# PRESIDENCY UNIVERSITY

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
Approved by AICTE, New Delhi

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

# School of Engineering

# Bachelor of Technology Degree

# Program Regulations and Curriculum 2019-2023

# B. Tech. (Information Science and Engineering)

# 2019-2023

**Regulations No: PU/AC-20.3/SOCSE01/ISE/2019-23**
**Resolution No. 3 of the 20th Meeting of the Academic Council held on 15th February 2023, and Ratified by the Board of Management in its 21st Meeting held on 22nd February 2023**

## February – 2023

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# Bachelor of Technology Degree
# Program Regulations and Curriculum, 2019-2023

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, 2019 of the University, the Academic Council hereby makes the following Regulations, namely;

**Preliminary:**

**Short Title and Commencement**

(a) These Regulations shall be called the **Bachelor of Technology Degree Program Regulations and Curriculum 2019-2023**.

(b) These Regulations are subject to, and, pursuant to the Academic Regulations, 2019

(c) These Regulations (with amendments) shall be applicable to the ongoing Bachelor of Technology Degree Programs of the 2019-2023 batch and to all other Bachelor of Technology Degree Programs which may be introduced in future.

(d) These Regulations (with amendments) shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum**,** along with all the amendments thereto.

(e) These Regulations (with amendments) shall come into force from the Academic Session 2019-20.

**Definitions:**

*In these Regulations, unless the context otherwise requires:*

*a) "Academic Council" means the Academic Council of the University;*

*b) "Academic Regulations" means the Academic Regulations, 2019 of the University;*

*c) "Academic Term" means a Semester or Summer Term;*

*d) "Act" means the Presidency University Act, 2013;*

*e) "Board of Examinations (BOE)" means the Board of Examinations of the University;*

*f) "Board of Management (BOM)" means the Board of Management of the University;*

*g) "CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations, 2019;*

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

*i) "Course" means, a specific subject usually identified by its Course Code and Course*

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*Name, with specified Credit Structure and Credits, Course Description/ Content/ Syllabus, a set of textbooks/ references, taught by assigned Course Instructor(s) to a specific class (group of students) during a specific Academic Term;*

*j) "Course Instructor" means the faculty member who is the Teacher/ Course Instructor for the concerned Course;*

*k) "DAC" means, the Departmental Academic Committee;*

*l) "Dean" means the Dean of the concerned School;*

*m) "HOD" means the Head of the concerned Department;*

*n) "Parent Department" means the department that offers the Degree Program that a student undergoes;*

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

*p) "Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum 2019-2023;*

*q) "Registrar" means the Registrar of the University;*

*r) "SGPA" means the Semester Grade Point Average as defined in the Academic Regulations, 2019;*

*s) "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;*

*t) "Section" means the duly numbered Section, with Clauses included in that Section, of these Program Regulations;*

*u) "Statutes" means the Statutes of Presidency University;*

*v) "Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;*

*w) "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, and,*

*x) "University" means Presidency University, Bengaluru;*

## 1. INTRODUCTION:

1.1. The **Academic Regulations, 2019** are applicable to all existing Degree Programs of the University. The Academic Regulations, and any amendments made therein, shall also be applicable to new Degree and Diploma Programs that may be offered by the University in future.

1.2. The **Bachelor of Technology Degree Program Regulations and Curriculum 2019-2023** are subject to, and, pursuant to the Academic Regulations, 2019.

1.3. These Program Regulations shall be applicable to the following **Bachelor of Technology (B.Tech) Degree Programs of 2019-2023:**

1.3.1. Bachelor of Technology in Civil Engineering, abbreviated as B.Tech (Civil Engineering);

1.3.2. Bachelor of Technology in Computer Science and Engineering, abbreviated as B.Tech (Computer Science and Engineering);

1.3.3. Bachelor of Technology in Electronics and Communication Engineering, abbreviated as B.Tech (Electronics and Communication Engineering);

1.3.4. Bachelor of Technology in Electrical and Electronics Engineering, abbreviated as B.Tech (Electrical and Electronics Engineering);

1.3.5. Bachelor of Technology in Mechanical Engineering, abbreviated as B.Tech (Mechanical Engineering);

1.3.6. Bachelor of Technology in Petroleum Engineering, abbreviated as B.Tech (Petroleum Engineering);

1.3.7. Bachelor of Technology in Computer Engineering, abbreviated as B.Tech. (Computer Engineering);

1.3.8. Bachelor of Technology in Computer and Communication Engineering, abbreviated as B.Tech. (Computer and Communication Engineering).

1.3.9. Bachelor of Technology in Information Science and Engineering, abbreviated as B.Tech. (Information Science and Engineering); and,

1.3.10. Bachelor of Technology in Information Science and Technology, abbreviated as B.Tech. (Information Science and Technology).

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

1.5. These Program 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.

1.6. 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 favor or considerations.

1.7. These Program Regulations are structured as follows:

1.7.1. **Part A:** Specific regulations relevant to the Bachelor of Technology (B.Tech) Degree Programs in pursuant of the provisions in Section 6.0 of the Academic Regulations, 2019 of the University.

1.7.2. **Part B:** Program Curriculum for the specific ongoing Bachelor of Technology (B.Tech) Degree Program of study as enumerated and named in Clause 1.3.

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## 2. PART A: PROGRAM SPECIFIC REGULATIONS

### 2.1. Program Description and Duration

B.Tech. Degree Programs are offered in the following branches/ disciplines by the respective parent Departments as indicated in Table 2.1 below:

**Table 2.1**

**B. Tech Degree Programs and respective Parent Departments**

| ***B.Tech Program (Branch/ a)*** | ***Parent Department*** |
|---|---|
| B.Tech (Civil Engineering) | Department of Civil Engineering |
| B.Tech (Computer Science and Engineering) | Department of Computer Science and Engineering |
| B.Tech (Electronics and Communication Engineering) | Department of Electronics and Communication Engineering |
| B.Tech (Electrical and Electronics Engineering) | Department of Electrical and Electronics Engineering |
| B.Tech (Mechanical Engineering) | Department of Mechanical Engineering |
| B.Tech (Petroleum Engineering) | Department of Petroleum Engineering |
| B.Tech (Computer Engineering) | Department of Computer Science and Engineering |
| B.Tech (Computer and Communication Engineering) | Department of Computer Science and Engineering |
| B.Tech (Information Science and Engineering) | Department of Computer Science and Engineering |

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| | |
|---|---|
| B.Tech (Information Science and Technology) | Department of Computer Science and Engineering |

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.

## 2.2. Admission Criteria to the Four-Year Bachelor of Technology (B.Tech) Degree Programs

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 are listed in the following Sub-Clauses:

**2.2.1.** 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 course.

**2.2.2.** 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.

**2.2.3.** 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.

**2.2.4.** 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.

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**2.2.5.** 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.

**2.2.6.** Candidates must fulfil the medical standards required for admission as

prescribed by the University.

**2.2.7.** 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.

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

## 2.3. 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:

**2.3.1.** 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 (fifth and sixth 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%).

**2.3.2.** 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.

**2.3.3.** 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.

**2.3.4.** 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.

**2.3.5.** 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.

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**2.3.6.** 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 2019-2023, minus the number of Credits prescribed for the 1st Year (total number of Credits prescribed for the 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 (Computer Science and 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 Computer Science and Engineering for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

**2.3.7.** 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.

## 2.4. 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:

**2.4.1.** The concerned student fulfils the criteria specified in Sub-Clauses 2.3.1, 2.3.2 and 2.3.3.

**2.4.2.** 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.

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

**2.4.4.** 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 a Committee constituted by the Vice Chancellor for this

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purpose. Further, the 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.

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

## 2.5. Change of Branch/ Discipline

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.

**2.5.1.** 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 6.00 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.

**2.5.2.** 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.

**2.5.3.** 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.

**2.5.4.** 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.

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

2.5.5.1. The actual number of students in the third 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; and,

2.5.5.2. 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.

**2.5.6.** 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.

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## 2.6. Professional Practice Courses

Professional Practice Courses (Professional Practice – I and Professional Practice – II) are practice based Courses with the objective to equip students with the skills of problem identification, root cause analysis and 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 Professional Practice Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations, 2019). The same shall be prescribed in the Course Hand-out.

## 2.7. Professional Practice – I

Professional Practice – I is a 5 Credit Course. This first level practice based course is conducted after the 4th Semester of the B.Tech Program, during the summer break (usually June – July), in accordance with the following options and guidelines:

### *2.7.1. Internship Program in an Industry/ Company:*

A student may undergo an Internship Program for a period of 6 – 8 weeks in an industry/ company, subject to the following conditions:

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

**2.7.1.2.** 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 for award of the Internship to a student;

**2.7.1.3.** 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 providing the Internship, as stated in Sub-Clause 2.7.1.2 above.

**2.7.1.4.** A student may opt for Internship in an Industry/ Company 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 offering such Internship confirms to the University that the Internship program shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

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**2.7.1.5.** A student selected for an Internship in an industry/ company shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

### *2.7.2. Project Work:*

A student may opt to do a Project Work in an Industry/ Company/ Research Laboratory or the University Department(s), subject to the following conditions:

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

***2.7.2.2.*** The student may do the project work in an Industry/ Company/ Research Laboratory of her/ his choice subject to the above mentioned condition (Sub-Clause 2.7.2.1). Provided further, that the Industry/ Company/ Research Laboratory 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.

## 2.8. Professional Practice – II

Professional Practice - II is an intensive practice based course with 15 Credits offered during the final (4th) year of the B.Tech Program. Students may register for Professional Practice – II in either the 7th Semester or the 8th Semester of the B.Tech Program, in accordance with the following guidelines:

***Internship Program in an Industry/ Company:***

A student may undergo an Internship Program for a period of about 15 weeks in an Industry/ Company, subject to the following conditions:

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

**2.8.1.2.** The selection criteria (minimum CGPA, pass in all Courses as on date, any other qualifying criteria) as applicable/ stipulated by the concerned Industry/ Company for award of Internship to a student;

**2.8.1.3.** The number of Internships available for the concerned Academic Term. Further, the available number of Internships will be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfills the criteria, as applicable, specified by the Industry/ Company providing the Internship, as stated in Sub-Clause 2.8.1.2 above.

**2.8.1.4.** A student may opt for Internship in an Industry/ Company 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 offering such Internship confirms to the University that the Internship program shall be conducted in accordance with the Program Regulations and Internship Policy of the

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University.

**2.8.1.5.** A student selected/ awarded an Internship Program in an Industry/ Company shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

***2.8.2. Project Work and Dissertation:***

A student may do an extensive Project Work (with a Dissertation) in an Industry/ Company/ Research Laboratory or the University Department(s), subject to the following conditions:

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

**2.8.2.2.** The student may do the Project Work in an Industry/ Company/ Research Laboratory of her/ his choice subject to the above mentioned condition (Sub-Clause 2.8.2.1). Provided further, that the Industry/ Company/ Research Laboratory 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.

## 2.9. Social Immersion Courses

The objective of a Social Immersion Course (SIC) is to sensitize and inculcate commitment to social and environmental issues and make a contribution through service and experiential learning. The outcome is to produce graduates who are sensitized and committed to serving the social and environmental needs of society.

The SIC is a 1- Credit Course coordinated by the parent Department or a group of Departments and the student is required to complete this course ideally during any of the Semesters of the 2nd or 3rd Year of the B.Tech Program. The nature and details of the SIC shall be approved by the concerned Departmental Academic Committee (DAC). As per the Academic Regulations, the 'S' grade is awarded for "satisfactory completion" of the Course and 'NC' grade is awarded for "non-completion" of the Course. The student who receives the "NC" grade shall repeat the SIC (it may be another type of SIC as approved by the concerned DAC) until the concerned student secures the "S" grade in the SIC. The "S" and "NC" grades do not carry grade points and hence not included in the SGPA, CGPA computations.

## 2.10. Open Electives

Open Electives are Courses offered by any Department/ School of the University. The primary objective of offering Open Electives is to provide interdisciplinary/ transdisciplinary learning experiences. The outcome is a graduate with a fair exposure to disciplines beyond the chosen Branch in the B.Tech Program.

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Open Electives offered by any Department/ School of the University are listed in the Course Structure under the Open Elective category and offered to students of any Department including the parent Department/ School.

The Course details and method of evaluation shall be clearly prescribed in the concerned Course Handout.

## 2.11. Specific Regulations regarding Assessment and Evaluation

(Refer Section 8.5 to 8.8 of the Academic Regulations 2019)

The components of continuous assessments, weightage for each component and the method of evaluation shall be assigned considering the nature of the Courses in terms of the pedagogy and outcomes.

**2.11.1** Normally, for the Courses that have only the Lecture and Tutorial Credit Structure (L – T – 0)/(L – 0 – 0), with no Practical component, the components of Continuous Assessment and the distribution of weightage among the components of continuous assessment and duration of the examination/ assessment shall be as detailed in the Table 2.11.1 below:

**Table 2.11.1 Method of Assessment for Courses with Credit Structures L–T–0 and L–0–0**

| S. No. | Components of Continuous Assessment | Weightage (% of Total Marks) | Duration of Assessment |
|---|---|---|---|
| 1 | Mid Term Examination | 30% | 1.5 hours |
| 2 | Continuous Assessment: This component of Continuous Assessment shall consist of at least two (02) of the following:<br>(1) Assignment(s),<br>(2) Quiz,<br>(3) Technical Seminar/Report,<br>(4) Attendance/Class participation,<br>(5) Assessment on the self-learning topic(s), or,<br>(6) Any other type of assessment as prescribed in the concerned Course Handout. | 20% | NA |
| 3 | End Term Final Examination | 50% | 3 hours |
| | **Total** | **100%** | |

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**Note:**

**(i)** An additional Test 3 may be conducted as an optional test to allow for improvement with approval of the Dean, School of Engineering. If a Test 3 is provided, then the higher marks obtained in any two tests shall be considered for evaluation.

**(ii)** Normally, the End Term Final Examination shall cover the entire course coverage as prescribed in the Course Handouts.

**2.11.2.** Normally, for Practical Courses that have only the Practical Credit Structure (0 – 0 – P), or Practical Courses with a Credit Structure (L – 0 – P), the components of continuous assessment and the distribution of weightage among the components of continuous assessment and duration of the examination/ assessment is detailed in the Table 2.11.2 below:

**Table 2.11.2 Method of Assessment for Practical Courses with Credit Structures 0–0–P and L–0–P**

| S. No. | Components of Continuous Assessments | Weightage (% of Total Marks) | Duration of Assessment |
|---|---|---|---|
| 1 | Mid-Term Examination: Laboratory Work/Practical exercises, conducted in every Laboratory/Practice session/activity, including Laboratory records, practice/project reports, attendance/class participation as applicable, and as prescribed by the Course Handout. | 30% | NA |
| 2 | Continuous Assessment: Practical Test/Viva-Voce/Quiz/Practice Assignments/Presentations and other assessments as prescribed in the Course Handout.. | 20% | NA |
| 3 | End Term Practical Examination: Practical Experiment/Practice Test(s) with Viva-Voce, Jury or any other type of assessment as prescribed in the Course Handout. | 50% | 2 or 3 hours |
| | **Total** | **100%** | |

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**2.11.3.** Normally, for Practice/ Skill based Courses, without a defined credit structure (L – T – P), but with assigned credits, (as defined in Clause 5.2 of the Academic Regulations, 2019), 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 prescribed in the concerned Course Handout. There shall be no component of End Term Final Examinations for such Courses.

**2.11.4.** In case any exception is required for a particular Course, where the methods of assessment prescribed in the specific regulations mentioned above in Sub-Clauses 2.11.1, 2.11.2 and 2.11.3 are not suitable/ relevant for the assessing the performance in the concerned Course, the BOS shall recommend the appropriate method of assessment for approval of the Academic Council.

