: materials, processes, quantifications and applications", Cambridge, Massachusetts: Elsevier, 2018.

References

1. Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2003.
2. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010
3. Ali K. Kamrani, Emand Abouel Nasr, "Rapid Prototyping: Theory & Practice", Springer, 2006
4. D.T. Pham, S.S. Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer 2001.

Web-Resources:

W1. https://nptel.ac.in/courses/112103306

W2. A text book of Additive manufacturing Technologies, Second edition, Springer https://www.google.co.in/books/edition/Additive_Manufacturing_Technologies/OPGbBQAAQBAJ?hl=en&gbpv=0

W3. https://kgut.ac.ir/useruploads/1523431958754buf.pdf

Web Resources:

https://presiuniv.knimbus.com/user#/searchresult?searchId=elements%20of%20Mechanical%20Engineering&_t=1659588753433

Topics relevant to "EMPLOYABILITY SKILLS": Functional models, 3d Models for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.	
Catalogue prepared by	Priyanka Umarji
Recommended by the Board of Studies on	15th BoS held on 22/07/2022
Date of Approval by the Academic Council	18th Meeting of the Academic Council held on 03rd August, 2022

Course Code: **MEC3046**	**Course Title: Micro and Nano Manufacturing** **Type of Course:** **1] Professional Elective Course** **2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of Micro and Nano manufacturing and their applications. This Course is aimed at teaching basic concepts of Micro and Nano manufacturing for mechanical engineering students. The course also enhances the knowledge of advanced technology applications through assignments**.**					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of "**Micro and Nano Manufacturing**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1. Get an awareness of different techniques used in micro and nano manufacturing. CO2. Understand micro and nanofabrication techniques and other processing routes in micro and nano manufacturing. CO3. Discuss about different techniques used in micro joining and the metrology tools in micro and nano manufacturing					
Course Content:						
Module 1	Overview of Micro and Nano Manufacturing	Assignment	Applications of Micro and Nano machining	10 sessions		
Topics: Introduction to Precision engineering, mIcro milling and micro drilling, Micro-electromechanical systems – merits and applications, Micro phenomenon in Electro-photography –applications. Introduction to Bulk micromachining, Surface micromachining steps.						
Module 2	Micro/Nano machining and forming techniques	Case Study	Nano plastic forming applications	07 Sessions		
Topics: Introduction to mechanical micromachining, Micro drilling – process, tools and applications Micro turning- process, tools and applications, Diamond Micro turning – process, tools and applications.						
Module 3	Micro and Nano Finishing Processes	Assignment	Real time application of Micro and Nano Finishing Processes	08 Sessions		
Topics: Introduction to Micro and Nano Finishing Processes, Magnetorheological Finishing (MRF) processes, Magnetorheological abrasive flow finishing processes (MRAFF) – process principle and applications, Force analysis of MRAFF process, Magnetorheological Jet finishing processes , Working principle						

and polishing performance of MR Jet Machine , Elastic Emission Machining (EEM) – machine description, applications.				
Module 4	Micro and Nano Fabrication	Assignment	Applications of Diamond technology and CNT	08 Sessions
Topics: Introduction to Micro Fabrication: basics, flowchart, basic chip making processes, Introduction to Nanofabrication, Nanofabrication using soft lithography – principle, applications – Examples (Field Effect Transistor, Elastic Stamp), Manipulative techniques – process principle, applications, Diamond - Properties and applications, CVD Diamond Technology, LIGA Process.				
Module 5	Micro and Nano measurement and characterization techniques	Assignment	Report on Nano metrology	08 Sessions
Topics: Introduction to micro and nano measurement, defining the scale, uncertainty, Scanning Electron Microscopy – description, principle, Scanning White-light Interferometry – Principle and application, Optical Microscopy				
Targeted Application & Tools that can be used: Application Area is Aerospace and Space, Defense and Medical fields, Automobiles and special control systems, Energy sectors. Professionally Used Software: Nil.				
Text T1. Mark. J. Jackson, Micro and Nano-manufacturing, Springer, 2006. T2. Mark. J. Jackson, Micro-fabrication and Nano-manufacturing - Pulsed water drop micromachining CRC Press 2006.				
References R1. Nitaigour Premchand Mahalik, Micro-manufacturing and Nanotechnology, 2006. R2. V.K.Jain, Micro-manufacturing Processes, CRC Press, 2012. 3. https://nptel.ac.in/courses https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&uniqueue_id=DOAB_1_06082022_6062				
Topics relevant to "EMPLOYABILITY SKILLS": Force analysis of MRAFF process, Magnetorheological Jet finishing processes , Working principle and polishing performance of MR Jet Machine , Elastic Emission Machining (EEM) for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr. Sudheer			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025			

Course Code: **MEC3016**	**Course Title: Statistics and Quality Control** **Type of Course:** **1] Professional Elective Course 2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	Nil					
Anti-requisites	**Industrial Engineering Techniques**					
Course Description	The purpose of this course is to enable the students to understand underlying concepts in statistical quality control and to develop ability to apply those concepts to the design and management of quality control processes in industries. The course is both conceptual and analytical in nature. The course develops the analytical, critical thinking, and decision making skills. The course also enhances the problem solving abilities through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Statistics and Quality Control**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Explains the basic concept of Quality, Quality tools CO2. Analyze process capability and operating characteristic curves CO3. Construct control charts and evaluate revised control limits CO4. Describe Six sigma methodology to improve quality					
Course Content:						
Module 1	Quality – An overview	Assignment	Data Collection and Analysis	6 sessions		
Topics: Introduction and definition of quality, quality control, Cost of quality, 7 basic Quality control tools**.**						
Module 2	Data collection and measurement analysis.	Case Study	data analysis task	15 sessions		
Topics: Type of data – variable and attributes, Data Sampling –Population and sampling, determining sample size, types of sampling, variation, types of variation- common cause, special cause, total variation. statistical hypothetical test, practical examples. Measurement system analysis- discrimination, accuracy, precision, Gauge R&R, Kappa analysis, Base lining- for discrete data- DPO, DPU, DPMO, using sigma value. For continuous date – Process Capability. Data analysis using Minitab Software.						
Module 3	Control Charts	Assignment	Data Collection and Analysis	14 sessions		
Topics:						

Control limits vs Specification Limit, Classification of Control charts, Control charts for variable data – I&MR chart, X bar R chart, X bar S chart. Control chart for attribute data – C chart, U chart, P chart, Np chart Data analysis using Minitab Software.				
Module 4	Six Sigma – Quality Improvement Tool	Case Study	Data Collection and Analysis	10 sessions
Topics: Introduction, DMAIC approach, DMADM approach, case studies.				
Targeted Application & Tools that can be used: Application Area is in health services, government organizations, banking and others such as marketing, finance, purchasing, industrial relations etc. Professionally Used Software: Minitab/ Excel				
Text Book T1: M. Mahajan, Statistical Quality Control, Dhanpat Rai & Co. (P) Limited (2016) T2: Chandra, M. Jeya. Statistical quality control. CRC Press, 2001. **References** R1: Montgomery, D. C., Introduction to Statistical Quality Control, John Wiley & Sons, 2002. R2: Dhillon, B. S., Applied Reliability and Quality: Fundamentals, methods, and Procedures, Springer, London, 200 **Weblinks:** https://www.mt.com/in/en/home/applications/Laboratory_weighing/statistical-quality-control.html https://www.iise.org/TrainingCenter/CourseDetail/?EventCode=SQC Work Study Journal, Emerald insight https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/00438029810238606/full/html International Journal of Quality & Reliability Management, Emerald insight https://presiuniv.knimbus.com/openFullText.html?DP=https://www-emerald-com-presiuniv.knimbus.com/insight/content/doi/10.1108/02656719710165428/pdfplus/html				
Topics relevant to "EMPLOYABILITY SKILLS": Measurement system analysis- discrimination, accuracy, precision, Gauge R&R, Kappa analysis, Base lining- for discrete data- DPO, DPU, DPMO, using sigma value. For continuous date – Process Capability for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Ms. Antara Ravindra Sarode			
Recommended by the Board of Studies on	BOS NO: 11th BOS held on 05/09/2020			
Date of Approval by the Academic Council	Academic Council Meeting No. 14, Dated 24/12/2020.			

Course Code: MEC3409	**Course Title: Digital Manufacturing and IOT** **Type of Course:** **1] Professional Elective Course**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course explores the integration of advanced manufacturing processes with the Internet of Things (IoT) to revolutionize production systems. Students will learn how digital technologies, such as automation, additive manufacturing, and cloud computing, are applied in modern manufacturing environments to enhance efficiency, flexibility, and product quality. The course emphasizes the role of IoT in enabling smart factories, real-time monitoring, predictive maintenance, and data-driven decision-making.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Digital Manufacturing and IOT**" and attain **EMPLOYABILITY SKILL** through **participative** learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: Understand the principles of digital manufacturing and IoT. CO2: Design and implement IoT-enabled manufacturing systems. CO3: Analyze real-time data to optimize production processes. CO4**:** Explore emerging trends and challenges in Industry 4.0.					
Course Content:						
Module 1	Introduction to Digital Manufacturing and IoT	Case Study	Descriptive	13 sessions		
Topics: Overview of Digital Manufacturing and IoT, Evolution from Industry 3.0 to Industry 4.0, Key Enabling Technologies (IoT, AI, Robotics, Cloud Computing), Fundamentals of IoT Architecture and Communication Protocols, Smart Factories: Concepts and Applications, Role of Sensors and Actuators in IoT Systems, Case Study: Digital Transformation in Manufacturing.						
Module 2	IoT-Enabled Manufacturing Systems	Case Study	Descriptive	12 sessions		
Topics: IoT Device Integration in Manufacturing Processes, Real-Time Data Acquisition and Processing, Edge Computing vs. Cloud Computing in IoT Applications, Data Analytics and Visualization Tools for IoT, Predictive Maintenance and Condition Monitoring Using IoT, Cyber-Physical Systems and their Role in Manufacturing, Digital Twins: Concepts, Creation, and Applications, Hands-On: Setting Up a Basic IoT System.						
Module 3	Advanced Digital Manufacturing Technologies	Case Study	Descriptive	10 sessions		
Topics: Additive Manufacturing (3D Printing) and IoT Integration, Automation and Robotics in Smart Factories, Autonomous Systems and Collaborative Robots (Cobots), Artificial Intelligence in						

Manufacturing Decision-Making, Augmented Reality (AR) and Virtual Reality (VR) in Production, Blockchain for Secure Manufacturing Supply Chains, Case Study: Advanced Digital Manufacturing Systems.				
Module 4	Challenges, Future Trends, and Industry Applications	Case Study	Descriptive	10 sessions
Topics: Security and Privacy Concerns in IoT Systems, Standards and Regulations in Digital Manufacturing, Sustainability and Green Manufacturing through IoT, Emerging Trends: 5G, AIoT, and Quantum Computing, Smart Logistics and Supply Chain Management with IoT, Industry Applications: Automotive, Aerospace, Healthcare, and Electronics, Project Presentation: Proposing a Smart Manufacturing Solution, Course Summary and Future Opportunities in Digital Manufacturing.				
Targeted Application & Tools that can be used: **Application** • Smart factories • Predictive maintenance • Construction and housing • Machine Design and Analysis **Tools** • MATLAB • Python • CAD/CAM Software				
Text Book's **1. "Internet of Things: A Hands-On Approach" (1st Edition)** by Arshdeep Bahga, Vijay Madisetti, Publisher: VPT.Finite Element Analysis Theory and Application with Ansys by Saeed Moaveni, 4th Edition, Pearson Publications 2015. **2. "Digital Manufacturing: The Revolution in Manufacturing" (1st Edition)** by Thomas L. Tuttle, Publisher: CRC Press.Modelling and Simulation Lab manual – Presidency University, Bangalore.				
References **1. "Industrial Internet of Things: Cybermanufacturing Systems" (1st Edition)** by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat, Publisher: Springer. **2. "Smart Manufacturing: The Lean and IoT Revolution" (1st Edition)** by Tony L. K. Wang, Publisher: Wiley.				
Topics relevant to EMPLOYABILITY SKILL : Digital Manufacturing and IoT – The integration of IoT and cyber-physical systems, with applications in industrial settings, covering IoT protocols, security, and real-time data analysis E**MPLOYABILITY SKILL** through **Participative learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr. Prashanth S P			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025			

Course Code: **MEC3410**	**Course Title: Lean Manufacturing** **Type of Course:** **1] Professional Elective Course**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course introduces the principles and practices of **Lean Manufacturing**, focusing on continuous improvement, waste reduction, and efficient production techniques. Students will learn how to implement Lean tools and strategies to optimize production processes, increase product quality, and reduce costs. The course covers key concepts such as value stream mapping, Kaizen, 5S, Kanban, and Six Sigma, which are essential for creating a culture of operational excellence in modern manufacturing environments. Through practical case studies and hands-on activities, students will understand how to apply Lean principles to achieve higher productivity and competitiveness.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Lean Manufacturing** " and attain **EMPLOYABILITY SKILL** through **participative** learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Understand the key principles and philosophy of Lean Manufacturing. **CO2:** Learn to identify and eliminate waste in production processes. **CO3:** Implement Lean tools such as Kaizen, 5S, and Value Stream Mapping. **CO4:** Develop skills to drive continuous improvement in manufacturing systems.					
Course Content:						
Module 1	Introduction to Lean Manufacturing	Case Study	Descriptive	13 sessions		
Topics: Overview of Lean Manufacturing and its Principles, History and Evolution of Lean Manufacturing, The Concept of Waste in Manufacturing (Muda), Core Principles: Value, Flow, Pull, and Perfection, Understanding Value Stream in Lean Context, Benefits and Challenges of Lean Manufacturing, Case Study: Lean Transformation in Industry						
Module 2	Identifying and Reducing Waste	Case Study	Descriptive	12 sessions		
Topics: Types of Waste (Muda) in Manufacturing, Identifying Non-Value-Added Activities, Waste Elimination through Just-in-Time (JIT), Overview of the Kaizen Philosophy and Practices, Using Kaizen Events for Waste Reduction, Value Stream Mapping (VSM) Introduction, Creating a Value Stream Map (Current State), Analyzing and Improving a Value Stream Map (Future State).						
Module 3	Lean Tools and Techniques	Case Study	Descriptive	10 sessions		
Topics: 5S System: Sort, Set in Order, Shine, Standardize, Sustain, Kaizen for Continuous Improvement, Introduction to Kanban: Pull System for Inventory Management, SMED (Single-Minute Exchange of						

Die) for Reducing Setup Times, Standard Work and Standard Operating Procedures (SOPs), Jidoka (Autonomation) and Quality at the Source, TPM (Total Productive Maintenance) for Reliability and Efficiency.				
Module 4	Implementing Lean Manufacturing and Measuring Success	Case Study	Descriptive	10 sessions
Topics: Steps for Lean Implementation in an Organization, Overcoming Resistance to Change in Lean Adoption, Role of Leadership in Lean Manufacturing, Employee Engagement and Involvement in Lean Practices, Key Performance Indicators (KPIs) for Lean Success, Sustaining Lean Improvements: The Role of Continuous Improvement, Lean and Six Sigma: Integration for Enhanced Efficiency, Measuring and Reviewing Lean Success: Case Studies and Metrics.				
Targeted Application & Tools that can be used: **Application** • Manufacturing Process Optimization • Just-in-Time (JIT) Production • Quality Control and Continuous Improvement • Supply chain optimization **Tools** • 5W • Kaizen • Kanban				
Text Book's 1. "The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer" (2nd Edition) by Jeffrey K. Liker, Publisher: McGraw-Hill. 2. "Lean Thinking: Banish Waste and Create Wealth in Your Corporation" (1st Edition) by James P. Womack, Daniel T. Jones, Publisher: Free Press.				
References 1. "Lean Production for Competitive Advantage: A Comprehensive Guide to Lean Methodologies and Management Practices" (1st Edition) by John W. Davis, Publisher: McGraw-Hill. 2. "The Lean Six Sigma Pocket Toolbook: A Quick Reference Guide to 100 Tools for Improving Quality and Speed" (1st Edition) by Michael L. George, David Rowlands, Mark Price, John Maxey, Publisher: McGraw-Hill.				
Topics relevant to EMPLOYABILITY SKILL : Lean manufacturing – Enhancing supply chain performance by improving communication and collaboration, reducing lead times, and optimizing inventory using Lean techniques like **Kanban** and **Standardized Work**. **EMPLOYABILITY SKILL** through **Participative learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr. Prashanth S P			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025			

Course Code: **MEC3040**	**Course Title: Modern Manufacturing Processes** **Type of Course: Discipline Elective & Theory only**	**L-T-P-C**	3	0	0	3
Version No.	2					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is intended to provide an overview of various Modern Manufacturing Processes such as Advanced Machining Processes, Advanced Casting Processes, Advanced Welding Processes, Advanced Metal Forming Processes, Lean Manufacturing, Industry 4.0 and related group technologies used in Industries. Also how these processes are used in smart manufacturing.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Modern Manufacturing Processes**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1. Distinguish the various methods of manufacturing processes. CO2. Discuss the principles, processes and applications of Advanced Machining & Casting Processes CO3. Discuss the principles, processes and applications of Advanced Welding & Metal Forming Processes CO4. Apply the various Lean Techniques & utilization of various technology that can be applied to industries for improving organizational performance					
Course Content:						
Module 1	Introduction to Manufacturing	Assignment	10 Sessions			
Topics: Introduction, Importance of Manufacturing Process, Manufacturing Process and 5 M's, Classification of Manufacturing Processes, Selection of Manufacturing Process, Types of Production, Functions In Manufacturing, Organization and Information Processing In Manufacturing, Plant Layout. Types of Automation, Automated Assembly Systems, Designs For Automated Assembly, Types Of Automated Assembly Systems.						
Module 2	Advanced Machining & Casting Processes	Case Study	15 Sessions			
Topics: Advanced Machining Processes: Abrasive Jet Machining (AJM), Ultrasonic Machining (USM), Water Jet Machining (WJM), Chemical Machining (CHM), Electro-Chemical Machining (ECM), Plasma Arc Machining (PAM), Electrical Discharge Machining (EDM), Electron Beam Machining (EBM), Laser Beam Machining (LBM). CNC Turining & Milling: The Machine Control Unit for CNC, CNC Words, CNC Part Program, Numerical examples Advanced Casting Processes: Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting						

Module 3	Advanced Welding & Metal Forming Processes	Assignment	12 Sessions
Topics: Advanced Welding Processes: Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW) Advanced Metal Forming Processes: Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming Electro-hydraulic forming, Stretch forming, Contour roll forming.			
Module 4	Lean Manufacturing & Industry 4.O	Assignment	8 Sessions
Topics: Lean Manufacturing: Introduction. Toyota Production System, What is Lean? 3M's of Lean 5S's of Lean, Lean Manufacturing Principles. Lean Manufacturing Tools. Industry 4.O: Introduction, Technologies of Industry 4.0, Application of Industry 4.O, Impact of Industry 4.O			
Targeted Application & Tools that can be used: • Creating smart factories where manufacturing technologies are upgraded and transformed by cyber-physical systems (CPSs), the Internet of Things (IoT), and cloud computing • Industry 4.0 combines embedded production system technologies with intelligent production processes to pave the way for a new technological age that will fundamentally transform industry value chains, production value chains, and business models.			
Text Book: 1. P N Rao, "Manufacturing Technology – Vol. 1 & 2", McGraw Hill Education .			
References 1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation". 2. Krar S. F. and Gill A. – 'Exploring Advanced Manufacturing Technologies' -Industrial Press – 2003 Dr. Ramachandra C G, "Lean Manufacturing", ISBN: 978-620-2-67580-2, LAP LAMBERT Academic Publishing, International Book Market Service Ltd., Member of Omni Scriptum Publishing Group, 17 Meldrum Street, Beau Bassin 71504, Mauritius, 2020 **Web links:** https://archive.nptel.ac.in/courses/112/107/112107078/ https://presiuniv.knimbus.com/user#/searchresult?searchId=advanced%20Manufacturing%20systems&_t=1674632488677			
Topics relevant to "EMPLOYABILITY SKILLS":PLC, Modern Manufacturing Processes for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.			
Catalogue prepared by	Dr. Ramachandra C G		
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 27/8/2022		
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022		

Course Code: **MEC3060**	**Course Title:** **Robotics** **Type of Course:** **1]Professional Elective Course** **2] Theory**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Robotics**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Description	Robotics and stimulate their interests in science and engineering through the participation of the entire engineering design process. This course provides an overview of robot mechanisms, dynamics, and intelligent controls.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Apply the concepts of inverse manipulator kinematics to a robot. CO2. Apply the concepts of kinetics and kinematics to a robot. CO3. Choose a suitable trajectory generation scheme for robot tasks. CO4. Identify the types of sensors used in various applications.					
Course Content:						
Module 1	Industrial Robots and Their Applications	Assignment	Problem on DOF, Manipulator.	12 Sessions		
Topics: Introduction to robotics, classification of robots, workspace analysis, Manipulator Kinematics: Convention for affixing frames to links – DH Representation, Derivation of Direct kinematic equations for various types of robots. Inverse Manipulator Kinematics: Solvability, algebraic vs. geometric, Examples of inverse manipulator kinematics, repeatability and accuracy.						
Module 2	Kinematics of Robot	Assignment	Jacobians, rigid body, dynamic study	12 Sessions		
Topics: Jacobians: Velocities and static forces: Linear and rotational velocity of rigid bodies, velocity propagation from link to link, jacobians, singularities, static forces in manipulators, jacobians in force domain, Cartesian transformation of velocities and static forces.						
Module 3	Trajectory Planning	Assignment	Trajectory analysis	12 Sessions		
Trajectory Generation: General consideration in path description and generation, joint space schemes, collision free path planning, Robot programming.						
Module 4	ROS	Case Study	Study different types of sensor	10 Sessions		

ROS: Introduction, ROS - Services, Actions, Launch Files, Building your own ROS environment, Autonomous Navigation, Manipulation, Robot Vision,
Design: Blender Introduction

Targeted Application & Tools that can be used:

Industrial applications of robots: Pick and place robots, welding and other industrial applications.
Automation in industries.

Text Book:

1. Robert J Schilling: Fundamentals of Robotics, Analysis and Control. Prentice Hall of India, 1996.
2. Gonzalez / Woods, Digital Image Processing, Addison Wesley, 1993.
3. R K Mittal and I J Nagrath: Robotics and control.
4. S K Saha: Introduction to Robotics.