## 2.12. Course Handout

The Course Handout (Refer Clause 6.2 of the Academic Regulations, 2019) is a comprehensive document describing the Objectives/ Outcomes of the Course, the detailed syllabus (with the prescribed Text Book(s) and Reference Material), the Lesson/ Session-wise Plan, and all the relevant and necessary details regarding the pedagogy, expectation from the students regarding preparation, participation and self-learning, components of continuous assessment and respective weightage (in percentage (%) of the total marks of all components of assessment) given to the components, and the method of evaluation. The guidelines for preparation of the Course Handout, its approval and delivery are listed in the following Sub-Clauses:

2.12.1. The Course Handout will be prepared as per the Outcome Based Education Guidelines of the University.

2.12.2. Normally the Course Handout is prepared by the Course Instructor(s) assigned to teach the Course. In cases of multiple sections of students registered for the same Course, an Instructor In-Charge, assigned by the DAC, shall prepare the Course Handout in consultation with the other Course Instructors assigned to the concerned Course.

2.12.3. The DAC shall examine each Course Handout and arrange for necessary deliberations as required. On acceptance of the completeness and quality of the Course Handout, the DAC shall approve the Course Handout.

2.12.4. A consolidated printed/ soft copy of the Booklet of all Course Handouts corresponding to the concerned Semester of a particular Program of Study shall be provided to every student concerned on the first day/ Registration day of the concerned Semester.

2.12.5. The Course Handout Booklet is a very important guide for the students registered in the concerned course. The students are expected to use the Course Handout Booklet to prepare regularly and benefit from each session (lecture/ tutorial/ practical) of the Course(s) and perform well in the continuous assessments and End Term Final Examination, as applicable. Every student shall read and adhere to all the guidelines prescribed in the Course Handout

Booklet.

## 2.13. Rules and Guidelines for Transfer of Credits from Massive Open Online Courses

(Refer Section 18.0 of the Academic Regulations, 2019.)

The provisions and rules pertaining to the transfer of credits through Massive Open Online Courses are outlined in Section 18.0 of the Academic Regulations, 2019.

With reference to Clause 18.2 of the Academic Regulations, the rules and guidelines for transfer of credits specifically from Study Webs of Active-Learning for Young Aspiring Minds-National Program on Technology Enhanced Learning (SWAYAM-NPTEL) are as stated in the following Sub-Clauses:

2.13.1. A student may complete SWAYAM-NPTEL courses 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 and/or the mandatory credit requirements of Management Sciences Courses as prescribed in the concerned B. Tech. Program Regulations and Curriculum. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses, the Open Elective Courses and the Management Sciences Courses as prescribed by the Program Regulations and Curriculum of the concerned B. Tech. Program.

2.13.2. Approved SWAYAM-NPTEL Courses shall be included as annexes to the Program Regulations and Curriculum for the concerned B. Tech. Program and shall be announced through University Notifications to the students from time to time. A student shall only request for transfer of credits from such approved/notified SWAYAM-NPTEL Courses as published by the concerned Departments.

2.13.3. SWAYAM-NPTEL Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM-NPTEL Course(s) and obtained the SWAYAM-NPTEL Certificate to this effect.

2.13.4. A student cannot transfer credits from SWAYAM-NPTEL Courses to earn the mandatory credits assigned for any other type of Courses (other than Discipline, Open Elective Courses and Management Sciences Courses) as prescribed in the concerned Program Regulations and Curriculum. However, a student may complete SWAYAM-NPTEL Courses and transfer equivalent credits in excess of the required mandatory Credits (and Courses). In the case of such transfers beyond the mandatory Credits the transferred Credits will be included in the calculations of SGPA and CGPA.

2.13.5. Before the commencement of each Semester or during Pre-Registration schedule as per the Academic Calendar, Parent Departments may release a list of SWAYAM-NPTEL courses approved as Discipline Elective courses for each B. Tech. Program offered by them. In addition, Departments may also

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release a list of Open Elective courses offered for all B. Tech. Programs.

2.13.6. Students may Pre-Register for the approved SWAYAM-NPTEL Courses in the respective Departments and register for the SWAYAM-NPTEL Courses as per the schedule announced by SWAYAM-NPTEL.

2.13.7. The credit equivalence of the SWAYAM-NPTEL Courses are based on course durations and/or as recommended by SWAYAM-NPTEL. The Credit Equivalence mapped to SWAYAM-NPTEL course durations for transfer of credits is summarised in Table 2.13.1 below.

**Table 2.13.1 SWAYAM-NPTEL Course Durations and Credit Equivalence**

| S. No. | Course Duration | Credit Equivalence for Transfer of Credits |
|---|---|---|
| 1 | 4 Weeks | 1 Credit |
| 2 | 8 Weeks | 2 Credits |
| 3 | 12 Weeks | 3 Credits |

2.13.8. A student who has successfully completed the approved SWAYAM-NPTEL Course(s) and wants to avail the provision of transfer of equivalent credits to fulfil (partially or fully) the mandatory credit requirements of the Discipline Electives and/or Open Electives and/or Management Sciences Courses as prescribed in the concerned Program Regulations and Curriculum, must submit the original SWAYAM-NPTEL Course Certificates to the Head of the Parent Department concerned, with a written request for the transfer of the equivalent credits. On verification of the SWAYAM-NPTEL Course Certificates and approval by the Head of the Department concerned, the SWAYAM-NPTEL Course(s) and equivalent Credits will be included in Course (with associated Credits) Registration of the concerned student in the Semester immediately following the completion of the SWAYAM-NPTEL Course(s).

2.13.9. The grading system for such SWAYAM-NPTEL Courses with transfer of credits is specified in Table 2.13.2 below.

**Table 2.13.2 Grading System for SWAYAM-NPTEL Courses**

| S. No. | Final Score on the SWAYAM-NPTEL Certificate | Grade Awarded |
|---|---|---|
| 1 | 90% and above | O |

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| Table 2.13.2 Grading System for SWAYAM-NPTEL Courses | | |
|---|---|---|
| **S. No.** | **Final Score on the SWAYAM-NPTEL Certificate** | **Grade Awarded** |
| 2 | From 80% to 89% | A+ |
| 3 | From 70% to 79% | A |
| 4 | From 60% to 69% | B+ |
| 5 | From 50% to 59% | B |
| 6 | From 40% to 49% | C |

2.13.10. A student may submit a request for credit transfer from SWAYAM-NPTEL Courses before the last instruction day of the seventh ($7^{th}$) Semester of the B. Tech. program as specified in the Academic Calendar. Requests for credit transfers shall not be permissible in the eighth ($8^{th}$) semester.

2.13.11. The maximum permissible number of credits that a student may request for transfer in a Semester is ten (10) credits.

2.13.12. The University shall not reimburse any fees/expense, a student may incur for the SWAYAM-NPTEL Courses.

## 3. PART B: PROGRAM CURRICULUM

# BACHELOR OF TECHNOLOGY DEGREE PROGRAM IN INFORMATION SCIENCE AND ENGINEERING
# B.TECH (INFORMATION SCIENCE AND ENGINEERING)
# 2019-2023

Information Science and Engineering (ISE) is a program which leads to specialization in Machine Learning. The study of information science is a process of understanding the properties and behavior of information by scientific analysis, manipulating, retrieval and dissemination of information. ISE curriculum encompasses both core knowledge of Computer Engineering and chain of courses required to solve problems using Machine Learning knowledge. The program focuses on empowering the students with hands on experience in a plethora of topics such as predictive analytics, pattern recognition, big data analytics, information retrieval, Machine learning using Python, and deep learning, each of which enhances the employability prospects of the students.

The program will also prepare students for postgraduate studies and helps in cracking different national and international aptitude tests for getting admission to IITs, NITs as well as different top ranked Universities in countries like USA, Australia, Singapore and Europe. The students are encouraged to take online courses, from SWAYAM, NPTEL at national level and MOOCs from Harvard, MIT, Microsoft and other top universities and institutions across the World. The program also includes value added courses like SIC and NSS activities that help the students to build moral and ethical standards and also to inherit qualities such as integrity, transparency, respect, professionalism and teamwork.

The Program Educational Objectives, Program Outcomes, Program Specific Outcomes and Learning Objectives of the B. Tech. Program in Information Science and Engineering at Presidency University are as follows.

**Program Educational Objectives (PEO)**

After the completion of B.Tech. Program in Information Science and Engineering from Presidency University, the graduates shall:

**PEO1:** Demonstrate success as a Computer Engineer with innovative skills, having moral and ethical values.

**PEO2:** Engage in lifelong learning through research and professional development.

**PEO3:** Serve as a leader in the profession through consultancy, extension activities and/ or entrepreneurship.

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**Program Outcomes (PO)**

Graduates of the B. Tech. Program in Information Science and Engineering will acquire:

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

**PO2: Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4: Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

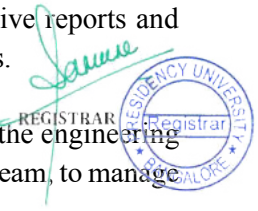
**PO6: The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10: Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.




**PO11: Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSO)**

At the end of the B. Tech. Program in Information Science and Engineering the students shall:

**PSO1:** Acquire the ability to explain and apply key ideas in artificial intelligence and machine learning to design intelligent solutions to problems in a variety of domains and business applications.

**PSO2:** Acquire hands-on experience in implementing scalable solutions with AI and machine leaning components, technologies and tools.

**PSO3:** Exhibit professional ethics, effective communication skills and excellent team work in their professional career.

**Learning Outcome (LO)**

**LO1:** To gain recognition as a Department of Excellence.

**LO2:** To provide opportunity to students to excel in curricular, extra-curricular and co-curricular activities.

**LO3:** To provide students an environment of innovation and train students to pursue research.

**LO4:** To equip students to face societal challenges.

## 3.1 PROGRAM CURRICULUM

### 3.1.1 **Mandatory** Courses and Credits

The B.Tech (Information Science and Engineering) Program structure (2019-2023) consists of 181 credits, leading to specialization in Machine Learning.

Table 3.1.1 summaries the type of Courses, number of Courses under each type and the associated credits that are mandatorily required for the completion of the Degree.

**TABLE 3.1.1**
**B.Tech (Information Science and Engineering) 2019-2023: Mandatory Courses and Credits**

| S. No. | TYPE OF COURSES | NO. OF COURSES | CREDITS |
|---|---|---|---|
| 1 | Humanities (HS) | 2 | 5 |
| 2 | Management Sciences (MS) | - | 6 |

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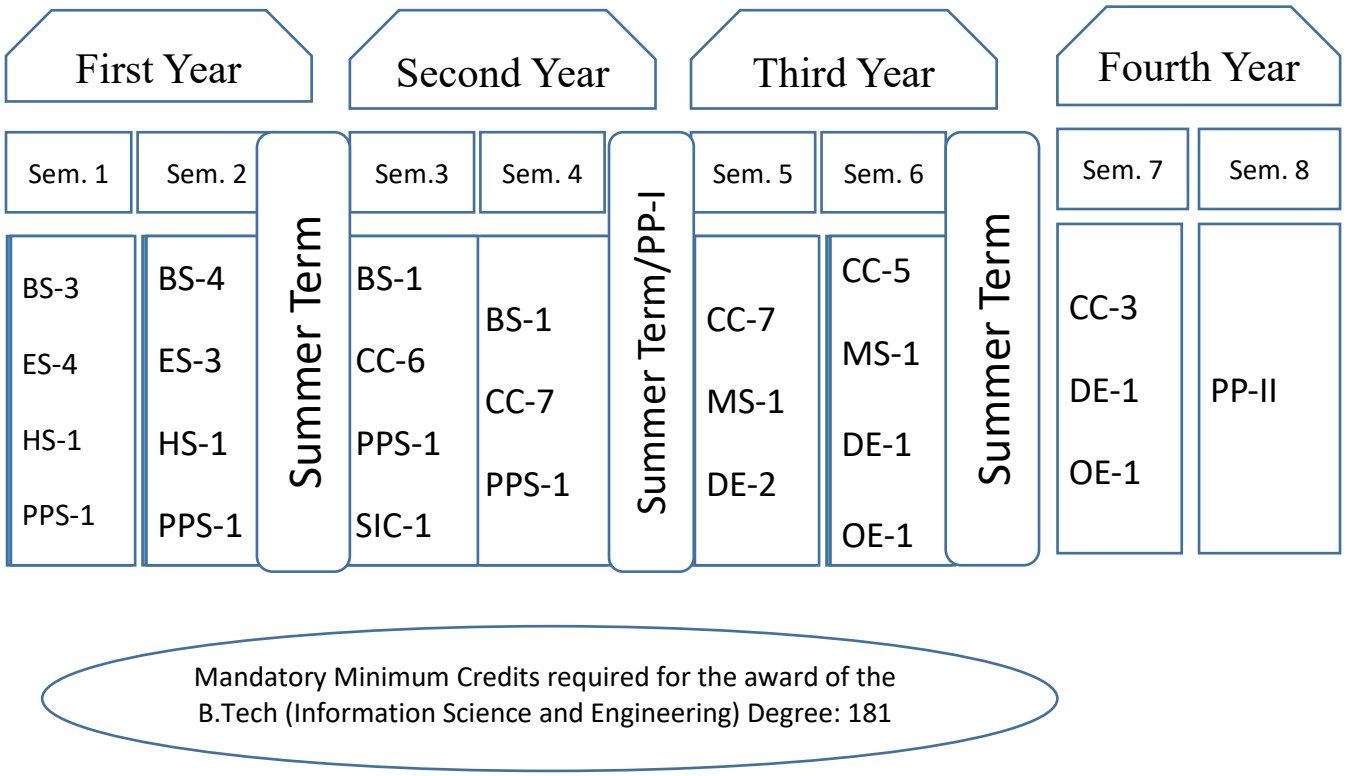
| | | | |
|---|---|---|---|
| 3 | Basic Sciences (BS) | 9 | 29 |
| 4 | Engineering Sciences (ES) | 7 | 21 |
| 5 | Core (Professional ) Course (CC) | 28 | 77 |
| 6 | Discipline (Professional) Elective (DE) | - | 16 |
| 7 | Open Elective (OE) | - | 9 |
| 8 | Professional Practice (PP) | 2 | 13 |
| 9 | Personal and Professional Skills (PPS) | 4 | 4 |
| 10 | Social Immersion Course (SIC) | 1 | 1 |
| **TOTAL** | | | **181** |
| **The mandatory minimum credits required for the award of the B. Tech. (Information Science and Engineering) Degree is 181 Credits.** | | | |

The Table 3.1.1 is indicative of various components such as Foundation Courses (Basic Sciences, Engineering Sciences, Humanities, Social Sciences and Management Sciences), Professional Core, Discipline and Open Elective Courses. The unique feature of this Program is Professional Practice - I of 6-8 weeks during the end of 4th Semester and before the commencement of 5th Semester for the student to have industry exposure. The Professional Practice - II will be during their 7th / 8th Semester for about 15 weeks. Social Immersion Course, which is mandatory, is introduced in the curriculum for the student to give value of social service such as community service, clean and green, NSS, Protection of environment and health hazards, etc.

Table-3.1.1 lists the mandatory Courses, type of Courses, number of type of Courses and the associated credits required for the completion of the B.Tech (Information Science and Engineering) Program.

### 3.1.2 B.Tech (Information Science and Engineering) Program Suggested Year Wise Structure




**Nomenclature:**

BS - Basic Sciences
ES - Engineering Sciences
HS - Humanities
MS - Management Sciences
CC - Core Course
DE - Discipline/Professional Electives
OE - Open Electives
PP-I/PP-II - Professional Practice
PPS - Personal and Professional Skills
SIC - Social Immersion Course

In the entire Program, the practical and skill based Course component contribute to an extent of approximately 30% out of the total credits of 181 for B.Tech (Information Science and Engineering) Program of four years duration.

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## 3.2 SUGGESTED PROGRAM STRUCTURE

| I SEM - PHYSICS CYCLE (Aug-Dec)# | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | CREDITS | | | |
| 1 | MAT 105 | Calculus and Linear Algebra | 3 | 1 | 0 | 4 | 4 | F[1] | - |
| 2 | PHY 101 | Engineering Physics | 4 | 0 | 0 | 4 | 4 | F | - |
| 3 | EEE 101 | Elements of Electrical Engineering | 3 | 0 | 0 | 3 | 3 | P[2] | - |
| 4 | CIV 101 | Elements of Civil Engineering | 3 | 0 | 0 | 3 | 3 | P | Env[4] |
| 5 | MEC 152 | Engineering Graphics | 2 | 0 | 4 | 4 | 6 | P | - |
| 6 | ENG XXXX | Humanities-I | 2 | 1 | 0 | 3 | 3 | F/E[3] | - |
| 7 | PHY 151 | Engineering Physics Lab | 0 | 0 | 2 | 1 | 2 | F | - |
| 8 | MEC 151 | Workshop Practice | 0 | 0 | 2 | 1 | 2 | P | - |
| 9 | PPS 105 | Building Self Confidence | 0 | 0 | 2 | 1 | 2 | E | - |
| | | **TOTAL** | **17** | **2** | **10** | **24** | **29** | | |
| [1] Foundation Course<br>[2] Professional Skills | | | | | | | [3] Employability Skills<br>[4] Environmental Issues | | |

| I SEM - CHEMISTRY CYCLE (Aug-Dec)# | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | CREDITS | | | |
| 1 | MAT 105 | Calculus and Linear Algebra | 3 | 1 | 0 | 4 | 4 | F | - |
| 2 | CHE 101 | Engineering Chemistry | 4 | 0 | 0 | 4 | 4 | F | - |
| 3 | ECE 101 | Elements of Electronics Engineering | 3 | 0 | 0 | 3 | 3 | P | - |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | MEC 101 | Elements of Mechanical Engineering | 3 | 0 | 0 | 3 | 3 | P | - |
| 5 | CIV 102 | Environmental Science and Disaster Management | 3 | 0 | 0 | 3 | 3 | F | Env |
| 6 | ENG 1XX | Humanities-I | 1 | 0 | 2 | 2 | 3 | E | - |
| 7 | CSE 151 | Computer Programming | 2 | 0 | 4 | 4 | 6 | E | - |
| 8 | CHE 151 | Engineering Chemistry Lab | 0 | 0 | 2 | 1 | 2 | F | - |
| 9 | PPS 105 | Building Self Confidence | 0 | 0 | 2 | 1 | 2 | F | PE[5]/S[6] |
| | | **TOTAL** | **19** | **1** | **10** | **25** | **30** | | |

[5] Professional Ethics
[6] Sustainability Issues

**II SEM - CHEMISTRY CYCLE (Jan-May)***

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | MAT 106 | Calculus, Differential Equations and Complex Variables | 3 | 1 | 0 | 4 | 4 | F | - |
| 2 | CHE 101 | Engineering Chemistry | 4 | 0 | 0 | 4 | 4 | F | - |
| 3 | ECE 101 | Elements of Electronics Engineering | 3 | 0 | 0 | 3 | 3 | P | - |
| 4 | MEC 101 | Elements of Mechanical Engineering | 3 | 0 | 0 | 3 | 3 | P | - |
| 5 | CIV 102 | Environmental Science and Disaster Management | 3 | 0 | 0 | 3 | 3 | F | Env |
| 6 | ENG 1XX | Humanities-II | 1 | 0 | 2 | 2 | 3 | E | - |
| 7 | CSE 151 | Computer Programming | 2 | 0 | 4 | 4 | 6 | E | - |
| 8 | CHE 151 | Engineering Chemistry Lab | 0 | 0 | 2 | 1 | 2 | F | - |
| 9 | PPS 106 | Effective Communication | 0 | 0 | 2 | 1 | 2 | F | PE/S |
| | | **TOTAL** | **19** | **1** | **10** | **25** | **30** | | |

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| II SEM - PHYSICS CYCLE (Jan-May)# | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | CREDITS | | | |
| 1 | MAT 106 | Calculus, Differential Equations and Complex Variables | 3 | 1 | 0 | 4 | 4 | F | - |
| 2 | PHY 101 | Engineering Physics | 4 | 0 | 0 | 4 | 4 | F | - |
| 3 | EEE 101 | Elements of Electrical Engineering | 3 | 0 | 0 | 3 | 3 | P | - |
| 4 | CIV 101 | Elements of Civil Engineering | 3 | 0 | 0 | 3 | 3 | P | Env |
| 5 | MEC 152 | Engineering Graphics | 2 | 0 | 4 | 4 | 6 | P | - |
| 6 | ENG 1XX | Humanities-II | 2 | 1 | 0 | 3 | 3 | F/E | - |
| 7 | PHY 151 | Engineering Physics Lab | 0 | 0 | 2 | 1 | 2 | F | - |
| 8 | MEC 151 | Workshop Practice | 0 | 0 | 2 | 1 | 2 | P | - |
| 9 | PPS 106 | Effective Communication | 0 | 0 | 2 | 1 | 2 | E | - |
| | | **TOTAL** | **17** | **2** | **10** | **24** | **29** | | |

**Note: At the end of the 1st year (Common to all B.Tech. Program) the total credits offered is 49.**

| III SEMESTER | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S.No. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | C | | | |
| 1 | MAT107 | Transform Techniques, Partial Differential Equations and Probability | 3 | 1 | 0 | 4 | 4 | F | |
| 2 | CSE 201 | Data Structures | 3 | 0 | 0 | 3 | 3 | P | - |
| 3 | CSE 202 | Digital Design | 3 | 0 | 0 | 3 | 3 | F | - |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | CSE 203 | Discrete Mathematics | 3 | 1 | 0 | 4 | 4 | F | - |
| 5 | CSE 258 | Problem Solving Using Python | 1 | 0 | 4 | 3 | 5 | P/E | - |
| 6 | CSE 223 | Computer Architecture and Organization | 3 | 0 | 0 | 3 | 3 | P | - |
| 7 | CSE 251 | Data Structures Lab | 0 | 0 | 4 | 2 | 4 | P | - |
| 8 | CSE 252 | Digital Design Lab | 0 | 0 | 2 | 1 | 2 | F | - |
| 9 | PPS 107 | Design Thinking And Team Building | 0 | 0 | 2 | 1 | 2 | E | PE |
| | | **TOTAL** | **16** | **2** | **12** | **24** | **30** | | |

*Student has to register for Social Immersion Course in any one semester 3/4/6 to earn the mandatory credits

| **IV SEMESTER** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S.No** | **COURSE CODE** | **COURSE NAME** | **CREDIT STRUCTURE** | | | | **CONTACT HOURS** | **TYPE OF SKILL** | **COURSE ADDRESSES TO** |
| | | | **L** | **T** | **P** | **C** | | | |
| 1 | MAT108 | Numerical Methods, Probability Distributions and Sampling Techniques | 4 | 0 | 0 | 4 | 4 | F | - |
| 2 | CSE 242 | Introduction to Machine Learning | 3 | 0 | 0 | 3 | 3 | P | - |
| 3 | CSE 210 | Operating Systems | 3 | 0 | 0 | 3 | 3 | P | - |
| 4 | CSE 206 | Microprocessors and Micro Controllers | 3 | 0 | 0 | 3 | 3 | P | - |
| 5 | CSE 207 | Database Management Systems | 3 | 0 | 0 | 3 | 3 | P | - |
| 6 | CSE 208 | Theory of Computation | 3 | 1 | 0 | 4 | 4 | P | - |
| 7 | CSE 253 | Database Management Systems Lab | 0 | 0 | 4 | 2 | 4 | P | - |
| 8 | CSE 254 | Microprocessors and Micro Controllers Lab | 0 | 0 | 2 | 1 | 2 | P | - |
| 9 | PPS 108 | Being Corporate Ready | 0 | 0 | 2 | 1 | 2 | E | PE |
| | | **TOTAL** | **19** | **1** | **8** | **24** | **28** | | |

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** Note: The students will undergo Professional Practice I during the summer break between the fourth and fifth semester and the credits earned will be accounted in the fifth semester.

| V SEMESTER | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | C | | | |
| 1 | CSE204 | Object oriented Programming | 1 | 0 | 4 | 3 | 5 | P | - |
| 2 | CSE212 | Analysis of Algorithms | 3 | 0 | 0 | 3 | 3 | P/E | |
| 3 | CSE 227 | Software Engineering and Project Management | 3 | 0 | 0 | 3 | 3 | P | - |
| 4 | CSE 228 | Principles of Artificial Intelligence | 3 | 0 | 0 | 3 | 3 | P | - |
| 5 | CSE 255 | Analysis of Algorithms Lab | 0 | 0 | 2 | 1 | 2 | P | - |
| 6 | CSE XXX | Discipline Elective – I | 3 | 0 | 0 | 3 | 3 | P/E | - |
| 7 | MGT 112 | Engineering Economics | 3 | 0 | 0 | 3 | 3 | E | P |
| 8 | CSEXXX | Discipline Elective-II | 1 | 0 | 4 | 3 | 5 | P/E | - |
| 9 | PIP 101 | Professional Practice - I ** | 0 | 0 | 0 | 5 | | P/E | PE |
| | | TOTAL | 19 | 0 | 10 | 27 | 27 | | |

| VI SEMESTER | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | C | | | |
| 1 | CSE 219 | Big Data Analytics | 1 | 0 | 4 | 3 | 5 | P/E | - |
| 2 | XXX XXX | Open Elective – I | 3 | 0 | 0 | 3 | 3 | P/E | - |
| 3 | CSE 232 | Information Retrieval and Organization | 3 | 0 | 0 | 3 | 3 | P | - |
| 4 | CSE 233 | Cloud Computing and Services | 3 | 0 | 0 | 3 | 3 | P/E | |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | CSE 261 | Machine Learning using Python | 1 | 0 | 4 | 3 | 5 | P/E | - |
| 6 | CSE 226 | Optimization Techniques | 3 | 0 | 0 | 3 | 3 | P | PE |
| 7 | MGT 113 | Digital Entrepreneurship | 3 | 0 | 0 | 3 | 3 | P/E | - |
| 8 | SIC 501 | Social Immersion Course | - | - | - | 1 | 0 | P | G/Env/S |
| | | **TOTAL** | **17** | **0** | **8** | **22** | **25** | | |
| Gender Issues | | | | | | | | | |

**VII SEMESTER**

| S.No. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | C | | | |
| 1 | CSE 243 | Natural Language Processing | 2 | 0 | 0 | 2 | 2 | P | - |
| 2 | CSE 235 | Introduction to Deep Learning | 3 | 0 | 0 | 3 | 3 | P | - |
| 3 | CSE 220 | Internet of Things | 1 | 0 | 4 | 3 | 5 | P/E | - |
| 4 | CSE246 | computer network and Simulation | 2 | 0 | 2 | 3 | 4 | p | - |
| 5 | CSEXXX | Discipline Elective – III | 3 | 0 | 0 | 3 | 3 | P/E | |
| 6 | CSEXXX | Discipline Elective – IV | 1 | 0 | 4 | 3 | 5 | P/E | - |
| 7 | XXX XXX | Open Elective – II | 3 | 0 | 0 | 3 | 3 | P/E | |
| | | **TOTAL** | **15** | **0** | **10** | **20** | **25** | | |

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| VIII SEMESTER | | | |
|---|---|---|---|
| **S.No.** | **COURSE CODE** | **COURSE NAME** | **Credits** |
| 1. | PIP 102* | Professional Practice- II | 15 |

* The Course PIP102 (15 Credits) will remain unchanged for the students who have gone abroad for pursuing higher education via international MoU with Presidency University.

| S.No. | COURSE CODE | COURSE NAME | Credits |
|---|---|---|---|
| 1. | XXX XXX | Open Elective -III | 3 |
| 2. | CSE XXX* | Discipline Elective – V | 2 |
| 3. | CSE XXX* | Discipline Elective – VI | 2 |
| 4. | PIP 103 | Professional Practice- II | 8 |
| | | **TOTAL** | **15** |

*for other Students, PIP102(15 credits) is proposed to be replaced with the courses as listed in the Table above.

**TABLE — 3.2.1**

**LIST OF COURSES IN HUMANITIES**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | ENG 103 | Technical Written Communication | 2 | 1 | 0 | 3 | 3 | F/E | - |
| 2 | ENG 104 | Technical Spoken Communication | 1 | 0 | 2 | 2 | 3 | E | - |

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| TABLE — 3.2.2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LIST OF MANAGEMENT SCIENCES COURSES | | | | | | | | | |
| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | CREDITS | | | |
| 1 | MGT 112 | Engineering Economics | 3 | 0 | 0 | 3 | 3 | E | - |
| 2 | MGT 113 | Digital Entrepreneurship | 3 | 0 | 0 | 3 | 3 | E | - |

| TABLE 3.2.3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DISCIPLINE ELECTIVES | | | | | | | | | |
| S.NO | COURSE CODE | COURSE NAME | L | T | P | C | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| 1 | CSE 302 | Programming in C# and .NET framework | 1 | 0 | 4 | 3 | 5 | E | - |
| 2 | CSE 303 | Information Theory and Coding | 3 | 0 | 0 | 3 | 3 | P | - |
| 3 | CSE 304 | Mobile Communications | 3 | 0 | 0 | 3 | 3 | P | - |
| 4 | CSE 305 | Parallel Computing | 3 | 0 | 0 | 3 | 3 | P | - |
| 5 | CSE 309 | Virtualization | 3 | 0 | 0 | 3 | 3 | P | - |
| 6 | CSE 310 | Mobile Applications Development | 1 | 0 | 4 | 3 | 5 | E | - |
| 7 | CSE 311 | Web Services | 1 | 0 | 4 | 3 | 5 | E | - |
| 8 | CSE 312 | Game Theory | 3 | 0 | 0 | 3 | 3 | - | - |
| 9 | CSE 313 | Storage Area Networks | 3 | 0 | 0 | 3 | 3 | P | - |
| 10 | CSE 314 | Software Architecture | 3 | 0 | 0 | 3 | 3 | P | - |
| 11 | CSE 320 | Graphics Programming | 3 | 0 | 0 | 3 | 3 | P | - |
| 12 | CSE 321 | Robotic Process Automation | 3 | 0 | 0 | 3 | 3 | P/E | - |
| 13 | CSE 322 | Agile Technologies | 3 | 0 | 0 | 3 | 3 | P | - |
| 14 | CSE 323 | Programming in JAVA | 1 | 0 | 4 | 3 | 5 | E | - |
| 15 | CSE 324 | Internet and Web Technologies | 1 | 0 | 4 | 3 | 5 | E | - |