References:

1. K S Fu R C Gonzales, C S G Lee: Robotics Control, Sensing, Vision and intelligence, McGraw Hill 1987.
2. John J Craig, Introduction to Robotics, Mechanics and control, second edition Addison – Wesley, 1999.
3. Mark W Spong & M Vidyasagar, Robot Dynamics and Control, John Wiley & Sons, 1989.
4. R P Paul: Robot Manipulators Mathematics Programming, Control, The computer control of robotic manipulators, The MIT Press 1979.
5. **Web Resources:**
W1- https://nptel.ac.in/courses/112105249
W2-
https://puniversity.informaticsglobal.com/login?qurl=https://search.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d1223875%26site%3dehost-live%26ebv%3dEB%26ppid%3dpp_xiii
W3-
https://www.knimbus.com/user#/searchresult?searchId=Robotics&_t=1663561891101

Topics relevant to "EMPLOYABILITY SKILLS": Trajectory Generation: General consideration in path description and generation, joint space schemes, collision free path planning, Robot programming for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Mr. ARUN GEORGE
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 29/7/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022

Course Code: **MEC3063**	**Course Title: Control Engineering** **Type of Course:** **1] Professional Elective** **2] Theory**		**L-T- P-C**	3	0	0	3
Version No.	2.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	The Modern-day control engineering is a relatively new field of study that gained a significant attention during 20th century with the advancement in technology. Control engineering has an essential role in a wide range of control systems, from simple household washing machines to high performance F-16 fighter aircraft. It seeks to understand physical systems, using mathematical modelling, in terms of inputs, outputs and various components with different behaviours; use control systems design tools to develop controllers for those systems; and implement controllers in physical systems employing available technology. A system can be mechanical, electrical, fluid and even biological and the mathematical modelling, analysis and controller design uses control theory in one or many of the time, frequency and complex S domains, depending on the nature of the design problem.						
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1. Identify the type of control system, controllers, various test signals, compensators, stability, concepts, analogous systems and frequency response terminologies, CO2. Develop mathematical models of mechanical, electrical, electro-mechanical and hydraulic control systems in order to obtain system response for given input test signals, CO3. Obtain the transfer functions by applying block diagrams reduction techniques and signal flow graphs for different applications of control system. CO4. Predict the stability of a control system by developing R-H criterion, bode and root locus plots.						
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of "**Control Engineering**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.						
Course Content:							
Module 1	Introduction	Assignment	Programming Task	7 Sessions			
Topics: Concept of automatic controls, open and closed loop systems, concepts of feedback, requirement of an ideal control system. Types of controllers - Proportional, Integral, Proportional Integral, Proportional Integral Differential controllers.							
Module 2	Mathematical Models	Case Study	Simulation and data analysis task	9 Sessions			

Topics:
Transfer function models, models of mechanical systems, models of electrical circuits, DC and AC motors in control systems, models of thermal systems, models of hydraulic systems. Analogous Systems: Force-voltage analogy and force – current analogy.

Module 3	Block Diagrams and Signal Flow Graphs	Assignment	Simulation task	8 Sessions

Topics:
Transfer Functions definition, function, block representation of system elements, problems on reduction of block diagrams.

Module 4	Frequency Response Analysis	Assignment	Simulation/Data Analysis	10 Sessions

Topics: Frequency Response Analysis using Bode Plots: Bode attenuation diagrams. Root Locus Plots: Definition of root loci, general rules for constructing root loci

Module 5	Series Feedback Compensation	Assignment	Simulation/Data Analysis	10 Sessions

Topics: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalmanand Gilberts test.

Targeted Application & Tools that can be used:
Contemporary issues Professionally Used Software: Matlab.

Text Book
T1. Modern Control Engineering: Katsuhiko Ogata, Pearson Education, 2003.
T2. Control Systems Principles and Design: M. Gopal, TMH, 2000

References
R1. Feedback Control Systems by Schism's series 2001.
R2. Control systems by I.J. Nazareth & M. Goal, New age International publishers 2002.
R3. Automatic Control Systems – B.C. Kuo, F. Golnaraghi, John Wiley & Sons, 2003.
R4. Control Engineering by U A Bakshi and V U Bakshi, Technical Publications, 2012

Web Links:
https://nptel.ac.in/courses/108106098

W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2628
Control Engineering Practice, Science Direct

W2:
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=ELEARNING601

Control Engineering, Knimbus Multimedia

Topics relevant to "EMPLOYABILITY SKILLS": Frequency Response Analysis using Bode Plots, Bode attenuation diagrams and Root Locus Plots for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.
Sample Thought provoking questions 1. The root locus is a graphical representation in s-domain and it is symmetrical about the real axis. Because the open loop poles and zeros exist in the s-domain having the values either as real or as complex conjugate pairs. Calculate the angle of asymptotes and centroid for the given transfer function. 2. In order to obtain the desired performance of the system, we use compensating networks. Compensating networks are applied to the system in the form of feed forward path gain. Elucidate about Lag compensator with a neat sketch.

Catalogue prepared by	Mr. Basavaraj Devakki
Recommended by the Board of Studies on	11th BoS held on 05/09/2020
Date of Approval by the Academic Council	14th Meeting of the Academic Council held on 24/12/2020

<table>
<tr><td>Course Code:
MEC3413</td><td colspan="3">Course Title: Vehicle Health Monitoring,
Maintenance and Safety
Type of Course: 1] Professional Elective Course
2] Theory</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course provides an in-depth understanding of Vehicle Health Monitoring, Maintenance, and Safety. It covers modern diagnostic tools, sensor technologies, and data analytics to monitor vehicle health in real-time, focusing on predictive and preventive maintenance techniques to optimize performance and reduce breakdowns. Students will learn how to implement effective maintenance strategies, adhere to industry safety standards, and understand the integration of advanced technologies like IoT and AI for better diagnostics and safety.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of Vehicle Health Monitoring, Maintenance, and Safety” and attain EMPLOYABILITY SKILL through participative learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:

CO1: Understand the principles and importance of vehicle health monitoring and how it contributes to vehicle performance and longevity.
CO2: Comprehend the role of diagnostic tools and sensors in detecting and analyzing vehicle issues.
CO3: Recognize the key safety standards and regulations applicable to vehicles, ensuring compliance with industry norms.
CO4: Comply with safety regulations and standards, ensuring vehicles meet industry safety requirements and best practices.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to Vehicle Health Monitoring and Maintenance</td><td>Case Study</td><td colspan="3">Descriptive</td><td>13 sessions</td></tr>
<tr><td colspan="9">Topics:
Overview of vehicle health monitoring systems, principles of predictive maintenance, types of vehicle sensors and diagnostic tools, introduction to vehicle data analytics, understanding vehicle diagnostics (OBD-II, CAN Bus), and case study on vehicle failure prevention.</td></tr>
<tr><td>Module 2</td><td colspan="2">Maintenance Strategies and Best Practices</td><td>Case Study</td><td colspan="3">Descriptive</td><td>12 sessions</td></tr>
<tr><td colspan="9">Topics:
Preventive, predictive, and corrective maintenance strategies, maintenance scheduling, spare parts management, cost optimization, analyzing vehicle wear and tear, and</td></tr>
</table>

documentation/reporting practices.				
Module 3	Vehicle Safety Systems and Standards	Case Study	Descriptive	10 sessions
Topics: Vehicle safety technologies, safety regulations (FMVSS, ISO, SAE), role of sensors in safety (ADAS, collision avoidance), tire and brake system monitoring, emergency response systems, and safety management practices.				
Module 4	Advanced Diagnostics and Real-Time Monitoring	Case Study	Descriptive	10 sessions
Topics: Diagnostic tools for modern vehicles, real-time monitoring technologies, IoT and AI in vehicle maintenance, machine learning for predictive analytics, remote diagnostics, fleet management optimization, and case studies on monitoring systems.				

Targeted Application & Tools that can be used:

Application

- Predictive Maintenance
- Fleet Management
- Improved Safety
- Reduced Downtime

Tools

- On-Board Diagnostics (OBD-II)
- CAN Bus System
- Telematics Systems
- Advanced Driver Assistance Systems (ADAS)

Text Book's

1."The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer" (2nd Edition) by Jeffrey K. Liker.

2."Lean Thinking: Banish Waste and Create Wealth in Your Corporation" (1st Edition) by James P. Womack and Daniel T. Jones.

References

1."Automotive Diagnostics and Maintenance" (1st Edition) by Tracy Martin.

2. "Vehicle Safety and Maintenance Systems" (1st Edition) by Robert Bosch

Topics relevant to "EMPLOYABILITY SKILL": **Vehicle Health Monitoring**, **Maintenance**, and **Safety** – Implement effective maintenance strategies, adhere to industry safety standards, and understand the integration of advanced technologies like IoT and AI for better diagnostics and safety. **EMPLOYABILITY SKILL** through **Participative learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3414**	**Course Title: Introduction to marine and Aerial Robotics** **Type of Course:** **1] Professional Elective Course** **2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course provides an introduction to the fundamental principles, technologies, and applications of marine and aerial robotics. Students will explore the design, control, and operation of autonomous systems, including underwater vehicles (ROVs/AUVs) and drones (UAVs). The course covers topics such as robot kinematics, dynamics, sensor integration, control systems, and navigation strategies in complex environments. Emphasis is placed on the unique challenges associated with operating in water and air, such as buoyancy, drag, turbulence, and communication constraints.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Marine and Aerial Robotics**" and attain **EMPLOYABILITY SKILL** through **Participative** learning techniques.					
Course Outcomes	CO1 Understand the fundamental principles of marine and aerial robotic systems. CO2 Design and implement control strategies for robotic platforms in water and air. CO3 Analyse and solve challenges related to sensing, navigation, and communication in dynamic environments. CO4 Develop and evaluate solutions for applications in exploration, data collection, and autonomous operations.					
Course Content:						
Module 1	Fundamentals of Marine and Aerial Robotics	Assignment	Data collection	12 sessions		
Topics: Fundamentals of marine and aerial robotics, Overview of their applications, history, and current trends, key components of robotic systems, including sensors, actuators, controllers, and power systems, followed by the principles of buoyancy and hydrodynamics for underwater robotics and the basics of aerodynamics and flight mechanics for aerial systems.						
Module 2	Sensors, Actuators, and Control Systems	Assignment	Mathematical	12 sessions		
Topics: Overview of sensors for robotics, sensor calibration and data acquisition, actuators for marine and aerial systems, introduction to control systems, feedback and PID control, control						

strategies for marine robots, control strategies for aerial robots, and hands-on lab for building a simple control system.				
Module 3	Navigation and Autonomy	Assignment	Mathematical	12 sessions
Topics: Localization and mapping basics, navigation in GPS-denied environments, environmental mapping with sensors, path planning algorithms, swarm robotics, machine learning in robotics, communication between robotic systems, and hands-on lab for programming autonomous navigation.				
Module 4	Applications and Future Trends	Assignment	Mathematical	09 sessions
Real-world applications of marine robotics, real-world applications of aerial robotics, ethical and environmental considerations, emerging technologies in robotics, course project demonstrations, and wrap-up with future learning opportunities.				
Targeted Application & Tools that can be used: Marine and aerial robotics are utilized in applications such as underwater exploration, environmental monitoring, search and rescue operations, and precision agriculture. Tools like Gazebo and V-REP are employed for simulation and modeling, while ROS and Arduino facilitate control and programming.				
Textbook T1.A First Course in Aerial Robots and Drones Author: Yasmina Bestaoui Sebbane Edition: 1st Edition Publisher: CRC Press Publication Date: February 24, 2022 ISBN-13: 978-0367631383 ISBN-10: 0367631385 Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch, and Alric P. Rothmayer, Fundamentals of Fluid Mechanics, 7th Edition, John Wiley and Sons, 2013. T2.Intelligent Marine and Aerial Vehicles: Theory and Applications Editors: Meng Joo Er, Ning Wang, Mahardhika Pratama, Sanjay Sharma Publisher: Nova Science Publishers Publication Date: 2018 ISBN-13: 978-1536134469 ISBN-10: 1536134465 **References** R1.Control of Ground and Aerial Robots Author: Mario Sarcinelli Filho Edition: Hardcover Publisher: Springer Publication Date: 2023 ISBN-13: 978-3031253580 ISBN-10: 3031253580 R2.Aerial Robots: Aerodynamics, Control, and Applications Editors: M. S. S. S. R. Anjaneyulu, S. S. S. R. Anjaneyulu Edition: Hardcover Publisher: IntechOpen Publication Date: 2016 ISBN-13: 978-9535134633 ISBN-10: 9535134630 **Topics for Technology Enabled Learning:** **Introduction to Aerial Robotics: Online Textbook** An online textbook covering modeling, dynamics, state estimation, flight control, and motion planning for aerial robotics.				
Topics relevant to " EMPLOYABILITY SKILL ": kinematics and dynamics of robotic motion, communication systems such as underwater acoustic and aerial GPS-based methods, and power and energy management for autonomous operations. **EMPLOYABILITY SKILL** through **participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr. Prashanth S P			

Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3099**	**Course Title: Autonomous Mobile Robots** **Type of Course:** **1] Professional Elective Course 2] Theory**		**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course provides an introduction to the fundamentals of mobile robotics, examining the basic principles of locomotion, kinematics, sensing, perception, and cognition that are key to the development of autonomous mobile robots. The course will give students an opportunity to design and fabricate a mobile robotic platform and program it to apply learned theoretical concepts.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Autonomous Mobile Robots**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Describe the fundamentals of mobile robots. CO2] Identify the different principles of locomotion and kinematics. CO3] Describe the different types sensing elements and perceptions. CO4] Describe the cognition system to develop autonomous mobile robots.					
Course Content:						
Module 1	Robot locomotion and Kinematics and Dynamics	Assignment	Data Collection	08 Sessions		
Topics: Types of locomotion, hopping robots, legged robots, wheeled robots, stability, maneuverability, controllability; Mobile robot kinematics and dynamics: Forward and inverse kinematics, holonomic and nonholonomic constraints, kinematic models of simple car and legged robots, dynamics simulation of mobile robots.						
Module 2	Perception	Case Study	Data collection	15 Sessions		
Topics: Proprioceptive/Exteroceptive and passive/active sensors, performance measures of sensors, sensors for mobile robots like global positioning system (GPS), Doppler effect-based sensors, vision based sensors, uncertainty in sensing, filtering.						
Module 3	Localization	Case Study	Data collection	12 Sessions		
Topics: Odometric position estimation, belief representation, probabilistic mapping, Markov localization, Bayesian localization, Kalman localization, positioning beacon systems						
Module 4	Introduction to planning and navigation	Assignment	Data Collection	10 sessions		
Topics: path planning algorithms based on A-star, Dijkstra, Voronoi diagrams, probabilistic roadmaps (PRM), rapidly exploring random trees (RRT), Markov Decision Processes (MDP), stochastic dynamic programming (SDP)						
Targeted Application & Tools that can be used: Automation mobile robot is relevant in various industries including Automotive, Aerospace, Medical, Building, Consumer Goods and Packaging.						

Text Book Autonomous Mobile Robots, by Siegwart and Nourbakhsh, MIT Press, 2004.	
References 1. Melgar, E. R., Diez, C. C., Arduino and Kinect Projects: Design, Build, Blow Their Minds, 2012. 2. H. Choset, K. M. Lynch, S. Hutchinson, G. Kantor, W. Burgard, L. E. Kavraki, and S. Thrun, Principles of Robot Motion: Theory, Algorithms and Implementations, PHI Ltd., 2005. 3. https://nptel.ac.in/courses/112106298 Weblinks:https://presiuniv.knimbus.com/user#/searchresult?searchId=autonomous%20mobile%20robots&_t=1688458579290	
Topics relevant to "EMPLOYABILITY SKILLS": Path planning algorithms based on A-star, Dijkstra, Voronoi diagrams, probabilistic roadmaps (PRM), rapidly exploring random trees (RRT), Markov Decision Processes (MDP), stochastic dynamic programming (SDP) for developing **EMPLOYABILITY SKILLS** through **Participative learning techniques.**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	Dr.Arpitha G R
Recommended by the Board of Studies on	BOS 17 held on 08/07/2023
Date of Approval by the Academic Council	6/9/2023

Course Code: **MEC3076**	**Course Title:** **Human Robot Interaction** **Type of Course:** **Discipline Elective & Theory Only**	**L-T-P- C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course on Human-Robot Interaction (HRI) explores the interdisciplinary foundation and practical aspects of how humans and robots communicate and collaborate. It begins with an overview of robot types, components, and the evolving robotics market, introducing essential hardware like sensors and actuators used in interactive systems. The course delves into both verbal and nonverbal modes of interaction, covering speech recognition, dialogue systems, and the perception and generation of nonverbal cues such as gestures, gaze, and posture. Students will also examine various application domains of HRI, including service robotics, education, healthcare, entertainment, personal assistance, and autonomous systems. Designed with a focus on foundational understanding and practical application, the course equips learners with the knowledge to comprehend and contribute to the growing field of human-centered robotics.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **"Human Robot Interaction"** and attain **EMPLOYABILITY SKILLS** through **Participative Learning techniques.**					
Course Out Comes	**On successful completion of the course the students shall be able to:** CO1. Explain the fundamental concepts of Human Robot Interaction (HRI) CO2. Summarize the sensors, actuators and hardwares used in HRI CO3. Illustarte the principles and processes of verbal communication between humans and robots. CO4. Differentiate various forms of nonverbal communication in HRI. CO5. Apply Human-Robot Interaction principles to design and implement robotic solutions for diverse sector specific applications CO6. Analyze real-world HRI scenarios to evaluate the effectiveness of robot deployment across diverse sectors.					
Course Content:						
Module 1	Human Robot Interaction	Assignment	Data Collection	13 Sessions		
Topics: Definition of Robot, types of robots, Robotics market and the future prospects, Asimov's laws, HRI as an interdisciplinary endeavor, evolution of HRI, Robot Anatomy, Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration. Robot motions, Joints, Work volume. Sensors used in HRI, Audio, Video, Robot Vision System.						
Module 2	Verbal Interaction	Assignment	Data Collection	12 Sessions		
Topics: Verbal Interaction: Human-human verbal interaction, components of speech, Written text versus spoken language, Speech recognition by the Robot, Basic principles of speech recognition, Practice in HRI, Voice-activity detection in HRI, Language understanding in HRI, Dialogue management, Basic principle, Practice in HRI, Speech production, TTS engines, Chat bots.						

Module 3	Non Verbal Interaction	Assignment	Data collection and Analysis	10 Sessions
Nonverbal Interaction- Functions of non-verbal cues in interaction, Types of nonverbal interaction, Gaze and eye movement, Gesture, Mimicry and Imitation, Touch, Posture and movement, Interaction rhythm and timing. Nonverbal interaction in robots, Robot perception of nonverbal cues, generating nonverbal cues in robots.				
Module 4	Applications	Case Study	Data collection and analysis	**10** Sessions
Applications of Human Robot Interaction- Service robots, Robots for learning, Robots for entertainment, Robots in Health care and therapy, Robots as personal assistants, Collaborative robots, robots in self driving cars, remotely operated robots, problems for robots applications.				
Targeted Application & Tools that can be used: Industrial applications of robots: Medical sector, Military Unit, Industries, Domestic Sector etc. Automation in industries.				
Text Book: 1. Christoph Bartneck, Tony Belpaeme, Friederike Eyssel, Takayuki Kanda, Merel Keijsers, Selma Šabanović, "Human Robot Interaction", Cambridge University Press, 2020. 2. Cynthia Breazeal "Designing Sociable Robots", MIT Press, 2002.				
References: 1. Dieter Vanderelst, "Human-Robot Interaction: An Introduction", 2019. 2. Fang Chen "Designing Human Interface in Speech Technology", Springer, 2021. **Web links:** 1. https://presiuniv.knimbus.com/user#/searchresult?searchId=Introduction%20to%20robotics%20and%20automation&_t=1655968277251 2. https://www.edx.org/learn/human-robot-interaction 3. https://onlinecourses.nptel.ac.in/noc22_me77/preview				
Topics relevant to "EMPLOYABILITY SKILLS": The sensing and digitizing function in non verbal interaction, Machine vision, Image processing and analysis, Training and Vision systems **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				

Catalogue prepared by	**Mr. Basavaraj Devakki**
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: MEC3417	**Course Title: Smart Mobility and Intelligent Vehicles** **Type of Course: 1] Professional Elective Course**		**L-T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The **Smart Mobility** course provides a comprehensive understanding of the technologies, strategies, and innovations transforming modern transportation systems. Designed to address the challenges of urbanization, climate change, and evolving mobility needs, the course covers critical topics such as electric and autonomous vehicles, intelligent transportation systems, Mobility-as-a-Service (MaaS), and sustainable urban mobility.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **Smart Mobility**" and attain **EMPLOYABILITY SKILL** through **participative learning techniques**.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1: Understand key concepts of smart mobility and sustainable transportation. CO2: Gain knowledge of electric and autonomous vehicle technologies. CO3: Learn how to design and implement shared mobility solutions (MaaS). CO4: Apply smart technologies to improve urban transportation systems.					
Course Content:						
Module 1	Foundations of Smart Mobility	Case Study	Descriptive	13 sessions		
Topics: Introduction to Smart Mobility, Overview of Sustainable Transportation, Intelligent Transportation Systems (ITS) Basics, Smart Traffic Management, Principles of Urban Mobility Planning, Role of Data Analytics in Mobility, Challenges in Current Mobility Systems.						
Module 2	Electric and Autonomous Vehicles	Case Study	Descriptive	12 sessions		
Topics: Fundamentals of Electric Vehicles (EVs), EV Batteries and Charging Infrastructure, Introduction to Autonomous Vehicles (AVs), Sensors and Perception Systems in AVs, Connectivity and Vehicle-to-Everything (V2X) Communication, Safety and Ethical Challenges in AVs, Integration of EVs and AVs into Smart Cities, Future Trends in EV and AV Technology.						
Module 3	Mobility-as-a-Service (MaaS) and Shared Mobility	Case Study	Descriptive	10 sessions		

<table>
<tr><td colspan="5">Topics:
Introduction to Mobility-as-a-Service, Components of MaaS Ecosystems, Shared Mobility Solutions: Ridesharing and Carsharing, Micro-mobility: E-scooters and E-bikes, Digital Platforms for MaaS Integration, Economic and Social Impacts of MaaS, Case Studies of MaaS Implementation.</td></tr>
<tr><td>Module 4</td><td>Sustainable and Connected Urban Mobility</td><td>Case Study</td><td>Descriptive</td><td>10 sessions</td></tr>
<tr><td colspan="5">Topics:
Concepts of Smart Cities and Urban Mobility, Sustainable Mobility Strategies, Renewable Energy Integration in Transportation, Public Transit Innovations, Smart Infrastructure and IoT in Mobility, Policy and Regulation for Smart Mobility, Global Trends in Sustainable Transportation, Final Project Presentation.</td></tr>
<tr><td colspan="5">Targeted Application & Tools that can be used:
Application
• Electric Vehicles (EVs)
• Autonomous Vehicles (AVs)
• Mobility-as-a-Service (MaaS)
• Smart Traffic Management
Tools
• Vehicle-to-Everything (V2X) Communication
• Intelligent Traffic Management Systems
• Electric Vehicle Charging Infrastructure
• Data Analytics and IoT for Mobility</td></tr>
<tr><td colspan="5">Text Book’s
1. "Introduction to Smart Mobility: Concepts and Technologies" (1st Edition) by George J. Hwang
2. "Electric and Autonomous Vehicles: Technology, Policy, and Impacts" (2nd Edition) by Anna P. Anagnostopoulou</td></tr>
<tr><td colspan="5">References
1. "Mobility as a Service: A New Paradigm for Public Transport" (1st Edition) by Kari Tervo
2. "Intelligent Transport Systems: Smart and Green Infrastructure Design" (3rd Edition) by Andreas R. K. Nilsen</td></tr>
<tr><td colspan="5">Topics relevant to “SKILL DEVELOPMENT”: Smart Mobility – understanding of the technologies, strategies, and innovations transforming modern transportation systems. EMPLOYABILITY SKILL through Smart mobility. This is attained through assessment component mentioned in course plan.</td></tr>
<tr><td colspan="2">Catalogue prepared by</td><td colspan="3">Dr. Prashanth S P</td></tr>
<tr><td colspan="2">Recommended by the Board of Studies on</td><td colspan="3">BOS Meeting No: 21, Dated: 6th July 2025</td></tr>
<tr><td colspan="2">Date of Approval by the Academic Council</td><td colspan="3">Academic Council Meeting No. 26, Dated 25/07/2025</td></tr>
</table>