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|---|---|---|---|---|---|---|---|---|---|
| 16 | CSE 325 | Bio Informatics | 3 | 0 | 0 | 3 | 3 | - | - |
| 17 | CSE 326 | Evolutionary Computing | 3 | 0 | 0 | 3 | 3 | - | - |
| 18 | CSE 327 | Web Data Mining | 3 | 0 | 0 | 3 | 3 | E | - |
| 19 | CSE 328 | Semantic Web Technologies | 3 | 0 | 0 | 3 | 3 | E | - |
| 20 | CSE 336 | Digital Image Processing | 3 | 0 | 0 | 3 | 3 | P | - |
| 21 | CSE 367 | Data Visualization | 1 | 0 | 4 | 3 | 5 | P | - |
| 22 | CSE368 | Distributed Systems | 3 | 0 | 0 | 3 | 3 | P | - |
| 23 | CSE399 | Programming in GO | 3 | 0 | 0 | 3 | 3 | P | |
| 24 | NAS 3001 | NASSCOM Powered DGNEXT | 3 | 0 | 0 | 3 | 3 | - | - |
| 25 | CSE390 | Front End Full Stack Development | 0 | 0 | 4 | 2 | 4 | EM | |
| 26 | CSE391 | JAVA Full Stack Development | 0 | 0 | 4 | 2 | 4 | EM | |
| 27 | CSE392 | .NET Full Stack Development | 0 | 0 | 4 | 2 | 5 | EM | |
| 28 | CSE357 | ETHICS IN ENGINEERING PRACTICE | 2 | 0 | 0 | 2 | 2 | - | - |
| 29 | CSE359 | DATASCIENCE FOR ENGINEERS | 2 | 0 | 0 | 2 | 2 | - | - |
| 30 | CSE360 | INTRODCUTION TO SOFT COMPUTING | 2 | 0 | 0 | 2 | 2 | - | - |
| 31 | CSE358 | INFORMATION SECURITY-5- SECURE SYSTEM ENGINEERING | 2 | 0 | 0 | 2 | 2 | - | - |

| TABLE — 3.2.1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **LIST OF COURSES IN HUMANITIES** | | | | | | | | | |
| **S. NO.** | **COURSE CODE** | **COURSE NAME** | **CREDIT STRUCTURE** | | | | **CONTACT HOURS** | **TYPE OF SKILL** | **COURSE ADDRESSES TO** |
| | | | **L** | **T** | **P** | **CREDITS** | | | |
| 1 | ENG 103 | Technical Written Communication | 2 | 1 | 0 | 3 | 3 | 1/3 | - |
| 2 | ENG 104 | Technical Spoken Communication | 1 | 0 | 2 | 2 | 3 | 3 | - |
| [1] Foundation Course; [2] Professional Skills; [3] Employability Skills; [4] Entrepreneurship skills; [5] Research skills [6]Sustainability Issues; [7] Environment Issues; [8] Professional Ethics; [9] Gender Equality, [10]Knowledge Enhancement. | | | | | | | | | |

| TABLE — 3.2.2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **LIST OF MANAGEMENT SCIENCES COURSES** | | | | | | | | | |
| **S. NO.** | **COURSE CODE** | **COURSE NAME** | **CREDIT STRUCTURE** | | | | **CONTACT HOURS** | **TYPE OF SKILL** | **COURSE ADDRESSES TO** |
| | | | **L** | **T** | **P** | **CREDITS** | | | |
| 1 | MGT 112 | Engineering Economics | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 2 | MGT 113 | Digital Entrepreneurship | 3 | 0 | 0 | 3 | 3 | 3 | - |
| [1] Foundation Course; [2] Professional Skills; [3] Employability Skills; [4] Entrepreneurship skills; [5] Research skills [6]Sustainability Issues; [7] Environment Issues; [8] Professional Ethics; [9] Gender Equality, [10]Knowledge Enhancement | | | | | | | | | |

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| TABLE 3. 2.3<br>DISCIPLINE ELECTIVE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
| | | | L | T | P | CREDITS | | | |
| 1 | EEE 301 | Microcontroller Applications | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 2 | EEE 302 | Electrical Machine Design | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 3 | EEE 303 | Electrical Equipment Testing and Commissioning | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 4 | EEE 304 | Introduction to Electrical Drives | 3 | 0 | 0 | 3 | 3 | 2/3 | 6 |
| 5 | EEE 306 | FACTs Controllers in Power Transmission & Distribution | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 6 | EEE 307 | Power Quality in Electrical Systems | 3 | 0 | 0 | 3 | 3 | 2/3 | 7 |
| 7 | EEE 308 | Real Time Embedded System Design | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 8 | EEE 309 | Battery Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 9 | EEE 310 | Electric Power Generation | 3 | 0 | 0 | 3 | 3 | 2/3 | 6 |
| 10 | EEE 311 | Utilization of Electrical Energy | 3 | 0 | 0 | 3 | 3 | 2/3 | 6 |
| 11 | EEE 312 | Power system operation and control | 3 | 0 | 0 | 3 | 3 | 2/3 | 6 |
| 12 | EEE 313 | High voltage engineering | 3 | 0 | 0 | 3 | 3 | 2/3 | _ |
| 13 | EEE 314 | Energy management systems and SCADA | 3 | 0 | 0 | 3 | 3 | 2/3 | 6 |
| 14 | EEE 315 | Advanced control systems | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 15 | EEE 316 | Power semiconductor devices | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 16 | EEE 317 | PWM Converters | 3 | 0 | 0 | 3 | 3 | 3/2 | — |
| 17 | EEE 318 | Distributed generation and Microgrid | 3 | 0 | 0 | 3 | 3 | 3/2 | 6/7 |
| 18 | EEE 319 | Electric Vehicles | 3 | 0 | 0 | 3 | 3 | 2/3 | 6/7 |
| 19 | EEE 320 | Finite Element Analysis for Electrical Machines | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 20 | EEE 321 | Switched Mode Power Conversion | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 21 | EEE 322 | PLC's for automation | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 22 | EEE 323 | Introduction to Micro Electro Mechanical Systems | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 23 | EEE 324 | Special Electrical Machines and their Applications | 3 | 0 | 0 | 3 | 3 | 2/3 | — |
| 24 | EEE 325 | Sensors, Transducers and their applications | 3 | 0 | 0 | 3 | 3 | 2/3 | — |

[1] Foundation Course; [2] Professional Skills; [3] Employability Skills; [4] Entrepreneurship skills; [5] Research skills

[6]Sustainability Issues; [7] Environment Issues; [8] Professional Ethics; [9] Gender Equality, [10]Knowledge Enhancement.

**TABLE — 3.2.4**

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | CIV 380 | Geographical Information Systems | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6 |
| 2 | CIV 280 | Environmental Impact Assessment | 3 | 0 | 0 | 3 | 3 | 2 | 7/6 |
| 3 | CIV 281 | Sustainable Materials and Green Buildings | 3 | 0 | 0 | 3 | 3 | 2 | 7/6 |
| 4 | CIV 381 | Construction Project Management | 3 | 0 | 0 | 3 | 3 | 2/3 | 8 |
| 5 | CIV 282 | Hazardous Waste Treatment | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6/8 |
| 6 | CIV 283 | Elements of Construction Management | 3 | 0 | 0 | 3 | 3 | 2 | 8 |
| 7 | CIV 382 | System Design for Environment and Sustainability | 3 | 0 | 0 | 3 | 3 | 2/4 | 7/6/8 |
| 8 | CIV 383 | Infrastructure Systems for Smart Cities | 3 | 0 | 0 | 3 | 3 | 2/4 | 7/6/8 |

[1] Foundation Course; [2] Professional Skills; [3] Employability Skills; [4] Entrepreneurship skills; [5] Research skills
[6]Sustainability Issues; [7] Environment Issues; [8] Professional Ethics; [9] Gender Equality, [10]Knowledge Enhancement.

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | CSE 395 | Image Processing | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 2 | CSE 296 | Data Structures Using C | 3 | 0 | 0 | 3 | 3 | 2 | |
| 3 | CSE 396 | Software Testing and Quality Assurance | 3 | 0 | 0 | 3 | 3 | 2/3 | |
| 4 | CSE 297 | Social Network Analytics | 3 | 0 | 0 | 3 | 3 | 2/3 | - |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | CSE 397 | Digital and Mobile Forensics | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 6 | CSE 298 | Database Management Systems | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 7 | CSE 398 | Multimedia and Animation | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 8 | CSE 299 | Data Analytics Using R | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 9 | CSE 399 | Data Visualisation | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 10 | CSE 501 | Technical Training | 0 | 0 | 6 | 3 | 3 | 2/3 | - |

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | EEE 221 | Energy Audit | 3 | 0 | 0 | 3 | 3 | 2/3/4 | 3/2 |
| 2 | EEE 222 | Research Methodology | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 3 | EEE 223 | Introduction to Smart Grid Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | 6 |
| 4 | EEE 103 | Professional Ethics in Engineering | 3 | 0 | 0 | 3 | 3 | - | 2 |
| 5 | EEE 224 | Soft Computing Techniques | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 6 | EEE 104 | Control Systems | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 7 | EEE 225 | Fundamentals of Robotics | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 8 | EEE 105 | Electrical Engineering Lab | 2 | 0 | 2 | 3 | 4 | 2/3 | - |
| 9 | EEE 226 | Nanotechnology Fundamentals and Applications | 3 | 0 | 0 | 3 | 3 | 2 | - |

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF ELECTRONICS AND COMMUNCATION ENGINEERING**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | ECE 295 | Artificial Neural Networks | 3 | 0 | 0 | 3 | 3 | 5 | - |
| 2 | ECE 296 | Biomedical Instrumentation | 3 | 0 | 0 | 3 | 3 | 10 | - |
| 3 | ECE 297 | IOT: Internet of Things | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 4 | ECE 298 | Industrial Automation and Control | 3 | 0 | 0 | 3 | 3 | 3 | - |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | ECE 299 | Computational Intelligence and Machine Learning | 3 | 0 | 0 | 3 | 3 | 5 | - |

[1] Foundation Course; [2] Professional Skills; [3] Employability Skills; [4] Entrepreneurship skills; [5] Research skills [6]Sustainability Issues; [7] Environment Issues; [8] Professional Ethics; [9] Gender Equality, [10]Knowledge Enhancement.

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF MECHANICAL ENGINEERING**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | MEC 102 | Automotive Vehicles | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 2 | MEC 103 | Nanotechnology | 3 | 0 | 0 | 3 | 3 | - | - |
| 3 | MEC 328 | Engineering Optimisation | 3 | 0 | 0 | 3 | 3 | - | - |
| 4 | MEC 329 | Operations Research for Engineers | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 5 | MEC 104 | Operations Management | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 6 | MEC 105 | Work Study | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 7 | MEC 106 | Project Management | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 8 | MEC 107 | Organizational Behaviour | 3 | 0 | 0 | 3 | 3 | 3 | - |
| 9 | MEC 330 | Renewable Energy Systems | 3 | 0 | 0 | 3 | 3 | - | 7/6 |
| 10 | MEC 331 | Design of Automatic Control Systems | 3 | 0 | 0 | 3 | 3 | - | - |

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF PETROLEUM ENGINEERING**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | PET 231 | Computational Methods in Chemical Engineering | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 2 | PET 232 | Computational Fluid Dynamics | 3 | 0 | 0 | 3 | 3 | 2 | - |
| 3 | PET 233 | Petroleum Corrosion Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 4 | PET 234 | Polymer Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 5 | PET 235 | Oil and Gas Quality Management | 3 | 0 | 0 | 3 | 3 | 2/3 | - |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | PET 236 | Oil and Gas Transportation and Marketing | 3 | 0 | 0 | 3 | 3 | 2/3 | - |
| 7 | PET 237 | Material Science and Engineering | 3 | 0 | 0 | 3 | 3 | 2 | - |

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF BASIC SCIENCES AND HUMANITIES**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | PSY 101 | Social Psychology | 3 | 0 | 0 | 3 | 3 | 2/3/4 | 8/6 |
| 2 | ENG 105 | Literature Appreciation | 3 | 0 | 0 | 3 | 3 | 2/3 | 9/6 |
| 3 | CHE 201 | Composite Materials | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6 |
| 4 | CHE 202 | Catalysis Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6 |
| 5 | CHE 203 | Surface Coating Technology and Corrosion Science | 3 | 0 | 0 | 3 | 3 | 2/3/4 | 7/6 |
| 6 | CHE 204 | Bioenergy | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6 |
| 7 | CHE 205 | Advanced Separation Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6 |
| 8 | PHY 201 | Elements of Nuclear Radiation and Technology | 3 | 0 | 0 | 3 | 3 | 2/3 | 7/6 |
| 9 | PHY 202 | Amorphous Semiconductors for Technological Applications | 3 | 0 | 0 | 3 | 3 | 2/3/4 | - |
| 10 | PHY 203 | Nano Structured Materials | 3 | 0 | 0 | 3 | 3 | 2/3/4 | - |

**OPEN ELECTIVES OFFERED BY THE DEPARTMENT OF L & D**

| S. NO. | COURSE CODE | COURSE NAME | CREDIT STRUCTURE | | | | CONTACT HOURS | TYPE OF SKILL | COURSE ADDRESSES TO |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CREDITS | | | |
| 1 | PPS 401 | Coding and Aptitude Training | 3 | 0 | 0 | 3 | 3 | 2/3 | |

[1] Foundation Course; [2] Professional Skills; [3] Employability Skills; [4] Entrepreneurship skills; [5] Research skills [6]Sustainability Issues; [7] Environment Issues; [8] Professional Ethics; [9] Gender Equality, [10]Knowledge Enhancement.

**Note:** However these are only indicative. Depending upon the need and availability of expertise new electives can be offered.

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### 3.3 COURSE DESCRIPTION AND SYLLABUS

| Course Name: | Calculus and Linear Algebra | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | MAT 105 | Credit Structure : | L | T | P | C |
| | | | 3 | 1 | 0 | 4 |

**Course Description:** The objective of this course is to model engineering problems, understand the applications of continuous functions and obtain solutions of real world problems. Calculus is the backbone of any engineering applications and hence this course is an extension of senior secondary or PUC level. This course introduces the concept of successive differentiation, properties of polar curves, expansion of function involving one variable and evaluation of indeterminate forms. Further, the students are exposed to partial differentiation techniques, its applications, differentiation of vector and scalar functions along with their applications, reduction formulae and evaluation of integrals with standard limits, and solution of first order and first degree differential equations with their applications. Also, the course provides the knowledge of matrices and system of equations.

Textbooks:

1. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10th edition, John Wiley, 2014.

Reference Books:

1. Glyn James, "*Advanced Modern Engineering Mathematics*", 4th edition, Pearson Education, 2015.
2. B.S. Grewal, *' Higher Engineering Mathematics*", 43rd edition, Khanna Publishers, 2014.

| Course Name: | Engineering Physics | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | PHY 101 | Credit Structure : | L | T | P | C |
| | | | 4 | 0 | 0 | 4 |

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**Course Description:** The main objective of this course is to study the basic concepts of physics that helps developing the ability to identify, formulate and apply to engineering applications. This course covers the areas, namely, applied physics and modern physics. The course includes the concepts of free electron theory, electrical properties and applications of contemporary and useful materials such as semiconductors,

superconductors and dielectric materials are discussed in detailed manner. It also emphasizes on modern concepts such as the concepts of lasers and its applications in the field of optical fiber communication system and other areas. Finally, the need of quantum mechanics, the quantum approach concepts like, matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent equation and application of Schrodinger's wave equation are discussed.

**Textbooks:**

1. Wiley, *Engineering Physics*, 2014 Wiley India.

**Reference Books:**


**1.** G Aruldhas, *Engineering Physics*,2014 PHI Learning Pvt. Ltd, Delhi.

**2.** M.N Avadhanulu, P G Kshirsagar, *Engineering Physics*, 2010 S Chand & Co. Pvt. Ltd.

**3.** Md. N. Khan, S Panigrahi, *Principles of Engineering Physics* 1 & 2, 2014 Cambridge Univ. Press.

**4.** Serway Raymond and Jewett John, *Physics for Scientists and Engineers with Modern Physics*, 2003 Cengage.

**5.** Arthur and Beiser Concepts of Modern physics 2017 7th Edition McGraw Hill Education.


| **Course Name:** | **Elements of Electrical Engineering** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **EEE 101** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** The course aims at nurturing the students with the significance of Electrical Engineering. The course provides exhaustive knowledge about the basic laws of electrical sciences, AC/ DC circuit analysis, AC & DC machines. It also includes Measuring Instruments, Earthing, Electrical wiring and safety measures.

**Textbook:**

1. John Hiley, Keith Brown and Ian McKenzie Smith, *"Hughes Electrical and Electronic Technology",* Pearson.

**Reference Books:**


1. K Uma Rao and A Jayalakshmi, *"Basic Electrical Engineering"* 2016 Revised Edition, I K International Publishing House Pvt. Ltd.
2. D.P. Kothari, I. J. Nagrath, *"Basic Electronics",* McGraw Hill Education.
3. Smarajit Ghosh*, "Fundamentals of Electrical and Electronics Engineering",* PHI.


| **Course Name:** | **Elements of Civil Engineering** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CIV 101** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |



**Course Description:** The objective of this Course is to make students learn the basics of Civil Engineering concepts, role of civil engineers, infrastructure development, sustainability, and solve problems involving

forces, loads and moments and know their applications in allied subjects. It is a pre-requisite for several Courses involving Forces and Moments.

The students should have a prior knowledge of basic mathematics and physics to pursue the Course. The Course consists of an introduction of civil engineering through an exposition of its disciplines, types of Infrastructure, different types of construction materials, composition of forces, concepts of resultants and equilibrium of forces.

After successful completion of the Course, the students would acquire knowledge on the basics of Civil Engineering, its scope of study, knowledge about green buildings, roads, airports, bridges and dams. They would be able to comprehend the action of Forces, Moments and other loads on systems of rigid bodies; Compute the reactive forces and the effects that develop as a result of the external loads.

**Textbooks:**

1. M.N. Shesha Prakash, Ganesh B. Mogaveer, "Elements of Civil Engineering and Engineering Mechanics", PHI Learning.
2. Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, "Elements of Civil Engineering", PHI Learning Pvt Ltd.

**Reference Books:**

1. Shrikrishna A Dhale and Kiran M Tajne, "Basics of Civil Engineering", S Chand Publication.
2. S. S. Bhavikatti, "Basic Civil Engineering", New Age International Publication
3. Satheesh Gopi, "Basic Civil Engineering", Pearson Publication

| **Course Name:** | **Engineering Graphics** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **MEC 152** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **2** | **0** | **4** | **4** |

**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 computerised drafting tools. Computerised 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.

**Textbook:**

1. N. D. Bhatt, "Engineering Drawing: Plane and Solid Geometry," Charotar Publishing House Pvt. Ltd.

**Reference Books:**

1. D. A. Jolhe, "Engineering Drawing: With an Introduction to AutoCAD," Tata McGraw Hill
2. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, "Engineering Graphics with AutoCAD," Prentice Hall.

**Course Material:**

"Engineering Graphics Lab Manual," Presidency University

| Course Name: | Technical Written Communication | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | ENG 103 | Credit Structure : | L | T | P | C |
| | | | 2 | 1 | 0 | 3 |

**Course Description:** A course on Technical Written Communication facilitates writing skills; letters, emails, notice, agenda, minutes of the meeting, reports, etc. The course will train the students to write better English and face the corporate wold with determination and self belief. The course includes theoretical session on communication, reading and writing skill with special emphasis on letters, emails and reports. Practical sessions in form of tutorials will help the students to practice vocabulary, reading, common errors, sentence transformations, etc.

**Reference Books:**


1. Greg Satell. *"Why Communication is Today's Most Important Skill."* FORBES. Feb 6, 2015.
2. Bacon, Francis. *"Of Studies." Selected Writings of Francis Bacon*. Ed. Hugh G. Dick. New York. Random House, 1955. P. 22.
3. Bovee, Courtland L. Thill, John V, Chatterjee. Abha. *Business Communication Today*. 10th Edition. Pearson.
4. Raman, Meenakshi. Sharma, Sangeetha. *Technical Communication: Principles and Practice.* Oxford University Press, New Delhi. 2015.
5. Hart, Steve. Nari, Aravind R. and Bhambhani, Veena. Embark: *English for Undergraduates.* New Delhi; Cambridge University Press, 2016.
6. Online Resources: a.Globarena Online Language Learning Software


| Course Name: | Engineering Physics Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | PHY 151 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description:** This course includes the laboratory sessions on determination of the wave length of Laser, Rigidity modulus, dielectric constant, calculation of Numerical Aperture and energy band gab by four probe method, fermi energy of copper and acceleration due to gravity by simple pendulum. It also includes experiments on characteristics of Transistor, Zener Diode and LCR Series and Parallel Resonance Circuits.

**Course Material: "***Engineering Physics Lab manual"* Presidency University.

| Course Name: | Workshop Practice | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | MEC 151 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**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.

The course involves a hands on approach to fitting of metal components, concept of development of surfaces through sheet metal work, usage of engineering measurement devices, metal joining by arc welding, and an introduction to plumbing and electrical connections.

**Course Material:**

"Engineering Workshop Lab Manual," Presidency University, 2017-18.

**Reference Books:**

1. B. S. Nagendra Parashar, R. K. Mittal, "Elements of Manufacturing Processes," Prentice Hall of India.
2. S. K. Hajra Choudhury, "Elements of Workshop Technology - Volume I - Manufacturing Processes," Media Promoters and Publishers Pvt. Ltd.

| **Course Name:** | **Building Self Confidence** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **PPS 105** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **0** | **0** | **2** | **1** |

**Course Description:** Developing right attitude, effective communication skills and confidence to be successful in this highly competitive environment is of utmost importance. This course helps the students to develop their personality and drives them to create their personal brand. The students are exposed to various fun-filled activities to gain confidence in facing people, facing crowd and expressing their ideas.

**Textbooks:**

Building Self Confidence Training Manual

**Reference Books:**

1. Prakash Iyer, *"The Habit of Winning"*, 2nd Edition, Penguin Books Ltd., 2016.
2. Jack Canfield, *"The Success Principles"*, 8th Edition, HarperCollins Publishers India, 2015.
3. Shiv Khera, 3d Edition, "You Can Win", Bloomsbury India, 2014.

| **Course Name:** | **Engineering Chemistry** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CHE 101** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **4** | **0** | **0** | **4** |

**Course Description:** The primary objective of the course is to introduce the students to the concepts and applications of chemistry in Engineering. It should cultivate in them an ability to identify chemistry in each piece of finely engineered products used in households and industry. It aims to strengthen the fundamental concepts of chemistry and then builds an interface with their industrial applications. It deals with applied and industrially useful topics, such as Water Technology, Engineering materials such as Polymers & Liquid

crystals, Introduction to Computational Chemistry, Electrochemistry principles & its application to batteries, Corrosion and its control, Fuels and combustion.

**Textbooks:**


1. Dr. K. Pushpalatha, "Engineering Chemistry", Revised Edition, Wiley.
2. Jain and Jain, "A text Book of Engineering Chemistry", S. Chand & Company Ltd. New Delhi, 2009, Reprint- 2016.


**Reference Books:**


1. Wiley, "Engineering Chemistry", Wiley.
2. F.W. Billmeyer, Text Book of Polymer Science, John Wiley & Sons, 4th Edition, 1996.
3. M.G. Fontana, N. D. Greene, Corrosion Engineering, McGraw Hill Publications, New York, 3rd Edition, 1996.
4. Principles of Physical Chemistry B.R.Puri, L.R. Sharma & M.S. Pathania, S. Nagin Chand & Co., 41 Ed., 2004.
5. Kuriakose J.C. and Rajaram J. " Chemistry in Engineering and Technology" Vol I & II, Tata Mc Graw – Hill Publications Co Ltd, NewDelhi, First edition Reprint 2010.
6. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press.


| **Course Name:** | **Elements of Electronics Engineering** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **ECE 101** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** The course aims at nurturing the students with the fundamental principles of electronics engineering, prevailing in various engineering applications. The course begins with the fundamentals of electronic systems and some basic laws of electricity. The topics include: classification of materials, types of Semiconductor materials, p-n Junction, Diodes, Characteristics, Rectifiers, Junction Transistor, BJT Configurations, Characteristics, BJT Biasing basics, Transistor Applications. Subsequently the student is introduced to Digital Electronics – Codes and Number systems – viz. Decimal, Binary and hexadecimal systems, conversions. 1's and 2's complements, binary addition. Boolean logic, basic gates and Universal Gates, and laws for reduction of the logic expressions, implementation using basic gates. Basics of communication systems, introduction to microprocessors and its applications.

**Textbooks:**


1. John Hiley, Keith Brown and Ian McKenzie Smith, *"Hughes Electrical and Electronic Technology"*, Pearson.


**Reference Books:**


1. Smarajit Ghosh, *"Fundamentals of Electrical and Electronics Engineering*", PHI.
2. D.P. Kothari, I. J. Nagrath, *"Basic Electronics",* McGraw Hill Education.

3. Rajendra Prasad, *"Fundamentals of Electronics Engineering",* Cengane Learning.

| **Course Name:** | **Elements of Mechanical Engineering** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **MEC 101** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** This course is designed to acquaint students with the fundamentals of mechanical engineering by covering some basics of thermal engineering, design engineering and manufacturing processes.

The discussion on thermal engineering includes the study of different forms of energy, the laws of thermodynamics, properties of steam, heat engines, heat pumps, steam boilers and an introduction to fluid properties and machinery. The discussion on design engineering covers transmission of motion and power. The discussion on manufacturing processes includes metal cutting and machines tools.

**Textbooks:**

1. K. P. Roy, S. K. Hajra Choudhury, Nirjhar Roy, *"Elements of Mechanical Engineering,"* Media Promoters and Publishers Pvt. Ltd. Mumbai.

**Reference Books:**

1. Pravin Kumar, *"Basic Mechanical Engineering*," Pearson.
2. V. K. Manglik, *"Elements of Mechanical Engineering,"* PHI.
3. Dr. D. S. Kumar, *"Elements of Mechanical Engineering," S.* K. Kataria & Sons.

| **Course Name:** | **Environmental Science and Disaster Management** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CIV 102** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** The overall objective of the course is to provide clear understanding of natural resources, environment, its maintenance and the basic concepts of disaster management. The course consists of the concepts of renewable and non-renewable resources, conservation of these resources, ecosystems, role of human being in maintaining a clean and useful environment for the future generations, maintaining ecological balance and conservation of biodiversity. It includes causes of environmental deterioration and its control; human environmental disturbances, water and air pollution, mitigation measures, disaster and waste management etc. After successful completion of the course, the students would be able to understand the various types of natural resources and problems due to over exploitation. Also gain knowledge about the different components of the ecosystem, their interrelation, various hazards, natural disasters, their effects and management.



**Textbooks:**

1. Benny Joseph, *"Environmental Studies",* McGraw-Hill.

**Reference Books:**


1. R. Rajagopalan, *"Environmental studies–From Crisis to Cure",* Oxford University Press.
2. P. Anandan and R. Kumaravelan, *"Environmental Science and Engineering",* Scitech.
3. ErachBharucha, *"Environmental Studies for Undergraduate courses",* Universities Press.
4. R.B. Singh (Ed), *"Disaster Management",*Rawat.
5. MahuaBasuand S. Xavier "*Fundamentals of Environmental Studies*" Cambridge University Press.


| **Course Name:** | **Technical Spoken Communication** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **ENG 104** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **2** | **2** |

**Course Description:** A course on Technical Spoken Communication aims at improving the target audience spoken skills in English. It is a theory cum practice course targeting to improve the I year B.Tech students' pronunciation, listening, narration , presentation and group discussion skills. Rules of pronunciation, syllable stress, traits of good listener, types of listening, barriers to listening, strategies for improving narration, presentation and group discussion skills will be delivered in the theory hours and practice and evaluation on the theories will be done in the practical hours.

**Reference Books:**


1. Tomson, Robert. *"The Interview."* Stories of Work, Life and the Balance in Between. The Write Place.
2. Daniel. J. C. "Unforgettable Salim Ali*." Inspiring People: Fifty People Who Made a Difference.* Readers Digest Selection.
3. Bovee, Courtland L. Thill, John V, Chatterjee. Abha. *Business Communication Today*. 10th Edition. Pearson
4. Carmine, Gallo. "*11 Presentation Lessons You Can Still Learn From Steve Jobs."* FORBES, October 12, 2012.
5. Thrishna's: *How to Do well in GDs and Interview*. New Delhi: Pearson 2013
6. Raman, Meenakshi. Sharma, Sangeetha. *Technical Communication: Principles and Practice.* Oxford University Press, New Delhi. 2015.
7. Hart, Steve. Nari, Aravind R. and Bhambhani, Veena. Embark: *English for Undergraduates*. New Delhi; Cambridge University Press, 2016.
8. J. K. Gangal, *A Practical course in Spoken English*, PHL Learning Private Limited, Delhi-2014.


| **Course Name:** | **Computer Programming** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 151** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **2** | **0** | **4** | **4** |



**Course Description:** This course will provide an introduction to foundational concepts of computer programming to students of all branches of Engineering. This module includes a mix of traditional lectures

and laboratory sessions. Each meeting starts with a lecture and finishes with a laboratory session. Topics covered in this course are problem formulation and development of simple programs, Pseudo code, Flow Chart, Algorithms, data types, operators, decision making and branching, looping statements, arrays, functions, pointers, structures, union and basic file operations. In the lab secession students are required to solve problems based on the above concepts to illustrate the features of the structured programming.

**Textbook:**

9.E. Balagurusamy, "*Programming in ANSI C*", Tata McGraw Hill.

**Reference Books:**

1. Yale Patt, Sanjay Patel, "*Introduction to Computing Systems: From bits and gates to C and beyond"*, McGraw Hill.

2. Ehrouz A Forouzan, Richard F Gilberg, "*Computer science: A structured programming approach using C"*, Cengage Learning.

| **Course Name:** | **Engineering Chemistry Lab** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CHE 151** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **0** | **0** | **2** | **1** |

**Course Description:** The lab course intends to train the students to develop their experimental skills and apply fundamental chemical principles in problems related to chemistry in engineering. The experiments are designed to support the theory lectures and the hands-on experience will thus enhance students' in understanding the concepts.

The course includes the estimation of total hardness of water by EDTA complexometric method, determination of the total alkalinity of a given water sample, estimation of Iron (II) in Mohr's salt, estimation of calcium oxide in cement, determination of Chemical Oxygen Demand (COD) of Industrial Waste Water sample, determination of pKa value of weak acid using pH meter, Estimation of copper colorimetrically, determination of Iron (II) by potentiometry, determination of viscosity co-efficient of a liquid using Ostwald's Viscometer, estimation of strength of mixture of acids by conductometry method.

**Course Material:** *"Engineering Chemistry Lab Manual",* Presidency University.

| **Course Name:** | **Calculus, Differential Equations and Complex Variables** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **MAT 106** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **1** | **0** | **4** |



**Course Description:** This course is also commonly designed for all engineering branches and the contents learned in the previous semester are the prerequisite for this course. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real-world applications to engineering problems. The topics covered include basic concepts of probability and

conditional probability, Baye's law and correlation analysis, Linear Regression and method of least square, Solution of second and higher order, linear ordinary differential equations with constant and variable coefficients. Formation of Partial Differential Equations (PDE), solution of homogeneous and non-homogeneous PDEs and the application of PDEs. Evaluation of double and triple integrals, change of order of integration, change of coordinates, beta and gamma functions, line integral, surface integral and volume integral of vector and scalar functions. Laplace transforms of functions and properties; Laplace transform of periodic and unit step functions. Inverse Laplace Transforms, Application of Laplace transforms and solution of differential equations.