Course Code: **MEC3064**	**Course Title: Manufacturing Control and Automation** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P-C**	3	0	3
Version No.	2.0				
Course Pre-requisites	NIL				
Anti-requisites	NIL				
Course Description	Manufacturing Control and Automation in manufacturing systems, acquire the fundamental concepts of automated flow lines and their analysis, classify automated material handling, automated storage and retrieval systems and illustrate adaptive control systems and automated inspection methods.				
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Manufacturing Control and Automation**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.				
Course Outcomes	On successful completion of this course the students shall be able to**:** CO1) Illustrate the basic concepts of automation in machine tools. CO2) Analyze various automated flow lines, explain assembly systems and line balancing methods. CO3) Describe the importance of automated material handling and storage systems. CO4) Interpret the importance of adaptive control systems, automated inspection systems**.**				
Course Content:					
Module 1	Automation & flow lines	Assignment	Cellular, Plant and Product Layout and flow lines analysis		15 Sessions
Topics: Introduction: Single-Station Manufacturing Cells, types and strategies of automation, Automation in machine tools, automation principles, Mechanical feeding and tool changing, machine tool control, elements in product realization. Automated Flow Lines: Methods of work part transport, transfer mechanisms, buffer storage, control function, Design and fabrication consideration.					
Module 2	Analysis of transfer line in automation	Assignment	Line balancing analysis		10 Sessions
Topics: Analysis of Automated Flow Lines: General terminology, analysis of transfer lines with and without buffer storage, partial automation, implementation of automated flow lines.					
Module 3	Modeling and simulation for manufacturing plant automation	Assignment	AI technologies		12 Sessions
Module 3: Modeling and simulation for manufacturing plant automation Modern Tools-Fuzzy logic, Application of Fuzzy logic system, Artificial Neural Networks in manufacturing automation, Machining Learning, AI in manufacturing systems, Benefits of AI systems, AI technologies and techniques, Future trends and opportunities,					
Module 4	Control technologies in automation	Assignment	Programming of microprocessors		08 Sessions

Module 4: Control technologies in automation Industrial Control Systems, process industries verses discrete-manufacturing industries, continuous versus discrete Control. Computer based control process and its forms. Programming of microprocessors using 8085 instructions. Programmable logic controllers.
Targeted Application: Application Area is Industrial Automation, Automated processing stations, Assembly line balancing, Industrial process control loop.
Textbook: 1.Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover./PE/PHI 2016.
References: 1. Computer Control of Manufacturing Systems: Yoram Coren. 2. CAD/CAM/CIM, (2ndEdition) by Radhakrishnan and Subramanian, New Age Publications. 3. Automation by W. Buekinsham. **Links:** 1. https://nptel.ac.in/content/storage2/courses/108105063/pdf/L01(SM)(IA&C)%20((EE)NPTEL).pdf 2. https://www.te.com/content/dam/te-com/documents/about-te/marketing/global/select-campaign/industrial-control-and-automation-guide.pdf 3. https://nptel.ac.in/courses/108105088 4. https://www.knimbus.com/user#/searchresult?searchId=Manufacturing%20Control%20and%20Automation&curPage=0&layout=list&sortFieldId=none&topresult=false&resultTab=Research
Topics relevant to "EMPLOYABILITY SKILLS": Assembly process, Manual Assembly Lines, Line balancing methods, ways for improving line balance, flexible assembly lines for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Dr. Aravinda T
Recommended by the Board of Studies on	19th BOS held on 05/07/2024
Date of Approval by the Academic Council	Academic Council Meeting No. 24, dated 03/08/2024

Course Code: MEC3419	**Course Title: Micro Electro Mechanical Systems Type of Course: Professional Elective Course & Theory only**	**L-T-P-C**	3-0-0-3
Version No.	1.0		
Course Pre-requisites	NIL		
Anti-requisites	NIL		
Course Description	This Course provides an introduction to Micro Electromechanical Systems (MEMS) with this comprehensive course, designed to equip you with the knowledge and hands-on skills to excel in this transformative field. Dive deep into the essential concepts, materials, and fabrication techniques that power MEMS technology, and explore how it is revolutionizing industries. From understanding foundational MEMS principles to mastering advanced sensor fabrication and characterization methods, this course offers a step-by-step guide to becoming proficient in MEMS applications. Engage with dynamic video content and develop practical skills in cleanroom protocols, micromachining. Learn to fabricate MEMS sensors, interface them with advanced techniques, and apply communication protocols to create innovative solutions.		
Course Out Comes	On successful completion of the course the students shall be able to: **CO1.** Appreciate the technologies related to Micro Electro Mechanical Systems. **CO2.** Understand design and fabrication processes involved with MEMS De-vices. **CO3.** Analyze the MEMS devices and develop suitable mathematical models. **CO4.** Know various application areas for MEMS device.		
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Micro Electro Mechanical Systems**" and attain **EMPLOYABILITY SKILL** through Participative Learning Techniques.		
Course Content:			

Module 1	Overview of MEMS and Microsystems	12 sessions
Topics: MEMS and Microsystem, Typical MEMS and Microsystems Products, Evolution of Microfabrication, Microsystems and Microelectronics, Multidisciplinary Nature of Microsystems, Miniaturization. Applications and Markets. [Apply level]		
Module 2	Working Principles of Microsystems	12 sessions
Topics: Introduction, Microsensors, Micro actuation, MEMS with Micro actuators, Micro accelerometers, Microfluidics. [Apply level]		
Module 3	Engineering Mechanics for Microsystems Design	10 sessions
Topics: Introduction, Static Bending of Thin Plates, Mechanical Vibration, Thermo mechanics, Fracture Mechanics, Thin Film Mechanics, Overview on Finite Element Stress Analysis. [Apply level]		
Module 4	Scaling Laws in Miniaturization	11 sessions
Topics: Introduction, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Fluid Mechanics, Scaling in Heat Transfer. [Apply level]		

Targeted Application & Tools that can be used:	
Text Book T1**:** Tai-Ran Hsu, MEMS and Micro systems: Design, Manufacture and Nanoscale Engineering, 2nd Ed, Wiley.	
References 1. Hans H. Gatzen,Volker Saile, JurgLeuthold, Micro and Nano Fabrication: Tools and Processes, Springer, 2015. 2. Dilip Kumar Bhattacharya, Brajesh Kumar Kaushik, Microelectromechanical Systems (MEMS), Cengage Learning.	
Topics relevant to "EMPLOYABILITY SKILLS": MEMS principles to mastering advanced sensor fabrication and characterization methods for **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by	Basavaraj Devakki
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3065**	**Course Title: Introduction to Robotics and Automation** **Type of Course:** **1] Professional Elective Course** **2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course provides an overview of robot anatomy, motion control system and intelligent controls. A wide scope is given to the area of Applications where in students understand how robotics can be applied in different industrial applications. The course also enhances the practical applications of robots and automation through case studies.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of **"Introduction to Robotics and Automation"** and attain **EMPLOYABILITY SKILLS** through **Participative Learning techniques.**					
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Describe Robot, Robotics and Various Components of Robots. CO2] Describe various types of sensors, actuators and its applications in robotics. CO3] Discuss different type of Automation and applications. CO4] Describe the different types of Automated manufacturing systems.					
Course Content:						
Module 1	Introduction to Robotics	Assignment	Data Collection	09 Sessions		
Topics: Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration. Robot motions, Joints, Work volume, Robot drive systems, End effectors – Tools and grippers.						
Module 2	Robot Sensors and Machine vision system	Assignment	Data Collection	13 Sessions		
Topics: Sensors in Robotics - Tactile sensors, Proximity and Range sensors, use of sensors in robotics. Machine Vision System: Introduction to Machine vision, the sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems.						
Module 3	Introduction to Automation	Assignment	Data collection and Analysis	10 Sessions		
History of Automation, Reasons for automation, Disadvantages of automation, Automation systems, Types of automation – Fixed, Programmable and Flexible automation, Automation strategies. Industrial Applications of Automation systems.						

Module 4	Automated Manufacturing Systems	Case Study	Data collection and analysis	13 Sessions
Components, classification and overview of manufacturing Systems, Flexible Manufacturing Systems (FMS), Types of FMS, Applications and benefits of FMS. Review of NC, CNC, DNC, Adaptive control and robotics in manufacturing. Advantages, disadvantages and applications.				
Targeted Application & Tools that can be used: Industrial applications of robots: Pick and place robots, welding and other industrial applications. Automation in industries.				
Text Book: 1.Robotics for Engineers by Yoram Koren, Mc Graw-Hill, 10th edition, 2011. 2. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk. Categories, edition 4, 2015.				
References: 1. Robot Technology by Philippe Coffet (Vol. 1 to Vol. 7), 2013. 2. Walking Machines, An introduction to legged Robots by D J Todd, 10, 2012. 3. Fundamentals of Robot Technology by D J Todd, 6, Dec 2012. 4. Introduction to Autonomous by Roland Siegwart, Illah R Nourbakhsh, MIT Press, edition 2, 2004 5. Robotics: State of the art and future Challenges, George A. Bekey, edition 1, 2008. **Web links:** 1. https://presiuniv.knimbus.com/user#/searchresult?searchId=Introduction%20to%20robotics%20and%20automation&_t=1655968277251				
Topics relevant to "EMPLOYABILITY SKILLS": The sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	**Dr. Arpitha G R**			
Recommended by the Board of Studies on	15th BOS, 29/7/2022			
Date of Approval by the Academic Council	No.18, 3/08/2022			

Course Code: **MEC3025**	**Course Title: Power Plant Engineering** **Type of Course:** **1] Professional Elective Course 2] Theory**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of Power generation plant and its technicalities. The Course deals with the components and layout of; thermal, nuclear, hydroelectric power plants, Site selection for various power plants, combined cycle power plants, Magneto Hydro Dynamics (MHD) systems. This Course also includes the economics of power generation, economic loading of power stations and technical aspects such as load curve analysis, load factor, diversity factor, power plant instrumentation, and controls.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Power Plant Engineering**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 Enlist the different types of load pattern such as industrial, urban traction load, power plants. CO2 Prepare a Heat Balance Sheet for the steam power plant. CO3 Analyze the steam cycles, reheat and regeneration cycles. CO4 Sketch the flow diagram and performance study of diesel power plant, gas turbine power plant and nuclear power plant.. CO5 Explain the Renewable energy resources, Photovoltaic cell, Solar power plant, Wind turbines for power producing sectors.					
Course Content:						
Module 1	Economics of Power Generation	Case Study	Data Collection		8 Sessions	
Topics: Introduction, load distribution curves, Load factor, plant factor, Average load, reverse and Diversity factor, Plant use factor, Different Load pattern for various power plant. **Case Study:** Collect the data on any diesel engine power plant / home based electric system and perform load calculation.						
Module 2	Steam power plant	Assignment	Report		12 Sessions	

Topics:
Various types of steam generators, working principles of boiler, boiler plant, Water tube boiler and Fire tube boiler and their Accessories, boiler mountings, Economizers, Superheaters, Reheaters, and Air Preheaters, Working principle of steam power plant.
Assignment: Write a report on the various types of generator available for steam power production.

Module 3	Gas turbine and Diesel power plant	Assignment	Report	10 Sessions

Topics:
Working principle of GT power plant, open type and closed types, Components of GT Plants, Ideal gas turbine and actual gas turbine, Methods to improve the thermal efficiency of the plant

Assignment: Write a comparative report indicating differences in turbine design for gas and diesel power plant.

Module 4	Nuclear and Hydroelectric Power Plant	Assignment	Data Analysis	8 Sessions

Topics:
Basics, Fission reaction, flow diagram of the nuclear power plant, Parts of the nuclear power plant, working principle, Description of parts in the reactor, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR). Layout of Hydroelectric power plant, Types of Hydropower plants. Description of intake, penstock, trash rack, turbines, and generator.

Assignment: Collect the data from below website, clean the data, make a visualization using Excel / Tableau / Power BI and find the insights from it.
https://www.kaggle.com/code/jonathanbouchet/nuclear-power-plant-geo-data

Module 5	Solar power plant	Assignment	Programming	8 Sessions

Topics:
Solar Radiation: Physics of Solar radiation, Global Beam and diffuse radiation, Fundamentals of Solar Cell: Solar PV basics, Solar PV Module, Solar Cell technologies, Crystalline cell, solar photovoltaic modules, Concentrators and PV Modules. Balance of Solar PV Systems: Battery technology, Batteries for PV systems, DC –DC converters, Charge Controllers, DC–AC inverters, Single phase, three phase, MPPThttps://www.kaggle.com/datasets/anderas/car-consume.

Targeted Application & Tools that can be used:
Application in power plant handling and its control

Professionally used software – SQL, Excel, Tableau and Power BI

Text Book
1. P K Nag, "*Power Plant Engineering*", Fourth Edition, McGraw Hill Publications. .
2. A Textbook of Power Plant Engineering: Rajput, R.K. Laxmi Publication..

Reference Books:
1. Black and Veatch, "*Power Plant Engineering*", First Edition, CBS Publishers and Distributors Pvt. Ltd.
2. Domkundwar, "*Power Plant Engineering*", Eight Edition, Dhanpat Rai & Co. (P) Limited.

E – Resources:

W1: Some Aspects of Power Plant Development* | The Aeronautical Journal | Cambridge Core **W2:** NPTEL Course co-ordinated by IIT Roorkee Faculty Name: Prof. Ravi Kumar. Link: https://nptel.ac.in/courses/112/107/112107291/ Youtube link: https://www.youtube.com/watch?v=iWWyI8CZhUw **W3:**https://presiuniv.knimbus.com/user#/searchresult?searchId=power%20plant%20engineering&_t=1662523457576
Topics relevant to "EMPLOYABILITY SKILLS": Boiler Plant Design, Coal Power Plant for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout

Catalogue prepared by	
Recommended by the Board of Studies on	15th BOS held on 29/07/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, dated 03/08/2022

Course Code: **MEC3026**	**Course Title:** **Turbomachinery** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	MEC2501,MEC2502					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of different turbines and their applications. It deals with gas turbines, steam turbines, performance parameters, flow through cascades, different turbine stages, compounding of turbines, axial compressor stages, centrifugal compressor stages, axial fans and propellers, centrifugal fans and blowers, and wind turbines					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Turbomachinery**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Describe basic concepts of turbomachines and visualize dimensional analysis. CO2. Discuss various energy transformation involved in turbomachines CO3. Describe the working of Pelton, Francis and Kaplan Turbine along their performance parameters.					
Course Content:						
Module 1	Basic terms and Dimensionless parameters and their significance	Assignment	Calculation of dimensionless number for various practical application.	10 Sessions		
Topics: Definition of turbo machine, parts of turbo machines, Comparison with positive displacement machines, Classification, Dimensionless parameters and their significance, Effect of Reynolds number, Unit and specific quantities, model studies, Effect of various shape and size effects on model and prototype.						
Module 2	Velocity Triangle and Energy Equation	Assignment	Data collection for different types of turbomachines in different industry.	12 Sessions		
Topics: Euler's energy equation, Alternate form of Euler's energy equation, Components of energy transfer, Velocity triangle, Degree of Reaction, Velocity triangles for different values of degree of reaction, Isentropic efficiency, Effect of Isentropic efficiency in working of turbomachines.						

Module 3	Hydraulic Turbines	Assignment	Data Collection on use of different types of Hydraulic turbine in different application areas.	10 Sessions
Topics: Hydraulic Turbines: Classification, various efficiencies. Pelton turbine – velocity triangles, design parameters, Maximum efficiency. Francis turbine - velocity triangles, design parameters, Draft tubes- Types and functions. External components- Types and functions. Darrius turbines – velocity triangles, design parameters.				
Module 4	Pumps	Assignment & Case study	Data collection for different types of pumps in different industry.	12 Sessions
Topics: Need and methods of compounding, expression for maximum utilization factor, Axial fans and propellers, centrifugal fans and blowers. Centrifugal Pumps: Classification and parts of centrifugal pump, Reciprocating Pumps: Classification and parts of reciprocating pump, different heads and efficiencies of reciprocating pump, Minimum speed for starting the flow, different head, Different types of efficiencies of reciprocating pump.				
Targeted Application & Tools that can be used: Turbomachines is currently used in various areas like Wind turbine power plant, hydroelectric power plant Aviation sector.				
Text books: 1. B.K.Venkanna., "*Fundamentals of Turbomachinery*", PHI, 4th edition, 2017.				
References 1. V. Kadambi, Manohar Prasad, "*An Introduction of Energy Conversion: Turbomachinery – Vol.III*",New Age International Private Limited. 2. Seppo A Korpela, "*Principles of Turbomachinery*", John Wiley and Sons. **Website link-**https://nptel.ac.in/courses/112106200/17 https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=BOOKYARDS_1_5255				
Topics relevant to "EMPLOYABILITY SKILLS": Hydraulics turbines, Centrifugal Pump Design for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout				
Catalogue prepared by	Mr. Neeraj and Mr. Narendra Singh			
Recommended by the Board of Studies on	15th BOS held on 29/07/2022			
Date of Approval by the Academic Council	Academic Council Meeting No. 18, dated 03/08/2022			

Course Code: **MEC2001**	**Course Title: Renewable Energy Systems** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P-C**	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of Different kinds of renewable energy sources and their applications. It covers Introduction of renewable energy sources, their advantages, potential, status of development, broad details of different renewable energy systems such as solar, wind, biomass, hydrogen etc; Renewable energy development policy, Renewable energy industries and future thrust areas in renewable energy development.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Renewable Energy Systems**" and attain **EMPLOYABILITY SKILL** through participative learning techniques.					
Course Outcomes	**On successful completion of the course students shall be able to:** **CO1.** Identify the different types of non-conventional energy sources and compare with various conventional energy systems, their prospects and limitations. **CO2.** Describe the use of solar energy and the various components used in the energy production with respect to applications. **CO3.** Appreciate the need of Wind Energy and the various Biomass Energy sources and know their classifications with applications. **CO4.** Acquire the knowledge of fuel cells, with emphasis on hydrogen energy.					
Course Content:						
Module 1	Introduction	Assignment	Data collection & Analysis	10 Session		
Topics: **Introduction to Energy Sources** General, World Energy Futures, Energy consumption, Renewable Energy Sources, Renewable Energy Resources, Advantages, Prospects of Renewable Energy Sources. **Assignment:** Prepare a comprehensive report on the 2021 energy mix in India.						
Module 2	Solar energy	Assignment	Data collection and data analysis /Case Study	16 Session		
Topic: **Solar Radiation and its Measurement:** Definition Solar Constant, Beam and Diffused Radiation, Sun at Zenith, Air Mass, Solar Radiation Geometry, Different Solar angles, Day length, Local Solar Time, Solar radiation Measurements, Estimation of Average Solar Radiation. **Solar Energy Collectors:** Physical Principles of the conversion of Solar Radiation into Heat, Flat Plate Collectors, Collector Efficiency, Concentrating Collector, Focusing type, Advantages and Disadvantages of both Flat plate and Concentrating type collectors.						

Solar Energy Storage: Solar Energy Storage systems, Solar Pond,
Applications of Solar Energy: Solar Water Heating, Solar Thermal Electric Conversion, Solar Distillation, and Solar Cooking, Solar PV Systems, Solar PV application.
Assignment : Collect data related to renewable energy generation (Solar)

Module 3	Wind And Biomass Energy	Assignment	Data collection	16 Sessions

Topics:
Wind Energy: Origin of Winds, Nature of Winds, Basic Principles of Wind Energy Conversion, Basics Components of a WECS, Classification, Advantages and Disadvantages, Applications of Wind Energy.
Biomass Energy: Biomass Conversion Technologies, Bio gas generation, Classification of Biogas plants, Biomass as a source of Energy, Methods of obtaining Energy from Biomass.
Assignment: Prepare a report on recent Data collection related to wind energy across the world.

Targeted Application & Tools that can be used:
Application Area is Alternate energy resources – NTPC, ReNew , Tata Power, Suzlon, Acme Solar, Adani, Greenko.
Professionally Used Software: Ms- Excel, /Python FOR data collection, analysis and design of system

Text Books:

1. T1. Rai G D, "Non-Conventional Energy Sources", Fourth Edition, Khanna Publishers, New Delhi, Feb. 2000
2. SOLAR ENERGY BY S P SUKHATME, 1988 Tata McGraw-Hill Education
3. Principles of Thermal Collection and Storage by S P Sukhatme,J K Nayak. Tata McGraw-Hill Education, 1988

Reference Book(s):

4. R1. Khan B H, "Non-Conventional Energy sources", Third edition, Tata Mc Graw Hill, New Delhi, 2015.
5. Tiwari G N & M K Ghosal, "Renewable Energy Resources"; Narosa Publishers, 2005

E-Resources:
W1:
https://presiuniv.knimbus.com/user#/searchresult?searchId=renewable%20energy%20&_t=1662529543766

Topics relevant to "EMPLOYABILITY SKILL": Solar Energy System, Bio gas Plant for developing **EMPLOYABILITY SKILL** through **Problem-Solving methodologies**. This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	Mr. Pranay Nimje
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 27/08/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022

Course Code: MEC3029	**Course Title: Advanced Heat Transfer** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	MEC2509					
Anti-requisites	NIL					
Course Description	This Course is designed to teach engineering students the concepts of heat transfer and application of heat transfer principles to the design. This Course provides an introduction to the fundamental concepts of heat transfer; Thermal conductivity steady-state and unsteady-state heat conduction multilayer conduction, heat transfer through a composite wall, critical insulation thickness, analytical and empirical relations for forced and free convection heat transfer; empirical relations used for pipe and tube flow, boundary layer and its thickness, heat exchanger analysis and design; to design and analyse the performance of heat exchangers and evaporators.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Advanced Heat-Transfer**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	CO1] Apply the concept of steady state conduction heat transfer in solids. CO2] Employ the methods of heat transfer with effective resistence. CO3] Compute the heat transfer coefficient for natural and forced convection. CO4] Apply the concept of radiation heat transfer between surfaces. CO5] Compute the effectiveness of a specific heat exchanger.					
Course Content:						
Module 1	Conduction	Assignment	Data collection	12 Sessions		
Topics: Introduction - basic modes of heat transfer and governing laws– conduction – general heat conduction equation in Cartesian – one dimensional steady state conduction with and without heat generation – concept of thermal resistance – concept of composite wall – overall heat transfer coefficient – critical thickness of insulation – extended surface heat transfer – fin performance –effect of variable thermal conductivity- problems. Unsteady state conduction in one dimension, lumped heat capacity system .						
Module 2	Convection	Assignment	Mathematical	12 Sessions		
Topics: Newton's law – concept of boundary layer – significance of Prandtl number – boundary layer equations – flat plate heat transfer– laminar and turbulent flow – Reynolds analogy – empirical						

relations in forced convection – internal flow – boundary conditions – laminar and turbulent flow – heat transfer coefficients – empirical correlations. Natural convection.				
Module 3	Radiation	Assignment	Mathematical	10 Sessions
Topics: Fundamentals of radiation – radiation spectrum – thermal radiation – concept of black body and grey body – monochromatic and total emissive power – absorptivity, reflectivity and transmissivity- laws of radiation – radiation between two surfaces – geometrical factors for simple configuration– radiation shields				
Module 4	Heat exchangers	Assignment	Mathematical	12 Sessions
Topics: Classification – log mean temperature difference – overall heat transfer coefficient – fouling and scaling of heat exchangers – LMTD and NTU method of performance evaluation of heat exchangers. Introduction to mass transfer – Fick's law of diffusion - problems				
Targeted Application & Tools that can be used: Application Area is Geophysical phenomenon, Hydrology, Aerospace, Aerodynamics, Microfluidics, Pipe network, heat exchangers. Industries using above applications and tools – Siemens, Quest Global, Simulent consulting, Triveni Engineering, TATA, GE etc				
Test book: 1. J P Holman, Souvik Bhattacharyya, "Heat Transfer" McGraw Hill Education (India)Pvt Ltd				
References 1. S. P. Sukhatme, "A text book on heat transfer", Universities press (India) private limited. 2. F. P. Incropera and D.P.Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons. **Topics for Technology Enabled Learning:** W1.NPTEL :: Mechanical Engineering - https://nptel.ac.in/courses/112108149 W2:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_1106				
Topics relevant to "EMPLOYABILITY SKILLS": Concept of composite wall – overall heat transfer coefficient – critical thickness of insulation – extended surface heat transfer – fin performance –effect of variable thermal conductivity for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Mr. Neeraj Singh			