**Textbooks:**


1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th edition, John Wiley-India Publishers, 2014.
2. Ronald E. Walpole, Raymond H. Myers, Sharon. L. Myers and Keying E. Ye, *Probability and Statistics for Engineers and Scientists*, Pearson Education, Delhi. 9th Edition, 2012.


**Reference Books:**


1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Edition, Cengage Learning, 2012.
2. B. S. Grewal, Higher Engineering Mathematics, 43rd edition, Khanna Publishers, 2014.


| **Course Name:** | **Effective Communication** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **PPS 106** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **0** | **0** | **2** | **1** |

**Course Description:** In order to succeed in the world that has become more global than being confined to smaller areas, we need to be very good in communication. This programme introduces students to different techniques of communication that makes them communicate clearly and effectively. During this programme, students are given a lot of exercises to inculcate better flow of thought and speech with emphasis on being effective in communication.

**Text Book:**

1. Presidency University *"Effective Communication"* Training Manual

| **Course Name:** | Transform Techniques, Partial Differential Equations and Probability | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **MAT 107** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **1** | **0** | **4** |

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**Course Description**: This course is commonly designed for all engineering branches and the contents learned in the previous semester are the prerequisite for this course. Solution of second and higher order, linear ordinary differential equations with constant and variable coefficients. Formation of Partial

Differential Equations (PDE), solution of homogeneous and non- homogeneous PDEs and the application of PDEs. Evaluation of double and triple integrals, change of order of integration, change of coordinates, beta and gamma functions, line integral, surface integral and volume integral of vector and scalar functions. Laplace transforms of functions and properties; Laplace transform of periodic and unit step functions. Inverse Laplace Transforms, Application of Laplace transforms and solution of differential equations. The course aims at introducing students to quantitative uncertainty analysis and risk assessment for engineering applications. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real-world applications to engineering problems. The topic covered include random variables, discrete and continuous probability distributions covering binomial, Poisson, geometric, exponential, uniform, normal distributions and their applications.

**Textbooks**:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley& Sons (India), 2014.
2. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2014.

**Reference Books**:

1. Advanced Engineering Mathematics, K .A. Stroud and Dexter Booth, Fifth Edition, Macmillan Education, UK.

2. B.S. Grewal, "*Higher Engineering Mathematics*", Khanna Publishers.

| **Course Name:** | **Data Structures** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 201** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** The purpose of this Course is to provide the students with solid foundations in data structures and algorithms. It focuses on logical structures of data, their physical representation, design of algorithms and techniques for program development and debugging. Emphasis is placed on the appropriate use and choice of standard data structures.

Topics include: ADT, lists, stacks, queues, trees, heaps, hash tables, and graphs.

**Text Book(s):**

Richard F Gilberg and Behrouz A Forouzan, *"Data Structures: A Pseudocode Approach with C", Cengage learning.*

**Reference Book(s):**

1. Robert L Kruse, Bruce P Leung and Clovis L Tondo, *"Data Structures and Program Design in C"*, Pearson.

2. Seymour Lipschutz, "*Data Structures with C(Schaum's Outline Series)"*, McGraw Hill Education.

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| **Course Name:** | **Digital Design** |
|---|---|

| Course Code: | CSE 202 | Credit Structure : | L | T | P | C |
|---|---|---|---|---|---|---|
| | | | 3 | 0 | 0 | 3 |

**Course Description:** This Course will provide the fundamental background needed to understand how digital systems work and how to design digital circuits. Students will gain experience with several digital systems, from simple logic circuits to programmable logic devices.

Topics include: Number systems and codes, Boolean algebra, logic circuits and minimization, Combinational and sequential logic circuits, Programmable Logic devices, State table and state diagrams, Counters and shift registers, Arithmetic operations and algorithms, fault diagnosis and tolerance.

**Text Book(s):**

1. Mano, M. Morris and Ciletti Michael D., *"Digital Design"*, Pearson Education.
2. Biswas N N ,*"Logic design Theory"*,Seagull Publishing.

**Reference Book(s):**

1. Jain, R. P., *"Modern Digital Electronics"*, McGraw Hill Education.
2. Roth, Charles H., Jr and Kinney Larry L., *"Fundamentals of logic Design"*, Cengage Learning.
3. Floyd T l ,*"Digital fundamentals"*,Pearson.

| Course Name: | Discrete Mathematics | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 203 | Credit Structure : | L | T | P | C |
| | | | 3 | 1 | 0 | 4 |

**Course Description:** Discrete Mathematics must be a core subject in computer Science as per ACM and IEEE. In contrast to calculus (for all engineering Courses), Discrete Mathematics is the back bone for Computer Science.

Topics include: Prepositional logic, Predicate logic, Sets, functions, sequences and sums, Basic and Advance counting techniques, Induction and Recursion, Fundamental Algorithms, the integers, Matrices and Relations

**Text Book(s):**

Kenneth H Rosen *"Discrete Mathematics and its Applications"*,McGraw Hill.

**Reference Book(s):**

1.S.EPP, *"Discrete Mathematics"*, Academic Press.

2. Thomas Kochy,*"Discrete Mathematics"*, Academic Press

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| Course Name: | Problem Solving Using Python | Employability |
|---|---|---|

| Course Code: | CSE 258 | Credit Structure : | L | T | P | C |
|---|---|---|---|---|---|---|
| | | | 1 | 0 | 4 | 3 |

**Course Description**:

This course provides the opportunity for the students of Computer Science engineering to develop Python scripts using its powerful programming features like lists, sets, tuples, dictionaries and sets. Students will also be introduced to object oriented programming concepts and packages for data visualization.

Topics include: Basics of Python programming, operators and expressions, decision statements, loop control statements, functions, strings, lists, list processing : searching and sorting, nested list, list comprehension, tuples and dictionaries, sets, file handling, exception handling, object oriented programming concepts, modules and packages for data visualization.

**Textbook(s)**

1. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Problem Solving and Python Programming", Tata Mc Graw Hill Edition, 2018.
2. Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India Edition, 2015.
3. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, 2017.

**Reference Book(s)**

1. E. Balagurusamy, "Introduction to Computing and Problem Solving Using Python", Tata McGraw-Hill, 2016
2. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2017

| Course Name: | Computer Organization | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 223 | Credit Structure: | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** This course covers basics of modern computer organization. The emphasis is on understanding the interaction between computer hardware and software at various levels. The students will learn the concepts of computer technology, performance evaluation, instruction set design, computer arithmetic, hierarchical memory systems, data path and control unit design of processors.

Topics: Introduction to Computer Arithmetic, Instruction sets, Processor vs. memory interaction, CPU Design, Memory system, Input-Output Interface, Asynchronous Data Transfer, Programmed I/O, Interrupts, Direct Memory Access, Basic Input / Output Structure.

**Text Book(s):**

1. "Computer Organization"- Carl Hamacher, Zvonko Vranesic Et al. Fifth Edition.
2. "Computer Organization and Design." The Hardware/Software Interface-David A. Patterson & John L. Hennessy Fifth Edition

**Reference Book(s):**

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015

| Course Name: | Data Structures Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 251 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

**Course Description:** Implementing Data structures like Stacks, Queues, Linked lists, Trees, Binary search trees, Heaps, Graph traversal using C language.

**Text Book(s):**

Richard F Gilberg and Behrouz A Forouzan, *"Data Structures: A Pseudocode Approach with C"*, Cengage learning.

**Reference Book(s):**

1**.** Behrouz A Forouzanand Richard F Gilberg, "*Computer science: A structured programming approach using C",*Cengage Learning.

2. Robert L Kruse, Bruce P Leung and Clovis L Tondo, "*Data Structures and Program Design in C"*, Pearson.

| Course Name: | Digital Design Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 252 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description:** Implementing digital design concepts like verification of logic gates, De morgan's theorem, Reducing Boolean expression using K-map, Adder and subtractor circuits, Number conversion, Multiplexer and De multiplexer using gates, Flip flops, shift registers and counters.

**Text Book(s):**

1. Mano, M. Morris and Ciletti Michael D., *"Digital Design",* Pearson Education.

2. Biswas N N,*"Logic design Theory"*, Seagull publishing.

**Reference Book(s):**

1. Jain, R. P., *"Modern Digital Electronics"*, McGraw Hill Education.

2. Roth, Charles H., Jr and Kinney Larry L, *"Fundamentals of logic Design",* Cengage Learning, .

3. Floyd T l , "*Digital fundamentals",* Pearson.

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| Course Name: | Design Thinking and Team Building | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | PPS 107 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description**: This Course is directed towards making students perform in teams, become an asset for a team and develop the Leadership Skills needed for today's time. It gives participants an understanding of their self-esteem level and how to have high self-esteem. The Course helps the participants to understand their level of assertiveness and helps them to develop their assertiveness in different situations. This Course also includes training on how to connect to team people, how to resolve conflicts among team members and how to lead oneself and a group of people. It covers details about different types of leadership, situational leadership and the situations where these different types of leadership are applicable.

**Course Material: "***Professional and Business Skills - I training material"*, Presidency University.

| Course Name: | Numerical Methods, Probability Distributions and Sampling Techniques | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | MAT 108 | Credit Structure : | L | T | P | C |
| | | | 3 | 1 | 0 | 4 |

**Course Description:** The objective of Engineering Mathematics – IV is to equip the students with adequate knowledge of basic mathematics that will enable them in formulating problems and solving them analytically as well as numerically in their Engineering programme. The course enables students to incorporate the knowledge of complex variables and their significance in engineering, Numerical methods and sampling theory to support their concurrent, subsequent engineering studies to explore complex systems, physicists, engineers and mathematicians require computational methods since mathematical models are rarely solvable analytically. This course provides an introduction to basic numerical methods such as fitting of various curves, interpolation, differentiation, integration. This course also provides an introduction to numerical solution of algebraic and transcendental equations, ordinary differential equations such as Taylor's series method, modified Euler's method and Runge-Kutta Methods. The course aims at introducing students to quantitative uncertainty analysis and risk assessment for engineering applications. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real- world applications to engineering problems. sampling distributions of means and variances, chi- squared, t and F distributions, methods of estimation, estimating means, proportions and variances, maximum likelihood estimation, tests of hypothesis on means, proportions and variances, chi-squared test of goodness of fit.

**Textbooks**


1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons (India), 2014.
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. Ronald .E. Walpole, Raymond. H. Myers, Sharon. L Myers, and Keying E.Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Delhi-9th edition, 2012.

**Reference Books**


1. B.S. Grewal, "Higher Engineering Mathematics", 43rd edition, Khanna Publishers.
2. B.S. Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.
3. Kishor S Trivedi, "Probability ansd Statistics with reliability, Queuing and Computer Science Applications", John Wiley & Sons, 2nd edition, 2008.


| Course Name: | Introduction to Machine Learning | | Employability | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 242 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:**

Machine Learning is a field of computational science that is key to develop intelligent systems that perform predictive data analytics. This course provides a concise introduction to fundamental concepts in machine learning and some of the popular machine learning algorithms.

Topics include: Data collection from files, web scrapping; pre-processing; feature selection, introduction to machine learning – supervised learning – decision trees, nearest neighbor algorithms; un-supervised learning – k-means clustering; Bayesian learning – Naïve Bayes ; brief introduction to ensemble learning ; association rule learning and deep learning.

**Text Books:**


1. Tan P. N., Steinbach M & Kumar V. "***Introduction to Data Mining"*** **,**Pearson Education, 2016.
2. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms form data science and machine learning", Packt Publishing, 2017.
3. Ethem Alpaydin, *"Introduction to Machine Learning"*, The MIT Press, 2014.


**Reference Books:**


1. Tom Mitchell, *"Machine Learning"*, McGraw Hill Education, 2015.
2. Peter Harrington, *"Machine Learning in Action"*, Wiley India 2016.
3. Sebastian Nowozin, Stephen J. Wright, *"Optimization for Machine Learning"*, Prentice Hall of India, 2013.
4. Vinod Chandra S.S., Anand Hareendran S, *"Artificial Intelligence and Machine Learning,* Prentice Hall of India, 2014.


| Course Name: | Operating Systems | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 210 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** Operating systems being central to computing activities, this Course provide understanding of the functions and functional modules of operating systems. The design and implementation of Operating systems is also covered.

Topics include: Core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security.

Students should have previous familiarity with programming in a high-level language, assembly language programming, CPU organization, instruction sets and registers.

**Text Book(s):**

Silberschatcz A, Galvin P B and Gagne G, "Operating System Concepts", Wiley.

**Reference Book(s):**

1. William Stallings, "Operating systems", Prentice Hall, Pearson.

2. Andrew S Tanenbaum and Albert S Woodhull, "Operating Systems Design and Implementation", Pearson.

| **Course Name:** | **Microprocessors and Microcontrollers** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 206** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description**: The objective of this Course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other Courses where control can be achieved via a microprocessor/ controller implementation. Topics include: Semiconductor memory devices and systems, microcomputer architecture, assembly language programming, I/ O programming, I/ O interface design, I/ O peripheral devices, data communications, and data acquisition systems.

**Text Book (s):**

1.Barry B Brey , "Intel *microprocessor 8086/ 8088*" ,Pearson,PHI.

2. Douglas V Hall, "*Microprocessors and Interfacing, Programming and Hardware*" Tata McGraw Hill.

**Reference book(s):**

**1.** Muhammad Ali Mazidi, "*Microprocessors and Microcontrollers*", Pearson.

2. Ramesh Gaonkar, "*Microprocessor Architecture, Programming and Applications with the 8085*", PHI

| **Course Name:** | **Database Management Systems** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 207** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** This Course aims at developing and managing efficient and effective databases. It helps the students to learn and practice data modelling using the entity-relationship diagrams and developing database designs using structured query languages.

Topics include: Introduction to Database systems, Data modelling, Relational Database design, Various Database Languages, Relational Database Issues , Transaction Management, File structure Techniques, Query processing and optimization, Advanced topics- introduction to distributed databases and spatial-temporal databases.

**Text Book(s):**

Silberschatz A, Korth H F andSudarshan S, "Database System Concepts", McGraw Hill Education.

**Reference Book(s):**

1. Elmasri R andNavathe S B, "Fundamentals of Database System", Pearson Education.

2. Hector G Molina, Jeffrey D Ullman and Jennifer Widom, "Database Management Systems", McGraw Hill Education.

| **Course Name:** | **Theory of Computation** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 208** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **1** | **0** | **4** |

**Course Description:** This is an introductory Course for the study of formal languages and the correspondence between language classes and the automata that recognize them.

Topics include: Formal definitions of grammars and acceptors, Deterministic and Nondeterministic systems, Grammar ambiguity, finite state and push-down automata; normal forms; Turing machines and its relations with algorithms.

**Text Book(s):**

Peter Linz, "*An introduction to Formal Languages and Automata*", Jones and Bartlett Publications..

**Reference Book(s)**:

1. Aho, Ullman and Hopcroft, "*Theory of Computation*", Pearson India.

2. MichaelSipser, "*Theory of Computation*", Cengage India

| **Course Name:** | **Database Management Systems Lab** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 253** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **0** | **0** | **4** | **2** |

**Course Description:** Database management lab is designed to have a real feel of database design using structured query languages, which includes use of various data definition, data manipulation commands, functions, joins, sub-queries, views ,set operations, procedures and triggers.

**Text Book(s):**

Elmasri R andNavathe S B, "*Fundamentals of Database System*", Pearson Education.