Recommended by the Board of Studies on	15th BOS held on 29/07/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, dated 03/08/2022

Course Code: **MEC3028**	**Course Title: Compressible Fluid Flow** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L- T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.1					
Course Pre-requisites	MEC2502					
Anti-requisites	NIL					
Course Description	The course begins with the basics of thermodynamics and fluid mechanics, including types of flows. The next large block of lectures covers wave motion, and isentropic flows and effect of friction and heat transfer on ducts. The second half of the course deals with shock waves and its effect on various properties and concludes with another small block dealing with introduction of multi-dimensional flows.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Compressible Fluid Flow**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1 Define various thermodynamics and fluid flow properties and types of flow CO2 Analyze the assumptions and physical meaning of terms in the equation of motion for continuum flow; CO3 Solve the governing equations for various flows including flow throug ducts, normal and oblique shocks and its effect on various flow properties; CO4 Solve the problems based on various shock waves, nozzle and diffuse Rayleigh line and Fanno Curves; CO5 Understand the concepts of the multi-dimensional flow.					
Course Content:						
Module 1	Basic	Assignment	Experiment	5 Sessions		
Topics: Introduction, Thermodynamic properties like pressure, temperature, density, volume, equilibrium, ideal gas, 1st, 2nd, and 3rd laws of thermodynamics, enthalpy and entropy, various Fluid flows like laminar and turbulent, steady and unsteady, compressible and incompressible flows, Mach number. **Assignment:** Teal time temperatutre measurement using thermocouple						
Module 2	Isentropic Flow and Wave Motion	Assignment	Analysis	20 Sessions		
Topics: Comparison of isentropic and adiabatic process, Mach number variation, stagnation function, Mass flow rate, Impulse function, Flow through nozzle and diffuser, Wave propagation in elastic solid medium, sound waves, steep finite pressure waves and expansion waves. **Assignment:** Analyse an aerodynamics body under sub-sonic, sonic and supersonic flow condition by using Fluent software.						
Module 3	Shocks (Normal and Oblique)	Assignment	Data Analysis	11 Sessions		
Topics: Development of shock waves, Governing equations, Prandtl-Meyer relation, Static pressure ratio, temperature ratio, density ratio, stagnation pressure ratio, change in entropy across the shock,						

strength of shock, Mach number for subsonic flow, introduction to oblique shock, its relation, Prandtl equation, Rankine-Hugoniot equation. **Assignment:** Obtain the fluid flow behavior of normal shock over various shaped-bodies using Ansys Fluent.				
Module 4	Flow in constant area ducts with friction and heat transfer	Case study	report	7 Sessions
Topics: Fanno Curves, Fanno Flow equations and its solutions, variation of flow properties, table and charts for Fanno flow, Rayleigh line, Fundamental equation, variation on flow properties, charts and tables for Rayleigh flow. **Assignment:** Write a brief report on below article related to flow in constant area duct. https://www.researchgate.net/publication/332798145_Fanno Flow AdiabaticFlow in a Constant Area Duct with Friction				
Module 5	Introduction to Multidimensional Flow	Assignment	Study based	2 Sessions
Topics: Continuity, momentum for Cartesian coordinates, Navier-stokes equation. **Assignment:** Derive a Navier strokes equation for cylindrical body				
Targeted Application & Tools that can be used: Application area mainly includes in Aerospace, aerodynamics of aircraft, Rocket propulsion, etc. Tools used: MS Excel, ANSYS Fluent				
Text Book: **T1:** S M Yahya, "Fundamentals of Compressible Flow with Aircraft and Rocket Propulsion", 5th Edition, New Age International Private Limited, 2016. **References:** **R1:** Michel A Saad, "Compressible Fluid Flow", 2nd Edition, Pearson Publication, 1992. **R2:** Ascher H. Shapiro, "The Dynamics and Thermodynamics of Compressible Fluid Flow", 1st Edition, John Wiley & Sons Publication, 1953. **E-Resources:** **W1**: https://nptel.ac.in/courses/112/103/112103294/ **W2**: https://presiuniv.knimbus.com/user#/searchresult?searchId=compressible%20fluid%20flow&_t=1662529184385				
Topics relevant to "EMPLOYABILITY SKILLS": Thermodynamic properties like pressure, temperature, density, volume, equilibrium, ideal gas, 1st, 2nd, and 3rd laws of thermodynamics, enthalpy and entropy, various Fluid flows like laminar and turbulent, steady and unsteady for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout				
Catalogue prepared by	Mr. Pranay Nimje			
Recommended by the Board of Studies on	15th BoS held on 22/07/2022			
Date of Approval by the Academic Council	18th Meeting of the Academic Council held on 03rd August, 2022			

Course Code: **MEC3027**	**Course Title: Refrigeration & Air Conditioning** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L- T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	MEC2509					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of principles of Refrigeration and Air conditioning (R and AC), thermodynamic analysis of R and AC systems, load estimates and design of various R and AC systems for comfort and industrial applications. The Course also includes theoretical or experimental investigation of refrigeration and air-conditioning problems.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Refrigeration & Air Conditioning**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Evaluate the performances of complex vapor compression systems. CO2 Choose suitable components for refrigeration system. CO3. Execute thermodynamic analysis of absorption refrigeration systems CO4. Evaluate various psychrometric properties from measured values of barometric pressure, dry bulb and wet bulb temperatures. CO5. Calculate the internal and external cooling loads on a building.					
Course Content:						
Module 1	Introduction		Data Analysis		10 Session	
Topics: Basic concepts: unit of refrigeration and COP, refrigerators, heat pump, Carnot refrigerator, applications of refrigerators, vapor compression refrigeration, ideal cycle, effect of sub cooling of liquid, super heating of vapor, deviations of practical (actual cycle) from ideal cycle, construction and use of p-h chart problems.						
Module 2	Refrigerator Components	Assignment	Data Analysis		10 Session	
Topics: Compressors: classification, working, advantages and disadvantages; Condensers: classification, working Principles. Evaporators: classification, working Principles; Expansion devices: types, working principles. Refrigerants: Properties, nomenclature selection of refrigerants, effects of refrigerants on global warming, alternate refrigerants.						
Module 3	Vapour Absorption Refrigeration	Assignment	Data Analysis		5 Session	
Topics: Vapor absorption refrigeration: description, working of NH3-Water, Li Br–water system, calculation of HCOP, Principle and operation of three fluid vapor absorption refrigeration systems.						
Module 4	Properties of Moist Air (Psychrometry)	Assignment	Data Analysis		6 Sessions	
Topics: Composition of moist air, Methods for estimating moist air properties, Methods for estimating moist air properties, Important psychrometric properties, Relations between						

psychrometric properties, Introduction to humidity ratio vs. dry-bulb temperature, psychrometric chart				
Module 5	Air Conditioning Systems	Assignment	Data Analysis	13 Sessions
Topics: Psychometric properties and processes, sensible and latent heat loads, characterization, need for ventilation, consideration of Infiltration, load concepts of RSHF, ASHF, ESHF and ADP; concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning and Requirements, air conditioning load calculations.				
Targeted Application & Tools that can be used: Application area includes HAVC systems Tools used: MS Excel, Matlab				
References: 1. C. P. Arora, Refrigeration and Air Conditioning‖ Tata McGraw-Hill, 17th Edition, 2006. 2. S.C. Arora, S Domkundwar, "A Course in Refrigeration and Air-Conditioning: Environmental Engineering", Dhanpat Rai. 3. 2. J. W. Jones, W. F. Stoecker, "Refrigeration and Air-Conditioning", McGraw Hill Education. 4. Ananthanarayanan, Basic Refrigeration and Air Conditioning‖, Tata McGraw-Hill, 2015. 5. Manohar Prasad, "Refrigeration and Air Conditioning‖ New Age International, Third Edition, 2015 6. P. L. Ballaney, Refrigeration and Air Conditioning‖ Khanna Publishers, 16th Edition, 2015. Web link Presidency University (knimbus.com) https://nptel.ac.in/courses/112105129				
Topics relevant to "EMPLOYABILITY SKILLS": Composition of moist air, Methods for estimating moist air properties, Methods for estimating moist air properties, Important psychrometric properties, Relations between psychrometric properties for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout				
Catalogue prepared by	Dr. Devendra Singh Dandotiya			
Recommended by the Board of Studies on	12th BoS held on 06/08/2021			
Date of Approval by the Academic Council	16th Meeting of the Academic Council held on 23rd October, 2021			

Course Code: **MEC3033**	**Course Title: Alternate Fuels** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course is designed to introduce the world of alternate fuels. The course acquaints the learners about production of alternate fuels, their performance and emission characteristics when used with Diesel in IC Engine. Latest emission norms like BS-6 and its comparison with Euro norms will be done. This course also reviews all the basic principles of IC Engine working, fossil fuels production and its structure.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Alternate Fuels**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1-Understand basic concepts of Internal Combustion Engines and fossil fuels. CO2-Understand the production methods of liquid and gaseous alternate fuels CO3-Discuss combustion, performance and its emission characteristics of different conventional and alternate fuels. CO4-Explain the National and International Emission Norms and Emission Control packages.					
Course Content:						
Module 1	Basics of Engines and Fuels	Assignment	Data Analysis Task	12 Sessions		
Topics: **Basics of Heat engines.** Classification of IC engines, Nomenclature of engine components, working principle of four stroke Engines, Performance Parameters and their standards. Concept of theoretical Otto & Diesel cycles**.** **Conventional fuels:** Solid, liquid, gaseous fuels, Characteristics of Engine fuels, fuels from Petroleum products, Chemical Structure of Petroleum fuels.						
Module 2	Liquid and Gaseous Alternate Fuels	Assignment	Data Analysis Task	10 Sessions		
Topics: **Alternate fuels** – Types of alternate fuels, Liquid fuels- alcohols, Production of methanol, ethanol. Their usage in engines. Gaseous Fuels- Hydrogen, LPG, CNG - Production, properties, storage and handling. Their usage in engines.						
Module 3	Bio Fuels	Assignment	Data Analysis Task	14 Sessions		

Topics:
Types of biofuels. Use of biomass as an energy source. Pyrolysis and Gasification processes. Biogas - Production and properties. Indian and Chinese biogas plants. Performance and emission characteristics of biogas.
Types of bio-diesels and their origin Need of bio-diesels, Trans-esterification method of production, Comparison of properties of bio-diesels v/s petro-diesel, Comparison of performance parameters and emission characteristics of bio-diesels v/s Petro diesel. Discussion on need for engine modifications to use biodiesels.

Module 4	Engine Emission norms in India and abroad	Assignment	Data Analysis Task	10 Sessions

Topics:
Sources and types of emissions. Effects of release of Carbon Monoxide, Unburnt hydrocarbon, Oxides of Nitrogen, Smoke and Particulate matter to the atmosphere. Control of effects of Emission – EGR, and Catalytic converter Package, Indian Emission Norms- Bharath stage and Euro norms. Comparison of Bharath stage 6 and Euro 6.

Targeted Application & Tools that can be used:
Application area are Automobile sector, Indian Railways and power generation.
Tools used: any CFD software

References
R1: G D Rai: "Non-conventional *Energy Sources*", Khanna Publishers.
R2: M. K. Ghoshal :"Renewable Energy Technologies", Narosa Publishers.
R3**:** B. Bharathiraja, J. Jayamuthunagai, R. Praveen Kumar " Biofuels" MJP Publishers
R4: Kumari Swarnim, "Biofuels in India – A new revolution" Mangalam Publications
E resources:
W1.https://presiuniv.knimbus.com/user#/searchresult?searchId=machine%20elements&_t=1656917902483
W2.https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=124896850&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Production of methanol, ethanol. Their usage in engines. Gaseous Fuels- Hydrogen, LPG, CNG - Production, properties for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Udaya Ravi Mannar
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3428**	**Course Title:** **Computational Fluid Dynamics** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	MEC2502					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of computational fluid dynamics (CFD), governing equations of fluid dynamics, mathematical behavior of partial differential equations, basic aspects of discretization, grids with appropriate transformations, and simple CFD techniques and their applications, numerical solutions of quasi-one-dimensional nozzle flows, numerical solution of a two-dimensional supersonic flow, incompressible Counter flow, and supersonic flow over a flat plate and advanced topics in CFD.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Computational Fluid Dynamics**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Outcomes	On successful completion of the course the students shall be able to: CO1. Understand the fundamentals of CFD and deriving governing equations. CO2. To give a basic understanding to the discretization of equations of mass, momentum and energy. CO3. Apply different CFD techniques to diffusion problems. CO4. Solving convection-diffusion problems and N-S equation. CO5. Understand numerical grid generation and apply time integration and turbulence methods to complex flows					
Course Content:						
Module 1	Introduction			6 sessions		
Topics: Introduction to CFD, Advantages, applications and the future of CFD, CFD solution procedure, problem setup processes, numerical solution, results report and visualization.						
Module 2	Governing Equations for CFD	Assignment	Mathematical	8 sessions		
Conservation equation; mass; momentum and energy equations; convective forms of the equations and general description, Classification into various types of equation; parabolic elliptic and hyperbolic; boundary and initial conditions; over view of numerical methods.						

Module 3	CFD mesh generation and techniques	Assignment	Mathematical	13 sessions
Types of meshes, local mesh refinement, moving meshes, guidelines for mesh quality and mesh design, Discretization of governing equations: FDM, FVM, converting governing equations to algebraic equation, FDM, FVM and comparison of the finite difference and finite volume method, numerical solutions to algebraic equations, pressure velocity coupling.				
Module 4	CFD solution analysis: Essentials	Assignment	Mathematical	8 sessions
Consistency, stability, convergence, accuracy Efficiency, case studies: channel flow and flow over a 90° bend.				
Module 5	Practical guidelines for CFD simulation and analysis	Assignment	Mathematical	10 sessions
Topics: Guidelines for boundary conditions, turbulence modelling, strategy for selecting turbulence modelling, near wall treatments, test case: assessment of two equation turbulence modelling Indoor air flow distribution, gas particle flow in a 90° bend, heat transfer coupled with fluid flow.				

Targeted Application & Tools that can be used:

Application Area is Geophysical phenomenon, Hydrology, Aerospace, Aerodynamics, Microfluidics, Pipe network, Turbo-machinery.

Industries using above applications and tools – Siemens, Quest Global, Simulent consulting, Triveni Engineering, TATA, GE etc

References

1. Jiyuan Tu, Guan Yeoh, Chaoqan Liu, "Computational Fluid Dynamics: A Practical Approach", Elsevier.
2. John D. Anderson Jr, "Computational Fluid Dynamics: The basics with Applications" McGraw Hill Education..
3. J. C. Anderson, D. A. Tannehil and R. H. Pletcher, "Computational Fluid Mechanics and Heat Transfer", Taylor & Francis publications, USA (1997)
4. H. Versteeg, W. Malalasekra, "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Pearson edition

Topics for Technology Enabled Learning:

W1.https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_1106

W2.https://nptel.ac.in/courses/112105045

Topics relevant to "EMPLOYABILITY SKILLS": Conservation equation; mass; momentum and energy equations; convective forms of the equations and general description, Classification into various types of equation for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3082**	**Course Title: Elements of Solar Energy Conversion** **Type of Course:** **1] Professional Elective Course** **2] Theory**		**L-T- P- C**	3	0	0	3
Version No.	1.0						
Course Pre-requisites	NIL						
Anti-requisites	NIL						
Course Description	This course intends to introduce the basic concepts required for the engineers to work in the field of solar energy technology, both industrial installations and research endeavours. The major focus is on the following topics: the apparent movement of the sun, irradiation prediction, intensity estimation on tilted plane, flat plate collectors, concentrating collectors of various kinds, thermal and photovoltaic routes of solar energy conversion. The course assumes basic knowledge in UG level thermodynamics, optics, semiconductor physics, heat transfer and engineering mathematics. The advanced UG ME students and the PG ME students intending to work in the solar energy field should opt for this course.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Elements of Solar Energy Conversion**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.						
Course Out Comes	On successful completion of the course the students shall be able to: CO1] Recognize the significance of the principles of solar energy in the engineering context CO2] Illustrate the fundamentals of solar energy conversion. CO3] Explain the various devices for solar energy conversion						
Course Content:							
Module 1	Solar Energy Measurements	Assignment	Data Collection				15 Sessions
Topics: - Basic concepts related to solar radiation, the sun, spectral distribution, sun- earth relationship,extraterrestrial radiation, revolution of earth, seasons, position of sun in the sky, position of sun with respect to the center of the earth - Concept of time, equation of time, solar time, standard time, Role of atmosphere on solar radiation, air mass, terrestrial spectrum, prediction of solar radiation - Diffuse and direct radiation, derivation of the relationships between angles - Sign conventions, angle of incidence o on a tilted plane, shading, sun-path diagram, overhangs, parallel rows of solar collectors, measurement of radiation - Estimation of total irradiance on a tilted surface, radiation augmentation							
Module 2	Solar Collectors	Assignment	Data Collection/Excel				15 Sessions
Topics: Flat plate collector, thermal analysis, heat removal factor							

Air heaters, thermal analysis of air heaters, overview of other thermal collectors, testing procedure
Single axis tracking, concentrating collectors, theoretical limit, classifications of concentrators Parabolic trough collector, thermal analysis, compound parabolic concentrators, parabolic dish collector, central receiver tower
Assignment: Study of solar collectors for Indian scenario

Module 3	Friction on Rigid Bodies	Assignment	Design	15 Sessions

Topics:
Non-thermal routes for solar energy conversion, Basics of photovoltaic effect, Electron-hole carrier formation and motion Band bending, photovoltaic generation, P-N junction diode, forward Bias, reverse bias Dark current, light-generated current, IV characteristic curve for P-N junction diodes, efficiency, effect of temperature intensity and spectrum, Comparative discussion on different solar conversion technologies in the state of the art form and the future directions
Assignment: Design of PV system for one of the labs of Presidency University

Targeted Application & Tools that can be used:
Application in renewable energy industries
Professionally used software – Excel

Text Book
T1 - Solar Engineering of Thermal Processes, 4th Ed, Duffie and Beckman,Wiley
T2 - Solar Energy, 4th Ed, Sukhatme and Nayak, McGraw-Hill Education
T3 - Solar Photovoltaics, 3rd Ed, Solanki, PHI learning pvt. Ltd.

References
R1 - Solar Energy Engineering, 2nd Ed, Kalogirou, Academic Press
R2 - Solar Energy, 1st Revised ed, Garg- Prakash, McGraw-Hill Education
Weblinks:
W1.
https://presiuniv.knimbus.com/user#/searchresult?searchId=solar%20energy%20conversion&curPage=0&layout=list&sortFieldId=none&topresult=false&source_type_code=eBook

Topics relevant to "EMPLOYABILITY SKILLS": Flat plate collector, thermal analysis, Air heaters, Single axis tracking, concentrating collectors, Parabolic trough collector and central receiver tower for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	**Mr. Pranay Nimje**
Recommended by the Board of Studies on	15th BOS and the Date of BOS 22/07/22
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

Course Code: MEC3096	**Course Title: Product Design in RAC** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T- P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	MEC2506					
Anti-requisites	NIL					
Course Description	This course will lead to an understanding of refrigeration and air-conditioning products, the components within these products, familiarity with selection parameters for the components and an appreciation of environmental impact of design choices. The course includes a case study to illustrate the process of design leading to a successful product in market.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Product Design in RAC**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall able to CO1] Analyse, evaluate and compare the performances of complex vapor compression systems. CO2] Evaluate the various sources of heat load on buildings and perform a heat load estimate. CO3] Design summer and winter air conditioning systems. CO4] analyses different AC system i.e. railways, telecom cooling system					
Course Content:						
Module 1	Introduction	Assignment	Mathematical	10 sessions		
Topics: Introduction to the design process in general and for Ref. & AC in particular. Applied Thermodynamics as a design tool. Refrigerants and their properties, energy efficiency and environmental considerations, Practical aspects .						
Module 2	Ref. system Components & their types	Assignment	Mathematical	10 sessions		
Topics: compressors, condensers, evaporators, expansion devices. Working principle of the components and unique feature						
Module 3	Selection of components	Assignment	Mathematical	12 sessions		
Topics: election of components for an intended design. Balancing the diversity of design objectives and optimization. Appreciation of the diverting in operating parameters in real applications and incorporation of controls and safety components.						

Module 4	Product design	Assignment	Mathematical	12 sessions
Topics: Product design - New product launch – Performance testing, reliability, safety, Case studies etc.				
Targeted Application & Tools that can be used: Application Area is Refrigeration and Air Conditioning Industries, Aerospace, Data Center cooling. Industries using above applications and tools –such as Carrier, Trane, LG, Samsung, Voltas, Blue star, Emerson, Danfoss etc.				
Text Book 1. Dossat, R.J., Principles of refrigeration, Dorling Kingsley (2008). 2. Stoecker, W. F., Refrigeration and Air conditioning, McGraw Hill (1986).				
References 3. Goshnay, W.B., Principles and Refrigeration, Cambridge University Press (1982). 4. Langley, B. C., Solid State Electronic Controls for HVACR, Prentice Hall (1989). 5. Arora, S. C. and Domkundwar, S., A Course in Refrigeration and Air Conditioning, DhanpatRai (1997). **Topics for Technology Enabled Learning:** https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_1106				
Topics relevant to "EMPLOYABILITY SKILLS": VCRS Pant Design, Cooling Tower Design for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout				
Catalogue prepared by	Dr. Devendra Singh Dandotiya			
Recommended by the Board of Studies on	15th BOS and the Date of BOS 29/07/22			
Date of Approval by the Academic Council	PU/AC18.6/MEC15/MEC/2021-2025/2022			

Course Code: **MEC3431**	**Course Title: Mechanical Vibrations** **Type of Course:** **1] Professional Elective Course 2] Theory**		**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	MAT1211					
Anti-requisites	NIL					
Course Description	This Course includes: governing equations of motions using Newton's laws of motion and energy principles, effective springs and masses, free and forced vibration with and without damping of linear systems with one and two degree of freedom, vibration isolation, modal analysis, and vibration problems in multi degrees of freedom systems. The associated laboratory provides an opportunity to validate the concepts Taught and enhances the ability to visualize the real system performance.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Mechanical Vibrations**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Explain the basics concepts of single degree of freedom systems. CO2. Predict the responses of damped single degree freedom system. CO3. Solve numerical examples on vibration system under harmonic excitation. CO4. Employ different methods to determine the natural frequencies of multi-degree freedom systems.					
Course Content:						
Module 1	Free un-damped vibration of Single Degree of Freedom Systems	Assignment	Programming Task, Data Analysis task	10 sessions		
Topics: Introduction, Basic concepts of vibration, Classification of Vibration, Characteristics of Simple Harmonic motion. Fourier series. Single degree freedom system, Free Vibration of an Undamped Translational System, Free Vibration of an Undamped Torsional System. Simple problems using MATLAB.						
Module 2	Free damped Vibration of Single-Degree-of-Freedom Systems	Quiz	Analytical thinking	12 Sessions		
Topics: Types of damping, Free Vibration with Viscous Damping, Free Vibration with Coulomb Damping. Simple problems using MATLAB.						
Module 3	Forced vibration of		Data Collection and	11		

	SDOFS	Assignment	Analysis	Sessions
Topics: Response of an Undamped and damped System under Harmonic excitation, Response of a Damped System under the Harmonic Motion of the Base. Critical speed. Simple problems using MATLAB.				
Module 4	Multi degree of freedom Systems	Assignment	Data Collection and Analysis	12 Sessions
Topics: Two-Degree-of-Freedom Systems, Continuous Systems - Longitudinal Vibration of a Bar, modal analysis, Holzer's method and Dunkerley's method-. Simple problems using MATLAB.				
Targeted Application & Tools that can be used: Application Area is suspension design of vehicles, aerospace, automobile kinematics and dynamics, vibration of machines. Professionally Used Software: MATLAB				
Project work/Assignment:				
Project Assignment: Carry out half car model study of different chassis used in Automobiles in India Assignment 1: Collect the data for dampers of your vehicle. Plot the transmissibility component of the same Engine				
Text Books **T1** W. T. Thomson, "***Theory of Vibration with application***," Pearson **T2** Singeresu S. Rao ***Mechanical Vibration*** 5th edition Prentice Hall, Pearson				
References **R 1** Leonard Meirovutch ***"Engineering Vibration,"*** Indian Edition **R 2** William Seto ***"Mechanical Vibration"*** Schaum Series **R 3** Rao V. Dukkipati, MATLAB An Introduction with Applications, https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_2609				
Topics relevant to "EMPLOYABILITY SKILLS": Kinetics: Force, mass and acceleration in Newton's second law of motion, work and energy, impulse and momentum for rigid bodies for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout				
Catalogue prepared by	Mr. Kunwar Chandra Singh			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025			

Course Code: **MEC3050**	**Course Title: Experimental Stress Analysis** **Type of Course:** **1] Professional Elective Course** **2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	MEC2505					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to appreciate the need for Strain gauge and Strain gauge Rosettes, Nature of light, 2-D & 3-Dimensional Photo elastic Analysis, Bire fringent coating and Introduction to holography. The course develops the critical thinking and analytical skills. The course also enhances the abilities through assignments.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1] Explain the different types of strain gauges and its arrangement CO2]Compute the stress and strain behavior of mechanical components using electrical strain gauges CO3] Compute the Photo elastic analysis with various techniques CO4] Explain the principles of circular polariscope					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of "**Experimental Stress Analysis**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Module 1	Electrical Strain Resistance Gauges	Assignment	Demonstration of the Experiment	12 sessions		
Topics: Introduction, Strain sensitivity in metallic alloys, Gage construction, Adhesives and mounting techniques, Gage sensitivity and gage factor ,Performance' Characteristics, Strain Gage circuits: Potentiometer, Wheatstone's bridges,						
Module 2	Strain Analysis:	Assignment	Case study	08 sessions		
Topics: Two element, three element rectangular and delta rosettes, Correction for transverse strain effects, Stress gage, Plane shear gage, Stress intensity factor gage.						
Module 3	Photoelastic Analysis and coatings	Assignment	Analysis of Photo elastic Models using Ansys Software	20 sessions		
Topics: Nature of light, Wave theory of light - optical interference, Stress optic law –effect of stressed model in plane and circular polariscopes, Isoclinics &Isochromatics, Fringe order determination Fringe multiplication techniques , Calibration photoelastic model materials Separation methods:						

Shear difference method, Analytical separation methods, Model to prototype scaling, Properties of 2D photoelastic model materials, and Materials for 2D photoelasticity.

Targeted Application & Tools that can be used:

Application Area is **HBK** Company selling and testing of Photo elastic models
Octagon company conducts Experimental Stress Analysis With using Strain Gauges During Load Tests On Door Fittings
Carryout the analysis using **Ansys Software**

Text Books

(i) Text Book (s) :

T1 - Experimental stress analysis: L.S. Srinath, M.R. Raghavan, K. Lingaiah, G. Gargesh, K. Ramachandara & B. Pant, Tata McGraw Hill publication 2000
T2 - Experimental stress analysis by Dally & Riley, Tata McGraw Hill Publication 2001.

References

R1 - "Analysis of stress and strain": A.J. Duraelli, E.A. Phillips and C.H. Trao McGraw Hill, 1958
R2 - "Applied stress analysis": A.J. Durelli, prentice hall India, 1970
R3 - "Hand Book of experimental mechanics": A.S. Kobayassin (Ed.,) SEM/ VCH, 2ndedition. 2000

(iii) Web-Resources:

W1: http://www.nptelvideos.in/2012/12/experimental-stress-analysis.html
W2: Experimental Stress Analysis by Prof.K.Ramesh, Department of Applied Mechanics,IIT Madras. For more details on NPTEL https://presiuniv.knimbus.com/user#/searchresult?searchId=experimental%20stress%20analysis&_t=1656570565499
W3: "Materials Engineering, Engineering and Technology" https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=ELEARNING864

Topics relevant to "EMPLOYABILITY SKILLS": Calibration photo elastic model materials Separation methods: Shear difference method, Analytical separation methods, Model to prototype scaling, Properties of 2D photoelastic model materials, and Materials for 2D photo elasticity for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout

Catalogue prepared by	Dr Yuvaraja Naik
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 29/07/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

Course Code: **MEC4010**	**Course Title: Product Lifecycle Management** **Type of Course: 1] Professional Elective Course** **2] Laboratory Integrated**	**L-T-P-C**	2	0	2	3
Version No.	1.0					
Course Pre-requisites	NIL					
	NIL					
Course Description	This course introduces Product Lifecycle Management process and methods which aim to emphasize the importance of product data creation, processing, storage, transformation and reuse to aid in decision making process. The course covers wide range of industry oriented case studies on different aspects of product management to strengthen the belief of Product Lifecycle Management. The principal constituents of PLM covered are Product Lifecycle Process, Work flow, CPD, Engineering Change Management, Digital Manufacturing and PLM, PLM Strategy and Assessment. Entire course runs both on class room lectures and hands on training. This course is designed to give a holistic view on PLM. This course also incorporates training on PLM tool 'Teamcenter13'					
Course Outcomes	On successful completion of this course the students shall be able to: CO1] Describe different processes associated with Product Lifecycle. CO2] Describe environment, drivers and PLM elements. CO3] Deploy Engineering Change Management process. CO4] Design Bill of Materials. CO5] Deployment of Work flow on Team center**.**					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Product Lifecycle Management**" and attain **EMPLOYABILITY SKILL** through Experiential learning techniques					
Course Content:						
Module 1	Introduction to Product Life Cycle Management (PLM)	Assignment	Data Collection and Analysis	8 sessions		
Topics: **Lecture:** Definition, PLM Lifecycle Model, Threads of PLM, Need for PLM, Opportunities and Benefits of PLM, Views, Components and Phases of PLM, PLM feasibility Study, PLM Visioning. **Hands-on:** Introduction to Teamcenter13, Perspective, Views, Navigation Pane, Primary, Secondary, Configure applications, Perspective and Views customization.						
Module 2	PLM Concepts, Processes and Workflow	Case Study	Data analysis task	10 sessions		
Topics: Characteristics of PLM, Environment Driving PLM, PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM. **Collaborative Product Development:** Engineering Vaulting, Product Reuse, Smart Parts, Engineering Change Management**.**						

Hands-on: My Teamcenter**:** Item creation, Item revision, Item configuration, Views of items, Item data reuse, Item data vaulting, Item data transformation.

Module 3	Collaborative Product Development	Assignment	Data Collection and Analysis	10 sessions

Topics:
Bill of Materials and Process Consistency, Design for Environment, Virtual Testing and Validation, Marketing Collateral.
Hands-on: Change Management: ECN, ECR
Structure Manager: BOM creation, BOM revision, Revision rules.
Workflow Designer: Design

Module 4	Digital Manufacturing – PLM	Assignment	Case study/Data Analysis	10 sessions

Topics: Digital Manufacturing, Benefits of Digital Manufacturing, Manufacturing the First-One, Ramp Up, Virtual Learning Curve, Manufacturing the Rest, Production Planning.
Hands-on: Query Builder, Organization, Access Manager, BMIDE, Architecture 2T & 4T

Module 5	Developing a PLM Strategy and Conducting a PLM Assessment	Assignment	Simulation/Data Analysis	08 sessions

Strategy, Impact of strategy, implementing a PLM strategy, PLM Initiatives to Support Corporate Objectives, Infrastructure Assessment, Assessment of Current Systems and Applications

Targeted Application & Tools that can be used:

Application Area is in all IT industries who provide services for Product Lifecycle Management, Software Requirement: Team Center by Siemens.

Text book

T1. Product Lifecycle Management: Grieves, Michael, McGraw-Hill Publications, Edition 2013, ISBN: 978-0071452304.
T2. Product Lifecycle Management Volume I: Stark, John, Springer, 3rd Edition, 2016, ISBN: 978-3319174396.

References

R1.Fabio Guidice, Guido La Rosa, Product Design for the environment -A lifecycle approach, Taylor and Francis 2013, ISBN:978-1420001044
R2.Robert J.Thomas, "NDP: "Managing and forecasting for strategic processes", Wiley Publications, 2013 ISBN:978-0471572268
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_2609

Topics relevant to "EMPLOYABILITY SKILLS": PLM software "TeamCentre" utilized to learn PLM concept for developing **EMPLOYABILITY SKILLS** through **Experiential Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Sandeep G M
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 29/07/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022

Course Code: **MEC3053**	**Course Title: Theory of Elasticity** **Type of Course: 1] Professional Elective Course** **2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	MEC2500					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to understand the importance of the behavior of components in 3-dimnesional environment and practical application of theory of elasticity. Using Elasticity in the design process enables to attain more efficient structure as it can provide accurate values for the stress, strains and Displacements even for structures of complicated geometries and loadings.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of " **Theory of Elasticity** " and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Solve problems related to elasticity CO2. Apply numerical methods to solve continuum problems. CO3. Apply different principles to solve the 3 dimensional problems. CO4. Reduce the computation effort by adopting the axisymmetric method. CO5. Solve the problem related to thermal loading.					
Course Content:						
Module 1	Analysis of Stress:	Assignment	Programming Task, Data Analysis task	10 sessions		
Topics: Definition and notation of stress, Equations of equilibrium in differential form, Stress components on an arbitrary plane, Equality of cross shear, Stress invariants, Principal stresses						
Module 2	Analysis of Strain:	Case Study	Simulation and data analysis task	10 sessions		
Topics: Strain invariants, Principal strains, Octahedral strains, Plane state of strain, Compatibility equations, Strain transformation. Principle of super position, Saint Venant principle.						
Module 3	Plane Stress And Plane Strain Problems	Assignment	Data Collection and Analysis	10 sessions		
Topics: Airy's stress function, Bi-harmonic equations, Polynomial solutions, Simple two-dimensional problems in Cartesian coordinates like bending of cantilever and simply supported beams, etc.						
Module 4	Polar Coordinates &	Assignment	Simulation/Data Analysis	15 sessions		

	Thermal Stress			

Equations of equilibrium, Strain displacement relations, Stress – strain relations, Axi – symmetric problems, Kirsch, Michell's and Boussinesque problems.

Targeted Application & Tools that can be used:

Application area of theory of elasticity in Design of structure buildings, machines, and cars, aircrafts, satellites, and the space shuttle, Biomedical.

Text Book (s)

T1. S. P. Timoshenko and J. N Gordier, "Theory of Elasticity" Mc-Graw Hill International 3rd edition, 20102.

T2. L. S. Srinath, "Advanced Mechanics of solids", Tata Mc. Graw Hill 2009

References (s)

R1: The Theory of Elasticity,Bruce K. Donaldson,2012 Cambridge University Press , Cambridge University Press - eBooks

R2: Elements of the theory of elasticity, Enrico Gnecco, Ernst Meyer 2015,Cambridge University Press , Cambridge University Press - eBooks

Weblinks:

https://archive.nptel.ac.in/courses/105/105/105105177/

W1:https://presiuniv.knimbus.com/user#/searchresult?searchId=Theory%20of%20Elasticity&curPage=1&layout=list&sortFieldId=none&topresult=false

Solving the Mixed Problem of Elasticity Theory with Mass Forces for Transversal-Isotropic Body, D. A.Ivanychev 2020 2nd International Conference on Control Systems, Mathematical Modeling, Automation and Energy efficient

W2:https://presiuniv.knimbus.com/user#/searchresult?searchId=Theory%20of%20Elasticity&curPage=2&layout=list&sortFieldId=none&topresult=false

Three-dimensional Problems of the Theory of Elasticity. By A. I. Lur'e.1964. (Interscience Publishers)

R. J. Knops 2016 The Mathematical Gazette , Cambridge University Press

Topics relevant to "EMPLOYABILITY SKILLS": Theory of elasticity in Design of structure buildings, machines, and cars, aircrafts, satellites, and the space shuttle for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. YUVARAJA NAIK
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 22/7/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

Course Code: MEC3054	**Course Title: Theory of Plasticity** **Type of Course:** **1] Professional Elective Course** **2] Theory**	**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	2.0					
Course Pre-requisites	MEC2505					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to learn the current state of the plasticity theory, and then to show the fascinating possibility of this promising branch of solid mechanics. Many applications in mechanics, material science and technology require a comprehensive understanding and reliable representation of the elastoplastic behavior observed in a large class of engineering materials. The course develops the critical thinking and analytical skills. The course also enhances the abilities through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Theory of Plasticity**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Understand the stress, deformation, deformation, relationship between stress and deformation and plastic deformation in solids. CO2. Understand plastic stress/deformation relationships and flow rules. CO3. Perform stress analysis in beams and bars including Material nonlinearity CO4. Analyze the performance of a material according to different efficiency theories for a given state of plastic strain and deformation of metals in engineering problems.					
Course Content:						
Module 1	Fundamentals of Elasticity	Assignment	seminar	12 sessions		
Topics: Basics Concept of stress, stress invariants, principal Stresses, octahedral normal and shearstresses, spherical and deviatoric stress,stress transformation; concept of strain,engineeringandnaturalstrains, octahedralstrain,deviator and spherical strain tensors, strain rate and strain rate tensor, cubical dilation, generalized Hooke's law, numerical problems.						
Module 2	Permanent Deformation of Metals	Assignment	Case Study	08 sessions		
Topics: Plastic Deformation of Metals: Crystalline structure in metals, mechanism of plastic deformation, factors affecting plastic deformation, strain hardening, recovery, re crystallization and grain growth, flow figures or Luder's cubes. Yield Criteria: Introduction, yield or plasticity conditions, Von Mises and Tresca criterion, geometrical representation						
Module 3	Stress Strain Relations:	Assignment	Analysis using suitable software	12 sessions		

Topics: Idealised stress-strain diagramsfor different material models, empirical equations, Levy-VonMises equation, Prandtl-Reuss and SaintVenant theory, and experimental verification of Saint Venant's theory of plastic flow. Concept of plastic potential, maximum work hypothesis,				
Module 4	Bending of Beams, Torsion of Bars and Slip Line Field Theory	Assignment	Experimental Investigation	12 sessions
Topics: Beams: Stages of plastic yielding, analysis of stresses, linear and nonlinear stress strain curve, problems. Torsion of various shaped bars - Pure torsion of prismatic bars - Prandtle's membrane analogy - Torsion of thin walled tubes and hollow shafts.				
Targeted Application & Tools that can be used: Application Area is NAL, ISRO Bangalore Analysis of Structural members like beams, bars, plates and trusses Professionally Used Software: **Ansys Software, Abacus.**				
Text Book (s) T1. Timoshenko and Goodier, (2000), Theory of Elasticity, McGraw Hill Company, New York T2. Theory of Plasticity and Metal forming Process"-Sadhu Singh, Khanna Publishers, Delhi				
References(s) R1. "Engineering Plasticity-Theory and Application to Metal Forming Process" -R.A.C. Slater, McMillan Press Ltd. R2. "Basic Engineering Plasticity", DWA Rees, 1st Edition, Elsevier. **Weblinks:** W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_17535				
Topics relevant to "EMPLOYABILITY SKILLS": Stages of plastic yielding, analysis of stresses, linear and nonlinear stress strain curve for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by	Dr Yuvaraja Naik			
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 22/07/2022			
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.			

Course Code: **MEC3436**	**Course Title:** **Tribology** **Type of Course:** **Discipline elective & Theory only**		**L-T-P-C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to appreciate the need for lubrication and bearings in mechanical power transmission system. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments.					
Course objectives	To equip students with a strong foundation in the principles of tribology and enhance their problem-solving and analytical skills to meet industry demands in power transmission, automotive systems, and surface engineering.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: Explain the fundamentals of friction, wear, and lubrication in mechanical systems. CO2: Apply Reynolds' equation to solve tribological problems in full film lubrication. CO3: Analyse lubrication regimes and their influence on tribo-system performance. CO4: Select appropriate lubricants and materials for specific tribological applications. CO5: Interpret tribological test data and apply computational methods for surface interaction analysis.					
Course Content:						
Module 1	Fundamentals of Tribology	Quiz	Critical thinking task	9 sessions		
Topics: Introduction to Tribology: Friction, Wear, Lubrication Historical development of tribology Contact mechanics: Real vs apparent contact area Types of wear: Adhesive, abrasive, corrosive, fatigue						
Module 2	Lubrication Mechanisms	Quiz	Critical thinking task	9 Sessions		
Topics: Lubrication regimes: Boundary, mixed, and hydrodynamic Film formation and thickness Viscosity and its significance Effects of surface roughness and operating conditions on lubrication						
Module 3	Reynolds Equation and Fluid Film Lubrication	Assignment	Computing and data interpretation task using MATLAB	9 Sessions		
Topics:						

Derivation of Reynolds' Equation Assumptions and limitations Pressure distribution and load capacity 1D and 2D numerical solutions using MATLAB Application to slider and pad models				
Module 4	Lubricants and Tribo-Materials	Assignment	Data collection and Analysis	9 Sessions
Topics: Types of lubricants: Mineral oils, synthetics, greases, solid lubricants Lubricant additives and their functions Properties of lubricants: Viscosity index, flash point, oxidation stability Tribo-materials: Surface treatments and coatings Material compatibility and selection for low-wear applications				
Module 5	Surface Engineering and Tribological Testing	Assignment	Data collection and Analysis	9 Sessions
Topics: Surface roughness characterization Tribological test methods: Pin-on-disc, Four-ball wear test Tribology in MEMS/NEMS, biomedical devices, automotive systems Wear mapping and failure analysis Introduction to nano-tribology				
Targeted Application & Tools that can be used: MATLAB for Reynolds equation modeling Tribology-specific experimental datasets for analysis Application area: Automotive, bio-implants, machinery maintenance				
Text book: 1. V B Bhandari, "Design of machine elements", Tata McGraw-Hill, Fourth Edition, 2011 2. Bernard J. Hamrock, Steven R. Schmid, Bo O. Jacobson, "Fundamentals of fluid film lubrication" Marcel Dekker, second edition, 2004				
References 1. Ming Qiu, Long Chen, Yingchun Li, Jiafei Yan, "Bearing tribology", Springer-Verlag Berlin Heidelberg, 1st Edition, 2017. 2. Michael M. Khonsari, E. Richard Booser, "Applied Tribology: Bearing Design and Lubrication: Bearing Design and Lubrication", third Edition, 2017 3. https://nptel.ac.in/courses/112/102/112102015/ 4. https://presiuniv.knimbus.com/openFullText.html?DP=http://www-sciencedirect-com-presiuniv.knimbus.com/science/journal/0301679X				
Topics relevant to "EMPLOYABILITY SKILLS": Reynolds equation, bearing design for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through the assessment component mentioned in the course handout				
Catalogue Prepared by	Mr. Sandeep G M			
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025			
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025			

Course Code: MEC3051	**Course Title: Fracture Mechanics** **Type of Course: 1] Professional Elective Course Theory**	**L-T- P- C**	3	0	0	3
Version No.	2.0					
Course Pre-requisites	MEC2505					
Anti-requisites	NIL					
Course Description	The objective of this course is to introduce the mathematical and physical principles of fracture mechanics and their applications to engineering design to develop the ability in students to compute the stress intensity factor, strain energy release rate, and the stress and strain fields around a crack tip for linear and nonlinear materials. It will also expand the students' knowledge on experimental methods to determine the fracture toughness and develop the students understanding on the design principle of materials and structures using fracture mechanics approaches.					
Course objectives	The objective of the course is to familiarize the learners with the concepts of " **Fracture Mechanics**" and attain **EMPLOYABILITY SKILL** through Participative learning techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Identify the basic fracture and fatigue mechanisms CO2. Understand crack resistance and energy release rate for crack criticality. CO3. Apply Linear Elastic Fracture Mechanics on brittle materials. CO4. Understand the relationship between crack tip opening displacement, SIF, ERR and application of such parameters for ductile and brittle materials CO5. Determine the critical values of parameters at crack tip using experimental techniques					
Course Content:						
Module 1	Introduction	Assignment	Programming Task,		10 sessions	
Topics: Introduction to Fracture Mechanics: Stress-Strain Curve, Elements of dislocation theory, Historical perspective, Stress Concentration effect of flaws, Fracture Mechanics approach to design, Effect of material properties on fracture, Cleavage, Brittle and Ductile fracture, ductile brittle transition, modes of fracture failure, Fatigue and stress corrosion crack growth, Damage tolerance.						
Module 2	Linear Elastic Fracture Mechanics	Case Study	Simulation and data analysis task		10 sessions	
Topics: An atomic view of fracture, Griffith Energy Balance, Energy release rate, instability and the R Curves, compliance, tearing modulus, Stress and Displacement field in isotropic elastic materials.						
Module 3	Elastic-Plastic Fracture Mechanics	Assignment	Data Collection and Analysis		15 sessions	
Topics: Crack tip deformation and plastic zone size, plane stress vs plane strain, effective crack length, Irwin plastic zone correction, Dugdale approach, effect of plate thickness.						

J Contour Integral: Relevance and scope, J as a path-independent line integral, J as a stress intensity parameter, Stress-Strain relations, J-Controlled fracture, Laboratory measurement of J, Crack Tip Opening Displacement (CTOD), Relationship between CTOD, K and G, Equivalence between CTOD and J, Determination CTOD from strip yield model, HRR Singularity

Module 4	Fatigue Fracture	Assignment	Simulation/Data Analysis	10 sessions

Topics: Introduction to fatigue, factors affecting fatigue performance, fatigue loading, constant and variable amplitude loading, some characteristics of fatigue crack, Paris Law
Numerical modelling by using k-e equations.

Targeted Application & Tools that can be used:

Application Area is Fracture Data collection, Automobile & Aerospace companies such as Boeing, Airbus, and Lockheed Martin etc.
Professionally Used Software: Matlab, SolidWorks & Ansys.