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**Reference Book(s):**

Silberschatz A, Korth H F andSudarshan S, "*Database System Concepts*", McGraw Hill Education.

| Course Name: | Microprocessors and Micro-Controllers Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 254 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description:** Familiarize the architecture of 8086 processor, assembly language programming and interfacing with various modules. Students will get hands on experience of 8086 instruction set, Addressing modes, Macro, string operations, DOS interrupt, BIOS interrupt, and interfacing using assembly language.

**Text Book(s):**

1. Muhammad Ali Mazidi, *"Microprocessors and Microcontrollers"*, Pearson.
2. Douglas V Hall, *"Microprocessors and Interfacing, Programming and Hardware"*, Tata McGraw Hill.

| Course Name: | Being Corporate Ready | | Life Skills Development | | Professional Ethics | |
|---|---|---|---|---|---|---|
| Course Code: | PPS 108 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description**: This Course is directed towards making students perform in teams, become an asset for a team and develop the Leadership Skills needed for today's time. It gives participants an understanding of their self-esteem level and how to have high self-esteem. The Course helps the participants to understand their level of assertiveness and helps them to develop their assertiveness in different situations. This Course also includes training on how to connect to team people, how to resolve conflicts among team members and how to lead oneself and a group of people. It covers details about different types of leadership, situational leadership and the situations where these different types of leadership are applicable.

**Books:**

**(i) Textbook(s)**

Being Corporate Ready Training Manual

**(ii) Reference Book(s)**

"Group Discussion and Interview Skills by Pataki, Priyadarshi, Cambridge University Press: 2016"

Prakash Iyer, "The Habit of Winning', Second Ed, Penguin Books Ltd, 2016.

Jack Canfield, "The Success Principles", 8th Edition, Harper Collins India, 2015

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| Course Name: | Analysis of Algorithms | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 212 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** This Course introduces techniques for the design and analysis of efficient algorithms and methods of applications. Deals with analyzing time and space complexity of algorithms, and to evaluate trade-offs between different algorithms.

Topics include: Asymptotic Notations and its properties, Mathematical analysis for Recursive and Non-recursive algorithms. Algorithm design techniques-Brute force- Travelling Salesman, Knapsack Problem, Divide-and-conquer- Merge sort, Quick sort, Binary search. Dynamic programming and greedy technique-Prim's, Kruskal's, Dijkstra's Algorithm, Coping with the limitations of algorithm- Backtracking – n-Queens problem.

**Text Book(s):**

Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms",* PHI Learning Private Limited.

**Reference Book(s):**

1. AnanyLevitin, *"Introduction to the Design and Analysis of Algorithms",* Pearson Education.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "*Data Structures and Algorithms"*, Pearson.
3. Donald E. Knuth, "*The Art of Computer Programming",* Volumes 1and 3 Pearson.

| Course Name: | Software Engineering and Project Management | | | | | | Category |
|---|---|---|---|---|---|---|---|
| Course Code: | CSE 227 | Credit Structure : | L | T | P | C | Ethics |
| | | | 3 | 0 | 0 | 3 | |

**Course Description**

The objective of this course is to help students understand the process and fundamental principles involved in software system development and software project management. The course covers software process models, software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course also covers project evaluation, planning, effort estimation and risk management aspects in software project planning.

Topics include: Introduction to Software Engineering, Process Life Cycle Models, Requirement Analysis and Specification, User Interface Analysis and Design, Software Testing, Project Management, Project Planning, Effort Estimation Techniques, Project Scheduling, Project Metrics & Evaluation, Risk Management.

**Text book(s):**

1. Roger S. Pressman, *"Software Engineering – A Practitioner's Approach"*, McGraw-Hill, 2017.
2. Bob Hughes, Mike Cotterell, Rajib Mall, "*Software Project Management*", 6th edition, McGraw-Hill, 2018.


**Reference book(s):**

1. Ian Sommerville, *"Software Engineering"*, Pearson Education Asia.

2. Rajib Mall, *"Fundamentals of Software Engineering"*, PHI.

| Course Name: | Analysis of Algorithms Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 255 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description:** Design and implement algorithms for the following problems using C/ C++ Language in LINUX/ Windows.

Brute force- Travelling Salesman, Knapsack Problem, Divide-and-conquer- Merge sort, Quick sort, Binary search. Dynamic programming and greedy technique- Prim's, Kruskal's, Dijkstra's Algorithm- Backtracking – N Queens Problem.

**Text Book(s):**

Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, *"Introduction to Algorithms"*, PHI Learning Private Limited.

**Reference Book(s):**

1. AnanyLevitin, *"Introduction to the Design and Analysis of Algorithms"*, Pearson Education.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, *"Data Structures and Algorithms"*, Pearson.

| Course Name: | Principles of Artificial Intelligence | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 228 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:**

This Course will introduce the basic principles in artificial intelligence. It will cover representation schemes, problem solving paradigms, constraint propagation, search strategies, knowledge representation, Probabilistic Reasoning.

**Topics include**: AI methodology and fundamentals, intelligent agents, search algorithms, game playing, supervised and unsupervised learning, uncertainty and probability theory, probabilistic reasoning in AI, Bayesian networks, statistical learning.

**Text Book(s):**

1. Stuart J. Russell and Peter Norvig, Artificial intelligence: A Modern Approach, 3rd edition, Upper Saddle River, Prentice Hall.

2. Elaine Rich, Kevin Knight and ShivashankarB.Nair, "Artificial Intelligence", TataMcGraw- Hill, Third Edition, 2009[R.N.].

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**Reference Book(s):**

1. N J Nilsson (1997). Artificial Intelligence- A new synthesis, Elsevier Publications.

2. N J Nilsson (1982). Principles of Artificial Intelligence, Springer.

3. Patterson, D. W. (1990). Introduction to artificial intelligence and expert systems. Englewood Cliffs, Prentice Hall.

4. Luger, G. F. (2002). Artificial intelligence: Structures and strategies for complex problem solving, Harlow, Pearson Education.

| **Course Name:** | **Object Oriented Programming** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 204** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **4** | **3** |

**Course Description**: This Course is designed for students who have prior programming experience. It introduces the concepts of object-oriented programming by focusing on the definitions and use of classes along with the fundamentals of object-oriented design.
Topics include: Control structures and data types, Object-oriented design- encapsulation and information-hiding, classes, objects, Constructor, Array, String, Inheritance, Polymorphism, Packages, Exception Handling, Thread, GUI and Applets

**Text Book(s):**

1. Cay S Horstmann and Cary Gornell, *"CORE JAVA volume I-Fundamentals"*, Pearson.
2. Cay S Horstmann and Cary Gornell, *"CORE JAVA volume II-Advanced Features"*, Pearson.

**Reference Book(s):**

1. Herbert Schildt, *"The Complete Reference Java 2",* Tata McGraw Hill Education.
2. James W. Cooper*, "Java TM Design Patterns – A Tutorial"*, Addison-Wesley Publishers.

### 3.1 COURSES FOR DISCIPLINE ELECTIVES

| **Course Name:** | **Programming in Advanced Java** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 301** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **4** | **3** |

**Course Description:** This intensive, hands-on Course explores advanced Java features and packages. Students will learn Multi-threaded applications, client server programming and JDBC connection.
This Course provide in-depth knowledge in JAVA programming - advanced concepts in java , packages and applets, GUI concepts in java-swing, java database connectivity, servlets, J2EE framework, java script and XML.

**Text Book(s):**

Cay S Horstmann and Cary Gornell, *"CORE JAVA volume II-Advanced Features"*. Prentice Hall.

**Reference Book(s):**

1. Cay S. Horstman and Gary Cornell, "Core Java Volume I-Fundamentals", ,Prentice Hall.
2. Schildt Herbert, *"Java 2: The Complete Reference"*, Tata McGraw-Hill.
3. DeitelandDeitel, "*Java How to Program"*, Pearson Education Asia.

| **Course Name:** | **Programming in C# and .NET Framework** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 302** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **4** | **3** |

**Course Description:** This Course deals with the programming skills that are required for developers to create Windows applications using the C# language. Helps the students to build an application that incorporates several features of the .NET Framework. C# and .NET is Microsoft's entry into the world of managed programming.

The Course introduces many of the techniques and technologies employed by modern desktop and enterprise applications, including- fundamentals of C# programming in Visual Studio. Overview of C#, CLR-Architecture, Object Oriented aspects of C#, Accessing data with ADO.NET, and Web based applications.

**Text Book(s):**

1. J. Liberty, *"Programming C#"*, O'Reilly.
2. AndrewTroelsen, *"Pro C# 10 and .NET 4 Platform"*, Apress.
3. Herbert Schildt, *"The Complete Reference: C#",* Tata McGraw-Hill.

**Reference Book(s):**

1. Robinson et al, *"Professional C#"*,Wrox Press.
2. E. Balagurusamy, *"Programming in C#"*, Tata McGraw-Hill.
3. S. ThamaraiSelvi, R. Murugesan, *"A Textbook on C#",* Pearson.

| **Course Name:** | **LAMP** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 303** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **4** | **3** |

**Course Description:** This Course will introduce the students to the process of installing and configuring the Linux operating system, the Apache web server, the MySQL database application and the PHP server scripting language / Python. The Course also covers how to maintain and trouble-shoot the system. Students will also learn using PHP/ Python to create data-driven web applications.

Topics include - Install Linux on computer, use the shell to navigate within Linux, perform system administrative tasks, configure network applications, install and configure a mail server, install and configure the Apache Web Server, install and configure MySQL, install and configure PHP/ Python

**Text Book(s)**:

Online manuals for Linux, Apache, MySQL, PHP/ Python

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| **Course Name:** | **Mobile Communications** |
|---|---|

| Course Code: | CSE 304 | Credit Structure : | L | T | P | C |
|---|---|---|---|---|---|---|
| | | | 3 | 0 | 0 | 3 |

**Course Description:** The Course helps the students to apply the engineering principles in the specification, design, development and deployment of mobile communications. Students will develop a detailed knowledge and critical understanding of the core skills in mobile communications and networks.
Topics include: Fundamental knowledge of wireless and mobile networks, mobile communication systems / networks / architecture. The cellular communications ,mobile networks, including wireless transmission technology, wireless PAN/ LAN/ MAN/ WAN, Mobile IP, AdHoc networks, sensor networks, wireless mesh networks

**Text Book(s):**

JochenSchiller ,*" Mobile Communications"*, Pearson Education.

**Reference Book(s):**

1. William tallings, *"Wireless Communications and Networks"* Pearson Education
2. C.K.Toh, *"AdHoc Mobile wireless Networks",*Pearson education

| Course Name: | Parallel Computing | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 305 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** The Course gives introduction to parallel computing; Models of parallel computers, Interconnection networks, basic communication operations,Introduction to parallel algorithms, Parallel programming paradigms, issues in implementing algorithms on parallel computers, Parallel programming with message passing interface, Performance analysis, Scalability analysis, Basic design technique for parallel algorithms, Parallel algorithms for selected topics like sorting, searching and merging, matrix algebra, graphs.

**Text Book(s):**

AnanthGrama, Anshul Gupta, George KarypisandVipin Kumar, *"Introduction to Parallel Computing",* Pearson Education.

**Reference Book(s):**

1. M J Quinn, *"Parallel computing: Theory and practice"*,MGH.
2. M.J.Quinn, *"Parallel Programming in C with MPI and OPENMP"*, Jaico Books,
3. F.Thomson Leighton, *"Introduction to Parallel Algorithms and Architectures : Arrays, Trees, Hypercubes"*, Morgan Kaufmann.

| Course Name: | Cloud Computing | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 306 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |



**Course description:** This Course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. Cloud Computing has emerged in recent years as a new paradigm for hosting and delivering services over the Internet. The students can explore various Cloud Computing terminology,

principles and applications. Understanding different views of the Cloud Computing such as theoretical, technical and commercial aspects.
Topics include: Evolution of cloud computing and its services available today, Introduction, Architecture of cloud computing, Infrastructure, platform, software, Types of cloud, Business models, cloud services, Collaborating using cloud services, Virtualization for cloud, Security, Standards and Applications.

**Text Book(s):**

John Rittinghouseand James Ransome, *"Cloud Computing, Implementation, Management and Strategy",* CRC Press.

**Reference Book(s):**

1. David E.Y. Sarna,*"Implementing and Developing Cloud Application",* CRC press
2. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *"Cloud Computing : A Practical Approach"*, Tata McGraw-Hill

| **Course Name:** | **Data Mining** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 307** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** This Course covers theory and practice of extremely large information storage (warehousing) and analysis (mining) mechanisms, with data growing at exponential rates knowledge gathering and exploration techniques are essential for gaining useful intelligence.
Topics include: Data Model for Data Warehouses, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, OLAP query processing. Data mining-Fundamentals, data mining process and system architecture, relationship with data warehouse and OLAP systems, data pre-processing. Mining Techniques and Application: association rules, mining spatial databases, mining multimedia databases, web mining, mining sequence and time-series data, text mining.

**Text Book(s):**

T1. Tan P. N., Steinbach M & Kumar V. "*Introduction to Data Mining"* ,Pearson Education, 2016.

**Reference Book(s):**

1. Han J & Kamber M, "*Data Mining: Concepts and Techniques",* Elsevier, Second Edition, 2006
2. G K Gupta, "*Introduction to Data Mining with Case Studies*", PHI, Third Edition, 2014.
3. Alex Berson and Stephen J. Smith, *"Data Warehousing, Data Mining and OLAP"*, Tata McGraw – Hill.

| Course Name: | Artificial Intelligence | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 308 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description**: This Course will introduce the basic principles in artificial intelligence. It will cover representation schemes, problem solving paradigms, constraint propagation, search strategies, knowledge representation, natural language processing, Expert systems, vision and robotics will also be delivered. Topics include: AI methodology and fundamentals, intelligent agents, search algorithms, game playing, supervised and unsupervised learning, decision tree learning, dimensionality reduction, clustering, support vector machines;, uncertainty and probability theory, probabilistic reasoning in AI, Bayesian networks, statistical learning , fuzzy logic. Several assignments will be given to enable the student to gain practical experience in using these techniques

**Text Book(s):**

S. Russell and P. Norvig. "*Artificial Intelligence: A Modern Approach"*. Pearson Education

**Reference Book(s):**

1. G F Luger "*Artificial Intelligence*",Pearson Education.
2. N J Nilsson "*Artificial Intelligence- A new synthesis*" Elsevier Publications.
3. N J Nilsson "*Principles of Artificial Intelligence*",Springer.

| Course Name: | Virtualization | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 309 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description: I**ntroduction to virtualization, Emphasis is placed on virtualization terminology, virtual machine storage, virtual networking and access control. Operating Systems Primer, Understanding Virtualization, Installing Virtual Machines, CPU and Memory Basics, Upgrading Operating Systems, Understanding File Systems, Vitalizing Storage Devices, Managing Devices in Virtualization, Resource Sharing

**Text Book (s):**

D Ruest and N Ruest "*Virtualization: A Beginners Guide*",MacGraw Hill

**Reference Book (s):**

1. Mathew Portney, "*Virtualization Essentials*"- Sybex.
2. Chris Wolf and M Halter , "*Virtualization: From Desktop to enterprise*" ,Morgan Kaufmann.

| Course Name: | Mobile Applications Development | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 310 | Credit Structure : | L | T | P | C |
| | | | 1 | 0 | 4 | 3 |



**Course Description** The main objective of the Mobile Application Development Course is to teach students the basis of android platform and application life cycle. Students will develop a mobile app with

Android containing at least one of the following phone material components: GPS, accelerometer or phone camera , use simple GUI applications and work with database to store data locally or in a server.
Topics will include memory management; user interface design; user interface building; input methods; data handling; network techniques and URL loading; GPS and motion sensing. Android application framework and deployment. Power management, Screen resolution, Touch interface, Store data on the device

**Text book(s):**

Online manuals for Mobile Applications development.

| **Course Name:** | **Web Services** | | | | | **Category** |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 311** | **L** | **T** | **P** | **C** | Employability |
| | | **1** | **0** | **4** | **3** | |

**Course Description:** The course includes the basic principles of service oriented architecture, its components and techniques. It provides an understanding of the architecture, technology, underlying service design and development aspects of web services. The students will also gain knowledge on the operational aspects of cloud services, which form the basic building blocks of cloud computing.
Topics include: Introduction to Service Oriented Architecture, Web Service fundamentals, WS-* extensions, Building Service Oriented Architecture, Web Services framework, Service Descriptions (WSDL), Messaging (SOAP & REST), Web Service Transactions, Orchestration and Choreography, Policies, Security.