Text Book (s) :

T1: Anderson T.L., Fracture Mechanics Fundamentals and Applications, CRC Press, Second edition, 1994
T2: Kumar Prashant, Elements of Fracture Mechanics, Wheelers Publishing Co. Ltd India, Second edition, 2010

References(s)

R1: Kumar Prashant, Elements of Fracture Mechanics, Wheelers Publishing Co. Ltd India, Second edition, 2010
R2: Hertzberg Richard W., Deformation and Fracture Mechanics of Engineering Materials, Wiley India, Fourth Edition, 1996
Weblinks:
https://nptel.ac.in/courses/112/106/112106065/
W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2123
"**Engineering Fracture Mechanics,** Materials Engineering, Engineering and Technology, Science Direct,"
W2:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NIFTEM_CUSTOM_2315
"Theoretical and Applied Fracture Mechanics", Science Direct

Topics relevant to "EMPLOYABILITY SKILLS": Crack Tip deformation, material characterization for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	**Mr. Prashanth S P**
Recommended by the Board of Studies on	15th BoS held on 22/07/2022
Date of Approval by the Academic Council	18th Meeting of the Academic Council held on 03rd August, 2022

Course Code: MEC3049	**Course Title: Mechanics of Composite Materials** **pe of Course: Professional Elective Course 2] Theory**		**L- T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	Introduction to composite Materials, Fiber Reinforced Plastic Processing, Applications and Mechanics of Fiber Reinforced Plastics, Characteristics of Fiber-Reinforced lamina, Laminated structure, Metal Matrix Composites, Fabrication Process for MMC's and Study Properties of MMC's, Micromechanics and Macro-mechanics of lamina and Failure theories.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Mechanics of Composite Materials** " and attain **EMPLOYABILITY SKILLS** through Problem Solving methodologies					
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Describe the various techniques of manufacturing metal matrix and fiber reinforced composites. CO2. Compute the Various Elastic Properties Using the Micromechanics Principle. CO3. Compute the Various Elastic Properties Using the Macromechanics Principle. CO4. Describe the Various Failure Theories and Methods Involved in Recycling of Composite Materials.					
Course Content:						
Module 1	Introduction to Composite Materials:	Assignment	Data Collection	08 Sessions		
Introduction to Composite Materials: Definition and classification of composite materials: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon-Carbon Composites. Reinforcements and Matrix Materials. **Manufacturing Techniques of Composites:** **Fiber Reinforced Plastic (FRP) Processing:** Layup and curing, fabricating process, open and closed mould process, Hand layup method, filament winding, pultrusion, pulforming, thermo-forming, injection molding, blow molding. **Fabrication Process for Metal Matrix Composites (MMC's):** Powder metallurgy technique, liquid metallurgy technique and secondary processing, special fabrication techniques.						
Module 2	**Micromechanics of Composites:**	Case Study	Data collection	15 Sessions		
Density, Mechanical Properties; Prediction of Elastic Constants, Micromechanical Approach, Halpin-Tsai Equations, Transverse Stresses. Thermal Properties; Expression for Thermal Expansion Coefficients of Composites, Expression for Thermal Conductivity of Composites. Mechanics of Load Transfer from Matrix to Fiber; Load transfer in Particulate Composites.						
Module 3	**Macromechanics of Composites:**	Case Study	Data collection	12 Sessions		

Elastic Constants of an Isotropic Material, Elastic Constants of a Lamina, Relationship between Engineering Constants and Reduced Stiffnesses and Compliances, Variation of Lamina Properties with Orientation, Analysis of Laminated Composites, Stresses and Strains in Laminate Composites, Inter-laminar Stresses and Edge Effects. Numerical Problems.				
Module 4	Monotonic Strength and Fracture	Assignment	Data Collection	10 sessions
Tensile and Compressive strength of Unidirectional Fiber Composites. Fracture Modes in Composites; Single and Multiple Fracture, Debonding, Fiber Pullout and Delamination Fracture. Strength of an Orthotropic Lamina; Maximum Stress Theory, Maximum Strain Criterion, Tsai-Hill Criterion, Tsi -Wu tensor theory. Comparison of Failure Theories. **Failure Analysis and Design of Laminates:** Special cases of Laminates; Symmetric Laminates, Cross-ply laminates, Angle ply Laminates, antisymmetric Laminates, Balanced Laminate.				
Text Book Composite Science and Engineering by K.K. Chawla Springer Verlag 1998				
References 1. Engineering Mechanics of Composite Materials, Second Edition, Issac M Daniel, Ori Ishai. 2. Mechanics of Composite Materials, Robert M.Jones, McGraw Hill Kogakusha Ltd.1998. 3. Mechanics of composites by Autar K Kaw, CRC press.2002. Web links: 1. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=SPRINGER4_2168 2. https://presiuniv.knimbus.com/user#/searchresult?searchId=introduction%20to%20composite%20materials&_t=1655967300201				
Topics relevant to "EMPLOYABILITY SKILLS": Layup and curing, fabricating process, open and closed mould process, Hand layup method, filament winding, pultrusion, pulforming for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.				

Catalogue prepared by	Dr. Yuvaraja Naik
Recommended by the Board of Studies on	11th BOS held on 05/09/2020
Date of Approval by the Academic Council	No.14, 24/12/2020

Course Code: MEC3075	**Course Title: Automotive Body Design** **Type of Course:** **1] Professional Elective Course 2] Theory**		**L-T-P-C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course will introduce students into the both strength and looks required for a vehicle. This course is designed to acquaint the students with little deeper knowledge on vehicle body design. This involves design of Chassis, body cover and ergonomics.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Automotive Body Design**" and attain **EMPLOYABILITY SKILL** through Problem solving methodologies.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1- Understand different design principles and methodologies CO2- Discuss on Chassis and their types CO3-Disuss on body design. CO4- Discuss on body ergonomics					
Course Content:						
Module 1	Basic Design Principles	Assignment	Assignment	10 Sessions		
Topics: Design Methodologies. Types of engines, Basic Engine components and Engine Nomenclature. Vehicle body design parameters. Types of vehicles and their body shapes and specifications.						
Module 2	Design of Chassis	Assignment	Assignment	12 Sessions		
Topics: Chassis – Definition and importance**.** Design parameters and concepts. Application of these to simple body designs. Case studies.						
Module 3	Body materials and design	Assignment	Assignment	10 Sessions		
Topics: Different materials that can be used for body structure, their strengths and weaknesses. Body structure and contours. Methods to check the feasibility of body designs.						
Module 4	Body building and ergonomics	Case study	Case study	10 Sessions		

Topics:
Necessity and importance of bodybuilding. Implementation of principles of ergonomics. Different techniques adopted. Case study.

Targeted Application & Tools that can be used:
Application areas are vehicle manufacturing and body building.
Tools used: CFD software

References
R1: R. N. Bahl, "*Automobile Design*", Dreamtech publishers through Wiley
R2**:** Kirpal Singh: "*Automobile Engineering I & II*", Standard Publishers and Distributors.

E resources:
https://presiuniv.knimbus.com/user#/searchresult?searchId=machine%20elements&_t=1656917902483
https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=iih&AN=124896850&site=ehost-live

Topics relevant to "EMPLOYABILITY SKILLS": Design parameters and concepts. Application of these to simple body designs body structure and contours. Methods to check the feasibility of body designs for developing **EMPLOYABILITY SKILLS** through **Problem Solving methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by	Dr. Udaya Ravi Mannar
Recommended by the Board of Studies on	15th BoS held on 22/07/2022
Date of Approval by the Academic Council	18th Meeting of the Academic Council held on 03rd August, 2022

<table>
<tr><td>Course Code:
MEC3440</td><td colspan="2">Course Title: Fixed Equipment in Oil and Gas Industry
Type of Course: Discipline Elective</td><td>L- T-P- C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="7">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="7">NIL</td></tr>
<tr><td>Course Description</td><td colspan="7">This course introduces engineering students and professionals to the core concepts and practices surrounding fixed equipment used in the Oil & Gas industry. With a focus on pressure vessels, columns, heat exchangers, and valves, the course combines fundamentals with industrial standards like ASME, API, and TEMA. Learners will gain hands-on exposure to equipment safety, design basis, metallurgy, and inspection methodologies. Emphasis is placed on safety relief mechanisms, industrial damage assessment, welding, and fabrication. Training is designed to enhance familiarity with the lifecycle performance of static equipment and instill confidence in code-based evaluation and troubleshooting techniques.</td></tr>
<tr><td>Course Objective</td><td colspan="7">The objective of the course is to familiarize the learners with the concepts of “Fixed Equipment in Oil & Gas Industry” and attain EMPLOYABILITY SKILLS through Problem solving methodologies</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">On successful completion of this course the students shall be able to:

CO1: Explain the function of static equipment and apply basic design criteria relevant to oil and gas operations.
CO2: Apply international codes and standards to static equipment design for different process conditions.
CO3: Evaluate the safety measures and protection mechanisms for static pressure equipment in Oil and Gas Industry.
CO4: Analyze fabrication methods and assess common damage mechanisms in static equipment.
CO5: Identify, classify and select valves for static systems based on application and performance specifications.
CO6: Interpret code-based calculation methods and verify compliance in static equipment design</td></tr>
<tr><td>Course Content:</td><td colspan="7"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to the Oil & Gas Industry and Static Equipment</td><td>Data interpretation</td><td colspan="2">Descriptive</td><td>8 sessions</td></tr>
<tr><td colspan="8">Topics:
Introduction to upstream and downstream operations in oil & gas industry – Types and roles of static equipment – Functional classification of pressure vessels, columns, and heat exchangers – Industry applications and significance – Safety standards and operational context – Overview of equipment lifecycle in refinery and petrochemical plants
Shell & tube heat exchanger and Counter & Parallel flow heat exchanger (Activity)</td></tr>
<tr><td>Module 2</td><td colspan="2">Codes and Standards in Design</td><td>Data interpretation</td><td colspan="2">Descriptive</td><td>12 sessions</td></tr>
<tr><td colspan="8">Topics:
Pressure vessel and heat exchanger classifications – Internal pressure design using UG-27 – External pressure and vacuum design – Nozzle opening and reinforcement calculations – Saddle, skirt, and support design formulas –</td></tr>
</table>

Application of ASME Section VIII Div 1 & 2 – Design margins and allowable stress limits – Use of mandatory appendices for alternative design approaches				
Module 3	Protection and Safety in Static Equipment	Case Study	Descriptive	10 sessions
Topics: Overview of ASME B31.3, API 660, and TEMA – Design criteria for internal and external pressure – Load combinations and design temperature effects – Material selection and stress limits per code – Structural thickness evaluation for piping – thin & thick cylinders – Bending equation – Flexibility and stress analysis basics – Span deflection and piping support requirements – Integration of code clauses in equipment design				
Module 4	Fabrication, Testing, and Failure Mechanisms	Case Study	Descriptive	10 sessions
Topics: Fabrication Techniques and Weld Evaluation Arc Welding, TIG Welding, MIG Welding, Spot Welding & Gas Welding (Activity) Basics of Industrial Damage Mechanisms (API 571): CUI, Wet H2S, Amine Corrosion Corrosion evaluation through Electro-chemical workstation (Activity)				
Module 5	Valves and Flow Control Components	Case Study	Descriptive	5 sessions
Topics: Introduction to API 571 damage mechanisms – Corrosion Under Insulation (CUI) – Wet H2S cracking – Amine stress corrosion – Overview of valve types and functions – API 598 valve inspection and testing standards – Valve selection for process applications – Maintenance and reliability of valves in oil & gas systems				
Targeted Application & Tools that can be used: • **Equipment Design & Inspection** • **Oil & Gas EPC Projects** • **Plant Maintenance & Safety Engineering** • **Fabrication & QA/QC** • **Asset Integrity Management**				
Textbook's 5. **Process Equipment Design – M.V. Joshi & V.V. Mahajani, Macmillan** 6. **Pressure Vessel Design Manual – Dennis R. Moss, Gulf Publishing**				
References **1. ASME Sec VIII Div 1 & 2 – Boiler and Pressure Vessel Code** **2. API 660, API 598, API 571 – American Petroleum Institute Standards** **3. TEMA Standards – Tubular Exchanger Manufacturers Association** **4. Maintenance and Reliability Best Practices – Ramesh Gulati, Industrial Press**				
Topics relevant to "Skill Development" focus on building practical competency in the design, safety, and maintenance of static equipment used in oil and gas facilities. Emphasis is placed on interpreting design codes, evaluating fabrication techniques, identifying failure modes, and selecting appropriate safety and flow control devices. Skill development is fostered through hands-on analysis, design calculation exercises, standards-based evaluations (ASME/API), and case-based learning methods, ensuring that learners are industry-ready to contribute effectively to equipment integrity, operational safety, and reliability programs.				
Catalogue prepared by	Dr. Sandeep G M			

Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3441**	**Course Title: Reliability and Maintenance in Oil and Gas Industry** **Type of Course: Discipline Elective Course**	**L- T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course introduces the principles and practices of reliability and maintenance engineering, specifically tailored for the oil and gas industry. Students will learn how to enhance asset performance, ensure operational safety, and minimize downtime through proactive maintenance strategies. The course emphasizes tools such as Reliability-Centered Maintenance (RCM), Failure Modes and Effects Analysis (FMEA), Risk-Based Inspection (RBI), and Condition-Based Monitoring (CBM). Key topics include asset integrity management, lifecycle cost optimization, and the application of digital technologies like predictive analytics and IoT in maintenance. Through practical case studies and hands-on exercises, students will gain the skills to implement effective maintenance programs that improve equipment reliability and operational efficiency in oil and gas environments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Reliability and maintenance in Oil and Gas Industry**" and attain **Employability skill** through **participative** learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Explain the fundamental concepts of reliability engineering and maintenance strategies such as RCM, RBI, FMEA, and CBM applied in the oil and gas industry. **CO2:** Explain NDE techniques (DPT, MPT, UT) and interpret their results to identify damage in components based on relevant acceptance criteria and design codes. **CO3:** Illustrate the failure patterns and root causes of equipment breakdowns using tools like RCM, risk matrix, and failure modes analysis for static and rotating equipment. **CO4:** Compare the effectiveness of maintenance programs by using performance indicators, CMMS tools (SAP, Oracle Primavera), and real-time analytics to optimize downtime and inventory. **CO5:** Analyze customized preventive, predictive, and condition-based maintenance programs integrating modern digital tools and industry standards (ISO 14224, API, PAS 55). **CO6:** Assess continuous improvement methodologies such as 5S, Kaizen, SMED, and Kanban to improve reliability, reduce setup times, and enhance plant performance.					
Course Content:						
Module 1	NDEs and it's applications	Assignment	Descriptive	8 sessions		
Topics: Various NDEs used for in-service inspection with emphasis on what kind of data/ observation each technique yields and a brief discussion on selecting the right technique for each component based on expected damage. Acceptance criteria and evaluation of results - overview and linkage to various deign codes. Die Penetrant Test, Magnetic Crack Detector Test, Ultrasonic Test (to be conducted as activity in lab)						
Module 2	Reliability - Static and	Assignment	Descriptive	16 sessions		

	Rotating Equipment			
Equipment Criticality, Reliability Cantered Maintenance, RCM methodology- Function / Functional failure / Failure modes/ Failure effects / Failure Consequence / Mitigation Strategies / Upgrade or Redesign, Failure patterns (Bathtub / wear out - Age related and Random failures), Risk Matrix (Consequence / Probability of failure), Static and rotating Equipment Strategy development. Whirling of shafts experiment, Gyroscope, balancing of rotating of masses, single rotor and double rotor systems, Porter governor, Watt governor and Journal bearing experiments to be conducted as activity				
Module 3	Planning and scheduling for outages (planned & unplanned)/ inventory planning - only concepts	Assignment	Descriptive	15 sessions
Topics: 5S System: Sort, Set in Order, Shine, Standardize, Sustain, Kaizen for Continuous Improvement, Introduction to Kanban: Pull System for Inventory Management, SMED (Single-Minute Exchange of Die) for Reducing Setup Times, Standard Work and Standard Operating Procedures (SOPs), Jidoka (Autonomation) and Quality at the Source, TPM (Total Productive Maintenance) for Reliability and Efficiency.				
Module 4	Tool Knowledge	Assignment	Descriptive	6 sessions
Topics: Primavera - Importance of digital platforms in maintenance, scheduling, and asset lifecycle Introduction to Enterprise Asset Management (EAM) and Project Management tools Overview of SAP P4, SAP HANA, and Oracle Primavera Comparison of legacy systems vs modern integrated platforms (Cloud/IoT integration) Structure of SAP for Plant Maintenance (PM) Functional Locations, Equipment Master, Task Lists SAP P4 vs SAP HANA (architecture and speed) Maintenance Planning & Execution in SAP: Notification → Work Order → Execution → Confirmation Real-time analytics with SAP HANA for downtime analysis & spare parts tracking (Primavera tool to be used)				

Targeted Application & Tools that can be used:

Application

- Asset Performance and Equipment Uptime Optimization
- Just-in-Time (JIT) Maintenance Execution
- Quality Control and Continuous Improvement in Maintenance Practices
- Reliability-Driven program

Tools

- 5W
- Kaizen
- Kanban and Primavera

Text Book's

7. **Maintenance and Reliability Best Practices**
   Author: Ramesh Gulati
   Edition: 3rd Edition
   Publisher: Industrial Press, Inc.
   ISBN: 978-0831135811

8. **Managing Maintenance Shutdowns and Outages**
   Author: Joel Levitt
   Publisher: Industrial Press
   ISBN: 978-0831135330

References

5. **SAP Plant Maintenance (SAP PM): Configuration Guide**
   Author: Karl Liebstückel
   Publisher: SAP Press
   ISBN: 978-1493215890

6. **Project Planning, Scheduling, and Control Using Primavera P6**
   Author: Paul Eastwood Harris
   Publisher: Eastwood Harris Pty Ltd
   ISBN: 978-1925185782

Topics relevant to **"Skill Development"** focus on enhancing **reliability and maintenance practices** by strengthening communication across maintenance and operations teams, reducing equipment downtime, and optimizing spare parts and asset utilization through structured approaches such as **Preventive Maintenance, RCM, and Kanban-based planning**. Skill development is fostered through participative learning techniques, with hands-on assessments and case-based evaluations as outlined in the course handout.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3441**	**Course Title: Reliability and Maintenance in Oil and Gas Industry** **Type of Course: Discipline Elective Course**	**L- T-P- C**	**3**	**0**	**0**	**3**
Version No.	1.0					
Course Pre-requisites	**NIL**					
Anti-requisites	**NIL**					
Course Description	This course introduces the principles and practices of reliability and maintenance engineering, specifically tailored for the oil and gas industry. Students will learn how to enhance asset performance, ensure operational safety, and minimize downtime through proactive maintenance strategies. The course emphasizes tools such as Reliability-Centered Maintenance (RCM), Failure Modes and Effects Analysis (FMEA), Risk-Based Inspection (RBI), and Condition-Based Monitoring (CBM). Key topics include asset integrity management, lifecycle cost optimization, and the application of digital technologies like predictive analytics and IoT in maintenance. Through practical case studies and hands-on exercises, students will gain the skills to implement effective maintenance programs that improve equipment reliability and operational efficiency in oil and gas environments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of "**Reliability and maintenance in Oil and Gas Industry**" and attain **Employability skill** through **participative** learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** **CO1:** Explain the fundamental concepts of reliability engineering and maintenance strategies such as RCM, RBI, FMEA, and CBM applied in the oil and gas industry. **CO2:** Explain NDE techniques (DPT, MPT, UT) and interpret their results to identify damage in components based on relevant acceptance criteria and design codes. **CO3:** Illustrate the failure patterns and root causes of equipment breakdowns using tools like RCM, risk matrix, and failure modes analysis for static and rotating equipment. **CO4:** Compare the effectiveness of maintenance programs by using performance indicators, CMMS tools (SAP, Oracle Primavera), and real-time analytics to optimize downtime and inventory. **CO5:** Analyze customized preventive, predictive, and condition-based maintenance programs integrating modern digital tools and industry standards (ISO 14224, API, PAS 55). **CO6:** Assess continuous improvement methodologies such as 5S, Kaizen, SMED, and Kanban to improve reliability, reduce setup times, and enhance plant performance.					
Course Content:						
Module 1	NDEs and it's applications	Assignment	Descriptive	8 sessions		
Topics: Various NDEs used for in-service inspection with emphasis on what kind of data/ observation each technique yields and a brief discussion on selecting the right technique for each component based on expected damage. Acceptance criteria and evaluation of results - overview and linkage to various deign codes. Die Penetrant Test, Magnetic Crack Detector Test, Ultrasonic Test (to be conducted as activity in lab)						
Module 2	Reliability - Static and	Assignment	Descriptive	16 sessions		

	Rotating Equipment			
Equipment Criticality, Reliability Cantered Maintenance, RCM methodology- Function / Functional failure / Failure modes/ Failure effects / Failure Consequence / Mitigation Strategies / Upgrade or Redesign, Failure patterns (Bathtub / wear out - Age related and Random failures), Risk Matrix (Consequence / Probability of failure), Static and rotating Equipment Strategy development. Whirling of shafts experiment, Gyroscope, balancing of rotating of masses, single rotor and double rotor systems, Porter governor, Watt governor and Journal bearing experiments to be conducted as activity				
Module 3	Planning and scheduling for outages (planned & unplanned)/ inventory planning - only concepts	Assignment	Descriptive	15 sessions
Topics: 5S System: Sort, Set in Order, Shine, Standardize, Sustain, Kaizen for Continuous Improvement, Introduction to Kanban: Pull System for Inventory Management, SMED (Single-Minute Exchange of Die) for Reducing Setup Times, Standard Work and Standard Operating Procedures (SOPs), Jidoka (Autonomation) and Quality at the Source, TPM (Total Productive Maintenance) for Reliability and Efficiency.				
Module 4	Tool Knowledge	Assignment	Descriptive	6 sessions
Topics: Primavera - Importance of digital platforms in maintenance, scheduling, and asset lifecycle Introduction to Enterprise Asset Management (EAM) and Project Management tools Overview of SAP P4, SAP HANA, and Oracle Primavera Comparison of legacy systems vs modern integrated platforms (Cloud/IoT integration) Structure of SAP for Plant Maintenance (PM) Functional Locations, Equipment Master, Task Lists SAP P4 vs SAP HANA (architecture and speed) Maintenance Planning & Execution in SAP: Notification → Work Order → Execution → Confirmation Real-time analytics with SAP HANA for downtime analysis & spare parts tracking (Primavera tool to be used)				
Targeted Application & Tools that can be used: **Application** • Asset Performance and Equipment Uptime Optimization • Just-in-Time (JIT) Maintenance Execution • Quality Control and Continuous Improvement in Maintenance Practices • Reliability-Driven program **Tools** • 5W • Kaizen • Kanban and Primavera				
Text Book's 9. **Maintenance and Reliability Best Practices** **Author:** Ramesh Gulati **Edition:** 3rd Edition **Publisher:** Industrial Press, Inc. **ISBN:** 978-0831135811				

10. **Managing Maintenance Shutdowns and Outages**
Author: Joel Levitt
Publisher: Industrial Press
ISBN: 978-0831135330

References

7. **SAP Plant Maintenance (SAP PM): Configuration Guide**
Author: Karl Liebstückel
Publisher: SAP Press
ISBN: 978-1493215890

8. **Project Planning, Scheduling, and Control Using Primavera P6**
Author: Paul Eastwood Harris
Publisher: Eastwood Harris Pty Ltd
ISBN: 978-1925185782

Topics relevant to **"Skill Development"** focus on enhancing **reliability and maintenance practices** by strengthening communication across maintenance and operations teams, reducing equipment downtime, and optimizing spare parts and asset utilization through structured approaches such as **Preventive Maintenance, RCM, and Kanban-based planning**. Skill development is fostered through participative learning techniques, with hands-on assessments and case-based evaluations as outlined in the course handout.

Catalogue prepared by	Dr. Prashanth S P
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	

Course Code: **MEC3445**	**Course Title: AI in Robotics and Automation** **Type of Course: Professional Elective, Lab based Course**	**L-T-P-C**	0	0	2	1
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This course explores the integration of Artificial Intelligence in Robotics and Automation systems. It explains perception, planning, and control of robotic systems enhanced by AI. Topics include sensor fusion, path planning, robotic vision, and machine learning for decision making. Applications in manufacturing, autonomous systems, and industrial automation are emphasized.					
Course Objective	This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies					
Course Outcomes	On successful completion of this course the students shall be able to: CO1: Define the core components of robotic systems and explain the role of AI in enabling intelligent automation. (BT-1) CO2: Describe how AI techniques enhance perception, sensor fusion, and feedback control in robotics. (BT-1) CO3: Apply AI-based tools such as vision models and reinforcement learning to perform basic robotic control tasks. (BT-3) CO4: Analyze different path planning algorithms and assess their performance in dynamic robotic environments. (BT-4) CO5: Implement AI models to simulate autonomous decision-making in robotic systems for manufacturing and automation use cases. (BT-3)					
Course Content:						
Module1	Introduction to Robotics and AI	Assignment	Data Collection and Analysis	6 Sessions		
Topics: • Basic components of robotic systems • Types of automation and levels of intelligence • Role of AI in modern robotic applications AI Perspective: • Introducing foundational concepts of neuromorphic computing and its potential in low-power robotic AI systems. • Analyze the shift from rule-based automation to AI-driven autonomy • Explore LLM-powered interfaces (e.g., voice-activated or multimodal command systems) for intuitive human-robot interaction.						
Module2	Perception and Control	Case Study	Simulation and data analysis task	6 Sessions		
Topics: • Sensor data acquisition and fusion • Robot kinematics and motion control • Feedback loops and PID tuning AI Perspective: • Use AI for signal interpretation and real-time decision making • Integrate vision transformers (ViT) or deep learning models (e.g., YOLO, Mask R-CNN) for real-						

time object detection and scene understanding.
- Utilize reinforcement learning to adapt control strategies based on environmental feedback and policy optimization.

Module3	Learning and Planning in Robots	Assignment	Data Collection and Analysis	6 Sessions

Topics: • Path planning algorithms: Dijkstra, A, RRT
- Reinforcement learning in robotic tasks
- Simulation of robotic environments

AI Perspective:
- Train AI agents using simulation to control robotic actions
- Apply graph neural networks (GNNs) for path planning and decision-making in dynamic multi-agent or cluttered environments.
- Implement meta-learning for enabling robots to generalize from few-shot tasks and rapidly adapt to new tasks with minimal data

Targeted Application & Tools that can be used:

Application Area	**Hands-on Application Problem**	**Tools / Technologies Used**	**Relevant Sectors**
Path Planning	Autonomous navigation in mobile robots	A*, RRT, ROS, OpenCV	Mobile Robots
Robotic Vision	Object detection and classification for robots	YOLO, TensorFlow, OpenCV	Industrial Automation
Control Systems	Regulating motion and ensuring system stability	PID, Reinforcement Learning	Manufacturing Robots

Application Area	**Hands-on Application Problem**	**Tools / Technologies Used**	**Relevant Sectors**
Path Planning	Autonomous navigation in mobile robots	A*, RRT, ROS, OpenCV	Mobile Robots
Robotic Vision	Object detection and classification for robots	YOLO, TensorFlow, OpenCV	Industrial Automation
Control Systems	Regulating motion and ensuring system stability	PID, Reinforcement Learning	Manufacturing Robots

Project work/Assignment: Intelligent Path Planning and Learning-Based Navigation for Mobile

Robots

Text Book

3. Siegwart, R., Nourbakhsh, I. R., & Scaramuzza, D. (2011). Introduction to Autonomous Mobile Robots (2nd ed.). MIT Press.

4. Kroemer, O., & Peters, J. (2022). Foundations of Robotics: A Multidisciplinary Approach. Springer.

5. AI and IoT-Based Intelligent Automation in Robotics. (2021). United States: Wiley.

6. West, D. M. (2018). The Future of Work: Robots, AI, and Automation. Germany: Brookings Institution Press.

References

3. Siciliano, B., & Khatib, O. (2016). Springer Handbook of Robotics (2nd ed.). Springer.

4. Sutton, R. S., & Barto, A. G. (2018). Reinforcement Learning: An Introduction (2nd ed.). MIT Press.

5. Murphy, R. R. (2019). Introduction to AI Robotics. United Kingdom: MIT Press.

Web Resources

1. https://www.ros.org/

2. https://pybullet.org/wordpress/

3. https://www.tensorflow.org/

Catalogue prepared by	Dr. Basavaraj
Recommended by the Board of Studies on	BOS NO: 22nd BOS held on 26/12/2025
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
MEC3446</td><td colspan="3">Course Title: Predictive Maintenance and Condition Monitoring using AI
Type of Course: Professional Elective, Lab based Course</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course provides an overview of AI-driven approaches to predictive maintenance and condition monitoring. It explores machine learning models for failure prediction, vibration analysis, sensor integration, and real-time diagnostics. Applications in manufacturing, automotive, and industrial systems are covered with a focus on operational reliability and downtime reduction.</td></tr>
<tr><td>Course Objective</td><td colspan="8">This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:

• • CO1: Define key concepts of predictive maintenance, failure mechanisms, and types of condition monitoring systems. (BT-1)
• CO2: Explain the role of AI and machine learning in processing sensor data for fault detection and remaining useful life prediction. (BT-1)
• CO3: Apply signal processing techniques and feature extraction methods to build predictive models for equipment health monitoring. (BT-3)
• CO4: Analyze time-series sensor data using supervised and unsupervised AI models for anomaly detection and classification. (BT-4)
• CO5: Implement real-time AI-based diagnostics and monitoring solutions for industrial systems using machine learning and deep learning models. (BT-3)</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module1</td><td colspan="2">Foundations of Condition Monitoring</td><td>Assignment</td><td colspan="3"></td><td>6 Sessions</td></tr>
<tr><td colspan="9">Topics:
• Concepts of preventive and predictive maintenance
• Types of faults and failure mechanisms
• Sensor types and data acquisition systems
AI Perspective:
• Utilize sensor data for condition classification using ML
• Integrate AI-based anomaly detection using historical sensor data to distinguish between normal and abnormal operational patterns.
• Use machine learning models to predict remaining useful life (RUL) based on multivariate condition monitoring data.</td></tr>
<tr><td>Module2</td><td colspan="2">Signal Processing and Feature Extraction</td><td>Case Study</td><td colspan="2">Case Study</td><td colspan="2">6 Sessions</td></tr>
</table>

Topics: • Time and frequency domain analysis
• Vibration and acoustic signal analysis
• Feature extraction using FFT and DWT
AI Perspective:
• Extract relevant features to train predictive models
• Employ deep learning (e.g., CNNs) for automatic feature extraction from vibration and acoustic signals.
• Apply dimensionality reduction techniques (e.g., PCA, t-SNE) to isolate the most informative features for fault classification

Module3	AI-Based Fault Diagnosis	Assignment	Mini Project	6 Sessions

Topics: • Anomaly detection and classification
• Supervised vs unsupervised fault detection
• Model deployment for online monitoring
AI Perspective:
• Use real-time inference for machine health analytics
• Utilize ensemble learning (e.g., Random Forest, Gradient Boosting) for multi-class fault classification across different equipment types.
• Deploy real-time fault prediction models using recurrent neural networks (RNNs) or LSTMs for time-series sensor streams

Targeted Application & Tools that can be used:

Application Area	**Hands-on Application Problem**	**Tools / Technologies Used**	**Relevant Sectors**
Anomaly Detection	Detecting early faults	Scikit-learn, Autoencoders	Process Industry, Railways
Vibration Analysis	Signal processing and defect localization	Librosa, SciPy, FFT	Rotating Equipment
Predictive Diagnostics	Remaining useful life prediction	XGBoost, LSTM	Automotive & Aerospace

Application Area	**Hands-on Application Problem**	**Tools / Technologies Used**	**Relevant Sectors**
Extract FFT Features	Analyze vibration patterns in machinery	Python, SciPy, FFT Libraries, Matplotlib	Signal processing, feature extraction, data visualization

Train Fault Classifier	Distinguish between healthy and faulty states	Python, Scikit-learn, Labeled Bearing Dataset	Supervised learning, model training, classification	
Build RUL Prediction Model	Estimate remaining useful life of components	Python, TensorFlow / Keras, LSTM, Regression Models	Time-series forecasting, deep learning, predictive maintenance	

Project work/Assignment: Assignment: AI-Based Predictive Maintenance Using Sensor Data

Text Book

7. Mobley, R. K. (2002). An Introduction to Predictive Maintenance (2nd ed.). Butterworth-Heinemann.

8. Widodo, A., & Yang, B.-S. (2007). Support vector machine in machine condition monitoring and fault diagnosis. Mechanical Systems and Signal Processing, 21(6), 2560–2574.

References

6. Deb, K. (2012). Multi-objective Optimization Using Evolutionary Algorithms. Wiley.

7. Forrester, A., Sobester, A., & Keane, A. (2008). Engineering Design via Surrogate Modelling. Wiley.

Web Resources

1. • https://www.ansys.com/

2. • https://pyfem.readthedocs.io/en/latest/

3. • https://pymoo.org/

Catalogue prepared by	Dr. Sandeep G M
Recommended by the Board of Studies on	BOS NO: 22nd BOS held on 26/12/2025
Date of Approval by the Academic Council	

<table>
<tr><td>Course Code:
MEC3447</td><td colspan="3">Course Title: Computational Methods and AI Tools in Mechanical Design
Type of Course: Professional Elective & Theory only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course introduces numerical and computational techniques relevant to mechanical design, integrating AI tools for optimization, simulation, and decision-making. It explores finite element methods (FEM), design of experiments (DOE), surrogate modeling, and use of AI frameworks for solving mechanical design problems efficiently.</td></tr>
<tr><td>Course Objective</td><td colspan="8">This course is designed to improve the learners' EMPLOYABILITY SKILLS by using PROBLEM SOLVING Methodologies</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:

• CO1: Explain the significance of computational methods and numerical modeling in modern mechanical design tasks. (BT-1)
• CO2: Apply optimization techniques such as gradient-based and evolutionary algorithms to solve mechanical design problems. (BT-3)
• CO3: Utilize AI-assisted tools for modeling, simulation, and performance prediction in design processes. (BT-3)
• CO4: Analyze surrogate models using techniques like Kriging or neural networks to accelerate design space exploration. (BT-4)
• CO5: Integrate multi-criteria decision-making frameworks and AI-based design automation in mechanical design workflows. (BT-4)</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module1</td><td colspan="2">Fundamentals of Computational Methods</td><td>Assignment</td><td colspan="3">Data Collection and Analysis</td><td>6 Sessions</td></tr>
<tr><td colspan="9">Topics:
• Finite Difference and Finite Element Methods
• Solving boundary value problems
• Matrix methods for structural systems
AI Perspective:
• Bridge traditional FEM with AI-based solvers for faster convergence
• Leverage AI-based solvers to enhance convergence and stability in solving large-scale mechanical systems (e.g., using physics-informed neural networks—PINNs).
• Integrate symbolic regression and AI-assisted PDE solving to derive governing equations from experimental or simulated data.</td></tr>
<tr><td>Module2</td><td colspan="2">Design Optimization and AI</td><td>Case Study</td><td colspan="3">Quiz + Case Study</td><td>6 Sessions</td></tr>
<tr><td colspan="9">Topics: • Gradient-based and heuristic optimization methods
• Introduction to Genetic Algorithms and Swarm Optimization
• Multi-objective design optimization
AI Perspective:
• Use evolutionary algorithms to find optimal design solutions</td></tr>
</table>

- Employ reinforcement learning or evolutionary algorithms for adaptive design optimization under multi-objective constraints.
- Utilize Bayesian optimization frameworks to explore design spaces efficiently with limited computational budgets

Module3	AI-Enabled Mechanical Design Tools	Assignment	Mini Project	6 Sessions

Topics:
- Surrogate modeling (Kriging, RBF, ANN)
- Design of Experiments (DOE) and Latin Hypercube Sampling
- Integrating ML models in CAD/CAE simulations

AI Perspective:
- Leverage AI to predict stress-strain fields and automate design decisions
- Apply generative design algorithms (e.g., GANs or variational autoencoders) to automatically generate lightweight, manufacturable geometries.
- Incorporate large language models (e.g., GPT or Code LLMs) to assist in interpreting design intent, generating scripts for simulation platforms, and automating design documentation

Targeted Application & Tools that can be used:

Application Area	**Hands-on Application Problem**	**Tools / Technologies Used**	**Relevant Sectors**
Structural Simulation	Predicting stress and strain in complex structures	ANSYS, Abaqus, Python, PyFEM	Automotive, Aerospace
Design Optimization	Refining component design for performance	SciPy Optimize, NSGA-II	Product Engineering
Surrogate Modeling	Approximating high-cost simulation results	Kriging, RBF, SVM	Rapid Prototyping

Application Area	**Hands-on Application Problem**	**Tools / Technologies Used**	**Relevant Sectors**
Parametric Shape Optimization	Minimize mass and stress concentration in a bracket design	Python, SciPy.optimize, CAD (Fusion360, SolidWorks)	Optimization, stress analysis, parametric modeling
Surrogate Model Construction	Accelerate design iteration using metamodels	PyKriging, scikit-learn, MATLAB	Surrogate modeling, regression analysis,

			approximation techniques
AI-Powered Design Evaluation	Predict failure points and evaluate design alternatives	ANSYS + Python (XGBoost, PyCaret)	AI-assisted simulation, predictive analytics
Genetic Algorithm for Topology Design	Explore novel shapes under load constraints	DEAP (Python), FEA software	Evolutionary design, optimization under constraints
Trade-off Analysis with MCDM	Perform design selection based on cost, weight, and efficiency	MATLAB, Excel + AHP, TOPSIS	Decision science, trade-off evaluation, MCDM

Project work/Assignment: AI-Based Multi-Objective Design Optimization

Text Book

9. Rao, S. S. (2009). Engineering Optimization: Theory and Practice (4th ed.). Wiley.

10.Logan, D. L. (2016). A First Course in the Finite Element Method (6th ed.). Cengage Learning.

References

8. Deb, K. (2012). Multi-objective Optimization Using Evolutionary Algorithms. Wiley.

9. Forrester, A., Sobester, A., & Keane, A. (2008). Engineering Design via Surrogate Modelling. Wiley.

Web Resources

4. • https://www.ansys.com/

5. • https://pyfem.readthedocs.io/en/latest/

6. • https://pymoo.org/

Catalogue prepared by	
Recommended by the Board of Studies on	BOS NO: 22nd BOS held on 26/12/2025
Date of Approval by the Academic Council	

Open Elective Course Catalogues (Offered by the Mechanical Engineering Department Department)

Course Code: **MEC3250**	**Course Title: Engineering Drawing** **Type of Course: Open Elective & lab based**	**L-T-P-C**	1	0	4	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The course is designed with the objective of giving an overview of engineering drawing with the help of software tools. It is introductory in nature and acquaints the students with the techniques used to create engineering drawings with computerized drafting tools. Computerized drafting provides accurate and easily modifiable graphic entities, easy data storage, easy retrieval facility and it enhances creativity. It will expose students to the concept of engineering drawing and teach them to draw different views of planes and solids in different orientations. The course will teach students to use AutoCAD to produce engineering drawings. They will learn to create drawing layouts, dimensioning, the theory of projection, orthographic projection of points, lines, planes and solids, isometric projection and be introduced to the development of surfaces.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Engineering Drawing**" and attain **ENTREPRENEURIAL SKILL** through Experiential learning techniques .					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1) Demonstrate competency using AutoCAD graphics software as per BIS conventions and standards. CO2) Comprehend the theory of projection for drawing projections of Points, Lines and Planes under different conditions. CO3) Prepare multiview orthographic projections of Solids by visualizing them in different positions. CO4) Prepare pictorial drawings using the principles of isometric projections to visualize objects in three dimensions.					
Course Content						
Module 1	Introduction to Drawing	Assignment	Standard technical drawing	02 Sessions		
Topics: Introduction, drawing instruments and their uses, relevant BIS conventions and standards, Lettering, Line conventions, dimensioning, Selection of drawing sheet size and scale.						
Module 2	Orthographic projections of Points, Straight Lines and Plane Surfaces	Assignment	Projection methods Analysis	20 Sessions		
Topics:						

Introduction, Definitions – Elements of projection and methods of projection, Planes of projection, reference line and conventions adopted. First angle and third angle projections. Projection of Points in all 4 quadrants. Projections of Straight Lines (located in first quadrant/first angle projection only): True and apparent lengths, true and apparent Inclinations to reference planes. (No application problems). Projection of Plane surfaces (First angle projection): Regular plane surfaces – triangle, square, rectangle, pentagon, hexagon and circle – in different positions inclined to both the planes using change of position method only.				
Module 3	Orthographic Projections of Solids	Assignment	Multi-view drawing Analysis	15 Sessions
Topics: Introduction, Projection of right regular prisms, pyramids, cone, hexahedron and tetrahedron in different positions (Problems resting on HP only and First angle projection).				
Module 4	Isometric Projections of Solids (Using isometric scale only)	Assignment	Spatial Visualization	8 Sessions
Topics: Introduction, Isometric scale, Isometric projections of right regular prisms, cylinders, pyramids, cones and their frustums, spheres and hemispheres, hexahedron (cube), and combination of 2 solids, conversion of orthographic view to isometric projection of simple objects.				
Targeted Application & Tools that can be used: Application Area is in understanding and interpreting an object in various positions and converting it into a technical drawing which can be universally accepted. Professionally Used Software: AutoCAD				
Text Book: 1.N. D. Bhatt, "Engineering Drawing: Plane and Solid Geometry," Charotar Publishing House Pvt. Ltd.				
References: 1. K.R. Gopalakrishna, "Engineering Graphics", Subhash Publishers, Bangalore. 2. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall. 3. D. A. Jolhe, "Engineering Drawing with Introduction to AutoCAD," Tata McGraw Hill. 4. Engineering Graphics Manual provided by Instructor incharge. **Webresources :** Knimbus - Your Library. Anywhere, Anytime.				
Topics relevant to "ENTREPRENEURIAL SKILLS ": Projection in First and third angle, Orthographic Projection for developing ENTREPRENEURIAL SKILLS through Experiential Learning techniques. This is attained through the assessment component mentioned in the course handout.				
Catalogue prepared by	Mr. Yeshwanth D			
Recommended by the Board of Studies on	BOS NO: 12th BoS held on 06/08/2021			
Date of Approval by the Academic Council	16th Meeting of the Academic Council held on 23rd October, 2021			

Course Code: MEC3251	**Course Title: Supply Chain Management** **Type of Course: Open Elective & Theory only**	**L-T- P-C**	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of this course is to enable the students to understand components of supply chain management, operational challenges in managing global supply chains and to develop the basic abilities in modelling supply chain. The course is both conceptual and analytical in nature. The course develops the analytical, critical thinking, and decision making skills. The course also enhances the problem solving abilities through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Supply Chain Management**" and attain **ENTREPRENEURIAL SKILL** through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1) Summarize the drivers and their role in the performance of Supply Chain. CO2) Construct Supply Chain Network according to the requirement of any particular type of product. CO3] Solve forecasting and inventory related issues in Supply Chain in practice. CO4] Estimate transportation requirements of global product in real life. CO5] Interpret the impact of future technologies in Supply Chain Management**.**					
Course Content:						
Module 1	Introduction to SCM	Assignment	Data Collection and Analysis	10 Sessions		
Topics: Understanding Supply Chain – Objectives, Importance and Decision phases in Supply Chain, Process and Cycle view, Examples of Supply Chain., Supply Chain Drivers – Various drivers, Framework for structuring drivers, Supply Chain Performance – Achieving strategic fit.						
Module 2	Designing the Supply chain Network	Case Study	Simulation and data analysis task	10 Sessions		
Topics: Designing distribution network – The Role of Distribution in the Supply Chain, Factors Influencing Distribution Network Design. Network Design In The Supply Chain - The Role of Network Design in the Supply Chain, Framework for Network Design Decisions and Making Network Design Decisions in Practice. Designing Global Supply Chain Networks.						

Module 3	Planning and Coordinating Demand and Supply	Assignment	Data Collection and Analysis	10 Sessions
Topics: Demand forecasting, Aggregate Planning in Supply Chain, Coordination in Supply Chain. Managing economies of scale in a supply chain: Cycle inventory, Managing Uncertainty In A Supply Chain: Safety Inventory, Determining The Optimal Level of Product Availability.				
Module 4	Designing and Planning Transportation Networks	Case Study	Data collection and Programming	08 Sessions
Topics: Transportation In a Supply Chain - The Role of Transportation in a Supply Chain, Modes of Transportation and Their Performance, The Role of IT in Transportation. The Role of Sourcing in a Supply Chain, Third- and Fourth-Party Logistics Providers, Supplier Selection—Auctions and Negotiations**.**				
Module 5	Future Technologies in Supply Chain	Assignment	Simulation and Analysis	07 Sessions
Topics: Information Technology In a Supply Chain, The Supply Chain IT Framework. The Future Technologies in the Supply Chain – AI, Additive Manufacturing, Driverless Vehicles, IoT, Block Chain Technologies, Wearable Devices.				

Targeted Application & Tools that can be used:

Application Area include almost all manufacturing organizations (Automotive – Hyundai, KIA, Ford etc.,) Processing industries (Petroleum – Reliance, Shell, HP etc.,), service industries like Banking, Hospital, etc. and E-commerce platforms like Amazon, Flipkart etc.

Professionally Used Software: SAP SCM, E2Open, Oracle SCM

Text Book

1. Chopra, S., & Meindl, P., "Supply Chain Management: Strategy, Planning, and Operation.". Pearson Bostan, Fifth Edition, 2013.

References

1. Hugos, M., "Essentials of Supply Chain Management", John Wiley & Sons, Inc., Third Edition, 2011.
2. Christopher. M., "Logistics & Supply Chain Management ", Prentice Hall., New Delhi, Fourth Edition, 2011.
Website: https://www.ascm.org
Supply Chain Management - New Perspectives by Sanda Renko , IntechOpen, 2011
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_2610
Supply Chain Management - Applications and Simulations, Md. Mamun Habib IntechOpen, 2011.
https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=INTECH_1_2609

Topics relevant to "ENTREPRENEURIAL SKILLS": The Future Technologies in the Supply Chain – AI, Additive Manufacturing, Driverless Vehicles, IoT, Block Chain Technologies for developing **ENTREPRENEURIAL SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.	
Catalogue prepared by	Dr. R. Jothi Basu
Recommended by the Board of Studies on	BOS NO: 15th BOS held on 29/7/2022
Date of Approval by the Academic Council	Academic Council Meeting No. 18, Dated 03/08/2022.

Course Code: MEC2004	**Course Title: Six Sigma for Professionals** **Type of Course: Open Elective & Theory only**	**L- T-P-C**	**3**	**0**	**0**	**3**
Version No.	2					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	Six Sigma is a methodology of implementing a highly successful project, or producing a high-quality product or service, using techniques and principles that ensure excellence. The Six Sigma methodology incorporates many years of studying best practices in business and its goal is ultimately the creation of a nearly error-free business environment. This course will give a complete overview of the Six Sigma process and prepare to be a Six Sigma team member.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Six Sigma for Professionals**" and attain **ENTREPRENEURIAL SKILL** through Participative learning techniques.					
Course Outcomes	**On successful completion of this course the students shall be able to:** CO1] Define the problem statement through customer analysis in terms of time, budget, and resource requirements. CO2] Summarize a detailed process map by gathering baseline data. CO3] Complete a root cause verification analysis by the help of inferential statistics and hypothesis testing. CO4] Devise a preliminary implementation plan, update standard work procedures and write an action plan.					
Course Content:						
Module 1	Define Phase	Assignment	Data Collection	12 Sessions		
Topics: **Define Phase: The Basics of Six Sigma, The Fundamentals of Six Sigma, Selecting Six Sigma Projects.**						
Module 2	Measure Phase	Case Study	Data Analysis	10 Sessions		
Topics: Measure Phase: Process Definition, Six Sigma Statistics, Measurement System Analysis, Process Capability.						
Module 3	Analyze Phase	Assignment	Data Analysis	12 Sessions		
Topics: Analyze Phase: Patterns of Variation, Inferential Statistics, Hypothesis Testing, Hypothesis Testing with Normal Data, Hypothesis Testing with Non-Normal Data.						

Module 4	Improve & Control Phase	Case Study	Data Analysis	11 Sessions
Topics: Improve and Control Phase: Simple Linear Regression, Multiple Regression Analysis, Statistical Process Control (SPC), Six Sigma Control Plans**.**				
Targeted Application & Tools that can be used: Application Area: Employ Six Sigma skills to lead a successful process improvement project to deliver meaningful results to the organization. Professionally Used Software: MINITAB/STATISTICA				
Textbook: 1. John Morgan, "Lean Six Sigma for Dummies ", A Wiley Brand, 3rd Edition 2015.				
References: 1. Michael George, David Rowlands, Mark Price, John Maxey, "The Lean Six Sigma Pocket Toolbook", The McGraw Hill Companies. 2. The council for six sigma certification, "SIX SIGMA, A Complete Step by Step Guide". W1:https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_06082022_3610				
Topics relevant to "ENTREPRENEURIAL SKILLS": Improve and Control Phase: Simple Linear Regression, Multiple Regression Analysis, Statistical Process Control (SPC), Six Sigma Control Plans for developing **ENTREPRENEURIAL SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				

Catalogue prepared by	Prof. Shashi Kiran G
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC2005**	**Course Title: Fundamentals of Aerospace Engineering** **Type of Course: Open Elective & Theory only**	**L-T-P-C**	3	0	0	3
Version No.	1.1					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The purpose of this course is to give an overview of the fundamentals of aerospace engineering. It will give an overview of the aircraft industry, discuss the different components of and different types of aircrafts, go into the mechanical, electrical, electronic and auxiliary systems in aircrafts, discuss aircraft engines, pressurization, cover the basic principles of flight and space flight, and discuss various aircraft maneuvers.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Fundamentals of Aerospace Engineering**" and attain **ENTREPRENEURIAL SKILL** through Problem solving methodologies.					
Course Outcomes	**On successful completion of the course the students shall be able to:** CO 1: Solve problems based on the concepts of flowing gases and the standard atmosphere CO 2: Apply the principles of basic aerodynamics to airfoils CO 3: Determine the thrust and power requirements for level, unaccelerated flight of an aircraft CO 4: Explain the criteria for longitudinal static stability for an airplane CO 5: Apply the basics of space vehicle trajectories to simple missions CO 6: Determine some propulsive characteristics of aircraft and rocket engines					
Course Content:						
Module 1	Introduction	Assignment	Data Analysis task		10 Sessions	
Topics: Introduction, early developments, Sir George Cayley, Otto Lilienthal, Wilbur and Orville Wright. fundamental physical quantities of flowing gas, the source of all aerodynamic forces, equation of state for a perfect gas, anatomy of the airplane and a space vehicle, definition of altitude, the hydrostatic equation, geopotential and geometric altitudes, definition of the standard atmosphere, pressure, temperature and density altitudes.						
Module 2	Basic Aerodynamics	Assignment	Programming task and simulation		15 Sessions	
Topics: The continuity equation, incompressible and compressible flow, momentum equation, elementary thermodynamics, isentropic flow, energy equation, speed of sound, low-speed subsonic wind tunnels, introduction to airfoils, airfoil nomenclature, lift, drag and moment coefficients, airfoil data, infinite versus finite wings, pressure coefficient, obtaining lift coefficient from the pressure coefficient**.**						

Module 3	Airplane Performance, Stability and Control	Assignment	Data Collection and Analysis	10 Sessions
Topics: The drag polar, equations of motion, thrust and power requirements for level, unaccelerated flight, thrust available and maximum velocity, power available and maximum velocity, definitions of stability and control, moments on the airplane, absolute angle of attack, criteria for longitudinal static stability.				
Module 4	Propulsion	Assignment	Data Collection and Analysis	10 Sessions
Topics: Introduction, propeller, reciprocating engine, jet propulsion, turbojet engine, turbofan engine, ramjet engine, rocket engine, rocket propellants, rocket equation, rocket staging and propellant requirements for spacecraft trajectory maneuvers.				
Targeted Application & Tools that can be used: Application Area is Indian Space Research Organization (ISRO), Hindustan Aeronautics Limited (HAL), DRDO, General Electric(GE), Bombardier and many others Professionally Used Software: XFLR, Aeolus.				
Textbooks T1 A. C. Kermode, Flight Without Formulae, Pearson Education, 10th Edition T2 A. C. Kermode, Mechanics of Flight, Pearson Education, 5th Edition				
References R1 Shevell, Fundamentals of Flight, Pearson Education, 2nd Edition R2 Dave Anderson, Introduction to Flight R3 I. Moir, A. Seabridge, Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, Wiley				
Web Resources: 1. Knimbus - Your Library. Anywhere, Anytime.				
Topics relevant to "ENTREPRENEURIAL SKILLS": Aerodynamic forces Equation, propellers equation for developing ENTREPRENEURIAL SKILLS through Problem-Solving methodologies. This is attained through the assessment component mentioned in the course handout.				
Catalogue prepared by	Mr. Yeshwanth D			
Recommended by the Board of Studies on	12th BoS held on 06/08/2021			
Date of Approval by the Academic Council	16th Meeting of the Academic Council held on 23rd October, 2021			

Course Code: MEC2006	**Course Title: Safety Engineering** **Type of Course: Open Elective/ Theory Only Course**	**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	The Course is designed with an objective of giving an overview of study of Industrial Safety followed in industries such as various safety terms used, Fire Safety, Mechanical Safety, Electrical Safety, Chemical Safety followed by case studies to understand the industrial safety in detail.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **Safety Engineering**" and attain **ENTREPRENEURIAL SKILL** through Participative learning techniques.					
Course Out Comes	On successful completion of the course the students shall be able to: CO1. Understand the basic safety terms and international standards. CO2. Identify the hazards and risk analysis around the work environment and industries. CO3. Use the safe measures while performing work in and around the work area of the available laboratories. Able to recognize the sign boards and its application CO4. Recognize the types of fires extinguishers and to demonstrate the portable extinguishers used for different classes of fires. CO5. Report the case studies by sharing experience of the employees working in housekeeping, laboratories etc. CO6. Recognize the chemical and electrical hazards for its prevention and control.					
Course Content:						
Module 1	Introduction to Safety	Case Study	Data Collection	10 sessions		
Topics: Terms used: accident, safety, hazard, safe, safety devices, safety guard, security, precaution, caution, appliance, slip, trip, fall. Ladders and scaffolding. Unsafe acts, reason for accidents, MSDS (material safety data sheet), OSHA, WHO. Lockout and tag out procedures. Safe material handling and storage. Case studies: Student should identify the unsafe acts near their surroundings like housekeeping, lab as well as industrial layouts, road safety, campus layout, safety signs.						
Module 2	Fire Safety	Term paper	Data Collection	10 sessions		
Topics: Introduction, Class A, B, C, D and E fire. Fire triangle, Fire extinguishers, Fire hazard and analysis, prevention of fire. Fire protection and loss prevention, steps after occurrence of fire. Notice-first aid for burns, Portable fire extinguishers. Fire detection, fire alarm and firefighting systems. Safety sign boards, instruction on portable fire extinguishers. Case studies: demonstration of fire extinguishers, visit to local firefighting stations. Visit to fire accident sites to analyze the cause of fire and its prevention for future.						

Module 3	Mechanical Safety	Case Study	Data Collection	10 sessions
Topics: PPE, safety guards, safety while working with machine tools like lathe, drill press, power and band saws, grinding machines, safety during welding, forging and pressing. Safety while handling material, compressed gas cylinders, corrosive substance, waste drum and containers. Case studies: Visit to machine shop, workshops, foundry lab and local industries to record the practical observation and report the same with relevant figures and comments.				
Module 4	Electrical Safety	Assignment	Data Collection	08 sessions
Topics: Introduction to electrical safety, Indian standards on electrical safety, Electric hazards, effect of electric current on human body, causes of electrical accidents, prevention of electric accidents, PPE used. Electric shock. Primary and secondary electric shocks, AC and DC current shocks. Safety precautions against shocks. Safety precautions in small and residential building installations. Safety procedures in electric plant.				
Module 5	Chemical Safety	Case Study	Data Collection	07 sessions
Topics: Introduction to Chemical safety, Labeling of chemicals, acid hoods. Handling of acids, eye ashers and showers. Safety thinking, accident investigation, safety policy of the company, safety, loss prevention and control, check list for LPG installations, safety precautions using CNG, fire prevention and safety audit, confined space entry, risk assessment. Case studies: To visit chemical laboratory of the college and other chemical industries like LPG, CNG facilities and report.				
Targeted Application & Tools that can be used: **Job profiles like Safety Engineer etc**				
Text Book 1. L M deshmukh, "Industrial Safety & Management". McGraw Hill Education (India) Private Limited, ISBN-13:978-0-07-061768-1. 2. S Rao, R K Jain & Sauja, "Electrical Safety, fire safety & safety management", Khanna Publishers, ISBN:978-81-7409-306-6.				
References 3. A M Sarma, "Industrial Health & Safety Management", Himalaya Publishing House. 4. K S N Raju, "Chemical Process Industrial Safety", McGraw Hill Education (India) Private Limited, ISBN-13:978-93-329-0278-7 **Web Links** 1. https://puniversity.informaticsglobal.com:2229/login.aspx?direct=true&db=nlebk&AN=960146&site=ehost-live 2. https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=NAP_1_1600				
Topics relevant to "ENTREPRENEURIAL SKILLS": Safety practices and handling of fire extinguisher, for mechanical, safety precautions using CNG, fire prevention and safety audit and Safety precautions against shocks for developing **ENTREPRENEURIAL SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				

Catalogue prepared by	Mr. Basavaraj Devakki
Recommended by the Board of Studies on	11th BoS held on 05/09/2020
Date of Approval by the Academic Council	14th Meeting of the Academic Council held on 24/12/2020

<table>
<tr><td>Course Code:
MEC3255</td><td colspan="3">Course Title: Additive Manufacturing
Type of Course: Open Elective & Theory only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.1</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">Students will be able to Understand the fundamentals of various Additive Manufacturing Technologies for application to various industrial needs. Able to convert part file into STL format. Able to understand the method of manufacturing of liquid based, powder based and solid based techniques. Understand the manufacturing procedure of a prototype using FDM technique.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of "Additive Manufacturing " and attain EMPLOYABILITY SKILL through Participative learning techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:
CO1] Understand the fundamentals of Manufacturing Processes.
CO2] Understand the classifications of Manufacturing Process and methodologies of manufacturing for industrial applications.
CO3] Understand the fundamentals of Additive Manufacturing and its importance in Industrial Applications.
CO4] Understand the classifications of Additive Manufacturing and methodology of manufacturing the products using various technologies and study their applications, advantages and limitations.
CO5] Understand the methodology to manufacture the products using FDM technologies and study their applications, advantages and case studies.</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to Manufacturing Technology</td><td>Assign ment</td><td colspan="3">Identify the Major manufacturing Technologies and report the manufacturing capabilities</td><td>10 Sessions</td></tr>
<tr><td colspan="9">Topics:
Introduction to Manufacturing Technology: Introduction, Prototyping fundamentals, Historical development, Advantages of MT, Commonly used terms, process chain, modelling, Classification of Manufacturing process, Applications to various fields.</td></tr>
<tr><td>Module 2</td><td colspan="2">Manufacturing Processes</td><td>Assign ment</td><td colspan="3">Literature review</td><td>12 Sessions</td></tr>
<tr><td colspan="9">Topics:
Manufacturing Processes: Working methodologies of different Manufacturing processes like Casting Process, Machining process, Joining process, Forming process, Machine tools, Cutting tools, Material Specifications, applications, advantages and limitations.</td></tr>
</table>

Module 3	Introduction to Additive Manufacturing (AM)	Assign ment	Identify the Major manufactures in India for 3D printing and report the manufacturing capabilities	12 Sessions
Topics: Introduction to Additive Manufacturing: Introduction, Prototyping fundamentals, Historical development, Advantages of AMT, Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats				
Module 4	AM processes and Software	Assign ment	Decision Tree	11 Sessions
Topics: AM Processes: Classifications of Additive Manufacturing, Models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, Cura Software, Slicing, DFAM ,applications, advantages and limitations.				

Targeted Application & Tools that can be used:

Application Area is rapid prototyping, product design and development industries
Professionally Used Software: 3D Modeling software.

Text Book;

1. Jing Zhang; Yeon-Gil Jung, "Additive manufacturing: materials, processes, quantifications and applications", Cambridge, Massachusetts: Elsevier, 2018.
2. Salvatore Brischetto, Paolo Maggiore and Carlo Giovanni Ferro (Eds.), "Additive Manufacturing Technologies and Applications" MDPI -2017

References

1. Chua Chee Kai, Leong Kah Fai, "Rapid Prototyping: Principles & Applications", World Scientific, 2003.
2. Ian Gibson, David W Rosen, Brent Stucker., "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010
3. Ali K. Kamrani, Emand Abouel Nasr, "Rapid Prototyping: Theory & Practice", Springer, 2006
4. D.T. Pham, S.S. Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer 2001

Web Resources:
https://presiuniv.knimbus.com/user#/searchresult?searchId=elements%20of%20Mechanical%20Engineering&_t=1659588753433

Topics relevant to "EMPLOYABILITY SKILLS":3d modelling, Application of AM for developing **EMPLOYABILITY SKILLS** through **Participative Learning techniques**. This is attained through the assessment component mentioned in the course handout.

Catalogue prepared by	Priyanka S Umarji
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025

Course Code: **MEC3256**	**Course Title: Sustainable Technologies and Practices** **Type of Course: Open Elective & Theory only**		**L-T-P-C**	3	0	0	3
Version No.	1.0					
Course Pre-requisites	NIL					
Anti-requisites	NIL					
Course Description	This open elective course aims to provide students with a comprehensive understanding of sustainability principles and their applications in the fields of computer science, mechanical engineering, and electronics. The course explores the challenges and opportunities associated with sustainability, equipping students with the knowledge and skills to develop and implement sustainable technologies and practices in their respective engineering disciplines. Through a combination of theoretical learning, case studies, and hands-on projects, students will gain a multidisciplinary perspective on sustainability and its relevance to the rapidly evolving technological landscape.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of " **"Sustainable Technologies and Practices"** and attain **ENTREPRENEURIAL SKILL** through Participative learning techniques					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Introduce students to the fundamental concepts and principles of sustainability and their significance in engineering disciplines. CO2. Familiarize students with the latest sustainable technologies and practices in science and engineering. CO3. Enable students to analyse the environmental, social, and economic impacts of engineering projects and propose sustainable alternatives. CO4. Cultivate critical thinking and problem-solving skills to address sustainability challenges in engineering through project-based learning.					
Course Content:						
Module 1	Introduction to Sustainability	Assignment				10 sessions
Topics: Definition of sustainability and its relevance to engineering, Global environmental challenges and the role of technology in addressing these, Ethical considerations and the social dimension of sustainability, Life cycle assessment (LCA) methodologies, Carbon footprint analysis and reduction strategies						
Module 2	Sustainable Computing	Case Study	Simulation and data analysis task			10 sessions
Topics: Green computing and energy-efficient algorithms, Data center optimization and energy management						
Module 3	Sustainable Mechanical Engineering	Assignment	Simulation and data analysis task			10 sessions
Topics:						

Renewable energy systems and their integration, Energy-efficient design principles, Sustainable manufacturing processes				
Module 4	Sustainable Electronics engineering	Assignment	Simulation	08 sessions
Topics: Energy-efficient electronic devices and components, Energy harvesting and power management, Responsible electronic waste management				
Module 5	Sustainable Project Management	Assignment	Simulation/Data Analysis	07 sessions
Topics: Sustainability assessment frameworks and tools, Sustainability project planning and decision making				
Targeted Application & Tools that can be used: Contemporary issues: One contemporary issue in this course is the growing concern over e-waste management and the need for responsible disposal and recycling of electronic devices. Another issue is the increasing demand for energy-efficient computing systems and the development of green computing strategies to reduce the environmental impact of data centers and algorithms. Professionally Used Software: SimaPro, GaBi, EnergyPlus				
Textbooks: 1. R L Rag, L D Ramesh. "Introduction to Sustainable Engineering", PHI publication. 2. David T Allen, David R Shonnard. "Sustainable Engineering- Concepts, Design and Case Studies, Pearson 3. Munier, Nolberto. Introduction to sustainability. Amsterdam, The Netherlands: Springer, 2005.				
References 1. Portney, Kent E. Sustainability. MIT Press, 2015. 2. Green IT Strategies and Applications Using Environmental Intelligence By Bhuvan Unhelkar 1st Edition, Pub. Location Boca Raton, CRC Pres. 3. Kim, Jae H., and Myung J. Lee, eds. Green IT: technologies and applications. Vol. 26. No. 11. Berlin: Springer, 2011. 4. Graedel, Thomas E., and Braden R. Allenby. "Industrial ecology and sustainable engineering." (No Title) (2010). 5. Bakshi, Bhavik R. Sustainable engineering: principles and practice. Cambridge University Press, 2019.				
Topics relevant to "ENTREPRENEURIAL SKILLS": Data center optimization, Energy-efficient electronic devices and components, Green computing and energy-efficient algorithms for developing **ENTREPRENEURIAL SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout				
Catalogue prepared by	Dr. Devendra Singh Dandotiya, Dr. Udaya Ravi M			
Recommended by the Board of Studies on	17th BOS, 08/07/2023			
Date of Approval by the Academic Council	6/9/2023			

<table>
<tr><td>Course Code:
MEC3257</td><td colspan="3">Course Title: Industry 4.0
Type of Course: Open Elective & Theory only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.</td><td colspan="8">1.0</td></tr>
<tr><td>Course Pre-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Anti-requisites</td><td colspan="8">NIL</td></tr>
<tr><td>Course Description</td><td colspan="8">This course provides students with an introduction to Industry 4.0, its building blocks, its applications and advantages compared to conventional production techniques. Learners get a deep insight into how intelligent processes, big data, and artificial intelligence can be used to build up the production of the future. Also enabling design principles that support companies in identifying and implementing various Industry 4.0 scenarios and the key technologies for smart factories. The course also discusses the Impact of Industry 4.0 on Society: Impact on Business, Government, People etc & also future framework of Industry 4.0.</td></tr>
<tr><td>Course Objective</td><td colspan="8">The objective of the course is to familiarize the learners with the concepts of “Industry 4.0” and attain ENTREPRENEURIAL SKILL through Participative learning techniques</td></tr>
<tr><td>Course Outcomes</td><td colspan="8">On successful completion of this course the students shall be able to:
CO1) Understand the basic concepts of Industry 4.0 and scope for Indian Industry
CO2) Demonstrate conceptual framework and road map of Industry 4.0
CO3) Apply Industry 4.0 for various fields of application
CO4) Understand the Impact to Industry 4.0 for various fields of application</td></tr>
<tr><td>Course Content:</td><td colspan="8"></td></tr>
<tr><td>Module 1</td><td colspan="2">Introduction to Industry 4.0</td><td>Assignment</td><td colspan="2">Case Study</td><td colspan="2">12 Sessions</td></tr>
<tr><td colspan="9">Topics:
Introduction, History, core idea of Industry 4.0,origin concept of industry 4.0,Industry 4. production system, current state of industry 4.0, Technologies of Industry 4.0 – Big Data – Artifici Intelligence (AI) – Industrial Internet of Things - Cyber Security – Cloud – Augmented Reality How is India preparing for Industry 4.0</td></tr>
<tr><td>Module 2</td><td colspan="2">Conceptual Framework for Industry 4.0</td><td>Case Study</td><td colspan="2">Simulation and data analysis task</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="9">Topics:
Introduction, Main Concepts and Components of Industry 4.0, The Basic Characteristics of Industry 4.0, General framework, The Industry 4.0 Model Framework</td></tr>
<tr><td>Module 3</td><td colspan="2">Applications of Industry 4.0</td><td>Assignment</td><td colspan="2">Data Collection and Analysis</td><td colspan="2">10 Sessions</td></tr>
<tr><td colspan="9">Topics:</td></tr>
</table>

Manufacturing – Healthcare – Education – Aerospace and Defense – Agriculture – Transportation a Logistics **.**				
Module 4	Impact of Industry 4.0	Assignment	Case Study	13 Sessions
Topics: Impact of Industry 4.0 on Society: Impact on Business, Government, People. Education 4.0 – Curriculum 4.0 – Faculty 4.0 – Skills required for Future - Framework for aligning Education with Industry 4.0 – Framework for achieving next ten years vision – Challenges				
Targeted Application & Tools that can be used: Application Area are wearables (Samsung, Apple), health (GE Healthcare), traffic monitoring (Waze, google maps), fleet management, smart grid and energy saving (PowerGrid), agriculture, hospitality etc. Professionally Used Software: Kinoma, Arduino, Device Hive, Riot etc.				
References 1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation". 2. Bartodziej, Christoph Jan,"The Concept Industry 4.0". 3. Klaus Schwab,"The Fourth Industrial Revolution". 4. Christian Schröder ,"The Challenges of Industry 4.0 for Small and Medium-sized Enterprises". E Resource https://presiuniv.knimbus.com/user#/viewDetail?searchResultType=ECATALOGUE_BASED&unique_id=DOAB_1_2964				
Topics relevant to "ENTREPRENEURIAL SKILLS": Industry 4.0 technologies, Big Data, Artificial Intelligence (AI), Industrial Internet of Things (IoT), Cyber Security , Cloud and Augmented Reality for developing **ENTREPRENEURIAL SKILLS** through **Participative Learning techniques**. This is attained through assessment component mentioned in course handout.				

Catalogue prepared by	Dr. Ramachandra C G
Recommended by the Board of Studies on	17th BOS, dated 08/07/2023
Date of Approval by the Academic Council	6/9/2023

NTCC Course Catalogs: -

Course Code: **MEC7300**	**Course Title:** **Capstone Project** **Type of Course:** **NTCC**	**L- T-P- C**	-	-	-	10
Version No.	**2.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work or Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain **Employability Skills** through **Experiential Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Identify the engineering problems related to local, regional, national or global needs. CO2. Apply appropriate techniques or modern tools for solving the intended problem. CO3. Design the experiments as per the standards and specifications. CO4. Interpret the events and results for meaningful conclusions. CO5. Appraise project findings and communicate effectively through scholarly publications.					
Catalogue prepared by	Dr Joshi Manohar V					
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025					
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025					

Course Code: MEC7000	**Course Title: Internship** **Type of Course: NTCC**	**L- T-P- C**	-	-	-	2
Version No.	**2.0**					
Course Pre-requisites	**Knowledge and Skills related to all the courses studied in previous semesters.**					
Anti-requisites	**NIL**					
Course Description	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work or Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.					
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain **Employability Skills** through **Experiential Learning** techniques.					
Course Outcomes	On successful completion of this course the students shall be able to: CO1. Identify the engineering problems related to local, regional, national or global needs. CO2. Apply appropriate techniques or modern tools for solving the intended problem. CO3. Design the experiments as per the standards and specifications. CO4. Interpret the events and results for meaningful conclusions. CO5. Appraise project findings and communicate effectively through scholarly publications.					
Catalogue prepared by	Dr Joshi Manohar V					
Recommended by the Board of Studies on	BOS Meeting No: 21, Dated: 6th July 2025					
Date of Approval by the Academic Council	Academic Council Meeting No. 26, Dated 25/07/2025					