**Text book(s):**

Thomas Erl, "*Service-Oriented Architecture: Concepts, Technology, and Design"*, Pearson Education.

**Reference Book(s):**

1. Heather Williamson, "*XML, The Complete Reference*", McGraw Hill Education.
2. Frank. P. Coyle, "*XML, Web Services And The Data Revolution*", Pearson Education.
3. James Snell, Doug Tidwell, Pavel Kulchenko, "*Programming Web Services with SOAP*", O'Reilly publishers.

| **Course Name:** | **Game Theory** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 312** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** The Course takes a software engineering approach to game development. It introduces the architecture, algorithms, data structures and optimization techniques used in game development. Students are taught to use geometric models, 3D graphics pipeline, sound, music in game implementations. The use of networking techniques and factors which affect real time interactive control of games are introduced. After completing the Course students will be capable of developing their own interactive 3D computer game using established software engineering techniques by applying appropriate algorithms and data structures.

**Text Book(s):**

Steve Rabin, "*Introduction to Game Development*", copyright Charles River Media Incorporated,

**Reference Book(s):**

Joel Fan, CalinTenitchi, Eric Ries "*Black Art of Java Game Programming"*

| **Course Name:** | **Storage Area Networks** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 313** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description:** The course aims to equip students with basic introduction to Storage Area Networks, including storage architectures, logical and physical components of a storage infrastructure, managing and monitoring the data center and basic Disaster Recovery principles

Topics include:

Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Life Cycle, Components of Storage System Environment, Data Protection, Intelligent Storage System, Implementation of RAID, Direct Information Storage, to understand the role of objects in software process models, impact on testing. Content-Addressed Storage, Storage Virtualization, Business Continuity, Backup and Recovery, Local Replication, Remote Replication, Securing the Storage Infrastructure, Managing the Storage Infrastructure

**Text Book(s):**

1. G. Somasundaram, AlokShrivastava "*Information Storage and Management"*, EMC Education Services, Wiley India.

**Reference Book(s):**

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller *" Storage Networks Explained*", Wiley India.
2. Rebert Spalding *" Storage Networks The Complete Reference*", TataMcGraw Hill.
3. Richard Barker and Paul Massiglia "*Storage Area NetworksEssentials A Complete Guide to Understanding and ImplementingSANs*", Wiley. India.

| **Course Name:** | **Software Architecture** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 314** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Course Description**: This Course is designed to understand the software architectural requirements and drivers, exposure to architectural styles and views andbe familiar with architectures for emerging technologies .Software architecture has emerged as the central theme over which all large scale software is built. It is the algorithmic counterpart for large programs. Major topics covered are Architecture Documentation, Architecture Evaluation, Product Lines Enterprise Architecture and so on.

**Text Book(s):**

Paul Clements, Rick Kazman, and Mark Klein, "*Evaluating software architectures: Methods and case studies*". Addison-Wesley

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**Reference Book(s):**

Anthony J Lattanze, "*Architecting Software Intensive System. A Practitioner's Guide*", Auerbach Publications.

| Course Name: | Embedded Systems | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 315 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course description:** This Course covers the Embedded systems design concepts like overview of processors and hardware units, system on chip(SoC),VLSI circuit design technology, communication bus for device network, Device drivers and interrupt service mechanism, programming concepts-embedded C,C++, Real Time Operating systems, and embedded software development.

**Text book(s):**

Rajkamal, "*Embedded Systems Architecture, Programming and Design*", TATA McGraw- Hill.

**Reference book(s):**

1. Wayne Wolf, "*Computers as Components; Principles of Embedded Computing System Design",* Harcourt India, Morgan Kaufman Publishers.

2 K.V.K.K. Prasad, *"Embedded/ Real-Time Systems: Concepts, Design and Programming: The Ultimate Reference*", Dreamtech Press

| Course Name: | Advanced Computer Architecture | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 316 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description**: This course is designed to understand and analyse the high performance computers including multi core architecture. The major topics covered are Performance enhancements, advanced pipelining, dynamic scheduling and memory management, modern architectures, multi core multi CPU systems.

**Text Book(s):**

**"Computer Architecture: A Quantitative approach" –Hennessy &Patterson.**

**Reference Book(s):**

**Kai Hwang, briggs," Computer Architecture and Parallel Processing" MGH**

| Course Name: | Problem Solving Using Python | | Employability | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 258 | Credit Structure : | L | T | P | C |
| | | | 1 | 0 | 4 | 3 |

**Course Description**:

This course provides the opportunity for the students of Computer Science engineering to develop Python scripts using its powerful programming features like lists, sets, tuples, dictionaries and sets. Students will also be introduced to object oriented programming concepts and packages for data visualization.

Topics include: Basics of Python programming, operators and expressions, decision statements, loop control statements, functions, strings, lists, list processing : searching and sorting, nested list, list comprehension, tuples and dictionaries, sets, file handling, exception handling, object oriented programming concepts, modules and packages for data visualization.

**Textbook(s)**

1. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Problem Solving and Python Programming", Tata Mc Graw Hill Edition, 2018.

2. Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India Edition, 2015.

3. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, 2017.

**Reference Book(s)**

3. E. Balagurusamy, "Introduction to Computing and Problem Solving Using Python", Tata McGraw-Hill, 2016

4. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson, 2017

| Course Name: | Computer Organization | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 223 | Credit Structure: | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** This course covers basics of modern computer organization. The emphasis is on understanding the interaction between computer hardware and software at various levels. The students will learn the concepts of computer technology, performance evaluation, instruction set design, computer arithmetic, hierarchical memory systems, data path and control unit design of processors.

Topics: Introduction to Computer Arithmetic, Instruction sets, Processor vs. memory interaction, CPU Design, Memory system, Input-Output Interface, Asynchronous Data Transfer, Programmed I/O, Interrupts, Direct Memory Access, Basic Input / Output Structure.

**Text Book(s):**

3. "Computer Organization"- Carl Hamacher, Zvonko Vranesic Et al. Fifth Edition.
4. "Computer Organization and Design." The Hardware/Software Interface-David A. Patterson & John L. Hennessy Fifth Edition

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**Reference Book(s):**

2. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015

| Course Name: | Data Structures and Algorithms Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 259 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

**Course Description:** Implementing Data structures like Stacks, Queues, Linked lists, Trees, Binary search trees, Heaps, Graph traversal using C language.

**Text Book(s):**

1. Michael T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples, John Wiley &Sons, Inc., 2002.

**Reference Book(s):**

1. Behrouz A Forouzanand Richard F Gilberg, "*Computer science: A structured programming approach using C",*Cengage Learning.

2. Robert L Kruse, Bruce P Leung and Clovis L Tondo, "*Data Structures and Program Design in C"*, Pearson.

| Course Name: | Digital Design Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 252 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description:** Implementing digital design concepts like verification of logic gates, De morgan's theorem, Reducing Boolean expression using K-map, Adder and subtractor circuits, Number conversion, Multiplexer and De multiplexer using gates, Flip flops, shift registers and counters.

**Text Book(s):**

1. Mano, M. Morris and Ciletti Michael D., *"Digital Design",* Pearson Education.

2. Biswas N N,*"Logic design Theory"*, Seagull publishing.

**Reference Book(s):**

1. Jain, R. P., *"Modern Digital Electronics"*, McGraw Hill Education.

2. Roth, Charles H., Jr and Kinney Larry L, *"Fundamentals of logic Design",* Cengage Learning, .

3. Floyd T l , "*Digital fundamentals",* Pearson.

| Course Name: | Cloud Computing & Services | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 233 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

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**COURSE DESCRIPTION**:

This Course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. Cloud Computing has emerged in recent years as a new paradigm for hosting and delivering

services over the Internet. The students can explore various Cloud Computing terminology, principles, and applications. Understanding different views of the Cloud Computing such as theoretical, technical, and commercial aspects.

**REFERENCE MATERIALS: Textbooks, reference books, any other resources, like webpages.**

**Textbooks**

1. John Rittinghouse and James Ransome, "Cloud Computing, Implementation, Management and Security", CRC Press.
2. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education.

**Reference Books**

1. David E.Y. Sarna, "Implementing and Developing Cloud Applications", CRC Press.

Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill

| **Course Name:** | **Design Thinking and Team Building** | **Life Skills Development** | **Professional Ethics** | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **PPS 107** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **0** | **0** | **2** | **1** |

**Course Description**: This Course is directed towards making students perform in teams, become an asset for a team and develop the Leadership Skills needed for today's time. It gives participants an understanding of their self-esteem level and how to have high self-esteem. The Course helps the participants to understand their level of assertiveness and helps them to develop their assertiveness in different situations. This Course also includes training on how to connect to team people, how to resolve conflicts among team members and how to lead oneself and a group of people. It covers details about different types of leadership, situational leadership and the situations where these different types of leadership are applicable.

**Course Material: "***Professional and Business Skills - I training material"*, Presidency University.

| Course Name: | Engineering Mathematics – IV | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | MAT 108 | Credit Structure : | L | T | P | C |
| | | | 3 | 1 | 0 | 4 |

**Course Description**

The course aims at introducing students to quantitative uncertainty analysis and risk assessment for engineering applications. Probability theory is of great use in understanding and modeling phenomena that exhibit random behavior and the emphasis is on real-world applications to engineering problems. The topic covered include basic concepts of probability and conditional probability, Baye's rule, discrete and continuous probability distributions covering binomial, Poisson, geometric, exponential, uniform, normal distributions and their applications, functions of random variable, random sampling and its properties, sampling distributions of means and variances, chi-squared, t and F distributions, methods of estimation, estimating means, proportions and variances, maximum likelihood estimation, tests of hypothesis on means, proportions and variances, chi-squared test of goodness of fit, correlations analysis, linear regression and method of least squares.

To explore complex systems, physicists, engineers and mathematicians require computational methods since mathematical models are rarely solvable analytically. This course provides an introduction to basic numerical methods such as fitting of various curves, interpolation, differentiation, integration. This course also provides an introduction to numerical solution of algebraic and transcendental equations, ordinary differential equations such as Taylor's series method, modified Euler's method and Runge-Kutta Methods.

**Textbook(s)**

T1 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.

T2 S.S. Sastry, Introductory methods of numerical analysis, 5th edition, Prentice-Hall of India, 2012.

T3Walpole R. E., Myers R. H., Myers S. L. and Ye K.E., "Probability and Statistics for Engineers and Scientists", Ninth Edition, Pearson Education (India), 2014.

**Reference Book(s)**

R1 B.S. Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.

R2 Curtis F. Gerald and Patrick O. Wheatley, Applied numerical analysis, Pearsoneducati E Education, 7th Edition, 2013.

R3 E. Ward Cheney and David R. Kincaid, Numerical Mathematics and Computing, 7th Edition, Cengage Learning, India, 2014.

R4 Richard A. Johnson, Irwin Miller and John Freund, "Miller & Freund's Probability and Statistics for Engineers", Eighth Edition, Pearson Education (India), 2015.

R5 Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Fourth Edition, Academic Press, 2009.

R6 Ramalingam Shanmugam and Rajan Chattamvelli, "Statistics for Scientists and Engineers", First Edition, Wiley Publications, 2015.

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| Course Name: | Introduction to Machine Learning | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 242 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:**

Machine Learning is a field of computational science that is key to develop intelligent systems that perform predictive data analytics. This course provides a concise introduction to fundamental concepts in machine learning and some of the popular machine learning algorithms.

Topics include: Data collection from files, web scrapping; pre-processing; feature selection, introduction to machine learning – supervised learning – decision trees, nearest neighbor algorithms; un-supervised learning – k-means clustering; Bayesian learning – Naïve Bayes ; brief introduction to ensemble learning ; association rule learning and deep learning.

**Text Books:**

4. Tan P. N., Steinbach M & Kumar V. "***Introduction to Data Mining"*** **,**Pearson Education, 2016.
5. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms form data science and machine learning", Packt Publishing, 2017.
6. Ethem Alpaydin, *"Introduction to Machine Learning"*, The MIT Press, 2014.

**Reference Books:**

5. Tom Mitchell, *"Machine Learning"*, McGraw Hill Education, 2015.
6. Peter Harrington, *"Machine Learning in Action"*, Wiley India 2016.
7. Sebastian Nowozin, Stephen J. Wright, *"Optimization for Machine Learning"*, Prentice Hall of India, 2013.
8. Vinod Chandra S.S., Anand Hareendran S, *"Artificial Intelligence and Machine Learning,* Prentice Hall of India, 2014.

| Course Name: | Operating Systems | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 210 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** Operating systems being central to computing activities, this Course provide understanding of the functions and functional modules of operating systems. The design and implementation of Operating systems is also covered.

Topics include: Core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security.

Students should have previous familiarity with programming in a high-level language, assembly language programming, CPU organization, instruction sets and registers.

**Text Book(s):**

Silberschatcz A, Galvin P B and Gagne G, "Operating System Concepts", Wiley.

**Reference Book(s):**

1. William Stallings, "Operating systems", Prentice Hall, Pearson.

2. Andrew S Tanenbaum and Albert S Woodhull, "Operating Systems Design and Implementation", Pearson.

| Course Name: | Microprocessors and Microcontrollers | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 206 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description**: The objective of this Course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other Courses where control can be achieved via a microprocessor/ controller implementation. Topics include: Semiconductor memory devices and systems, microcomputer architecture, assembly language programming, I/ O programming, I/ O interface design, I/ O peripheral devices, data communications, and data acquisition systems.

**Text Book (s):**

1.Barry B Brey , "Intel *microprocessor 8086/ 8088*" ,Pearson,PHI.

2. Douglas V Hall, "*Microprocessors and Interfacing, Programming and Hardware*" Tata McGraw Hill.

**Reference book(s):**

**1.** Muhammad Ali Mazidi, "*Microprocessors and Microcontrollers*", Pearson.

2. Ramesh Gaonkar, "*Microprocessor Architecture, Programming and Applications with the 8085*", PHI

| Course Name: | Database Management Systems | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 207 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** This Course aims at developing and managing efficient and effective databases. It helps the students to learn and practice data modelling using the entity-relationship diagrams and developing database designs using structured query languages.

Topics include: Introduction to Database systems, Data modelling, Relational Database design, Various Database Languages, Relational Database Issues , Transaction Management, File structure Techniques, Query processing and optimization, Advanced topics- introduction to distributed databases and spatial temporal databases.

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**Text Book(s):**

Silberschatz A, Korth H F andSudarshan S, "Database System Concepts", McGraw Hill Education.

**Reference Book(s):**

1. Elmasri R andNavathe S B, “Fundamentals of Database System”, Pearson Education.

2. Hector G Molina, Jeffrey D Ullman and Jennifer Widom, “Database Management Systems”, McGraw Hill Education.

| Course Name: | Theory of Computation | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 208 | Credit Structure : | L | T | P | C |
| | | | 3 | 1 | 0 | 4 |

**Course Description:** This is an introductory Course for the study of formal languages and the correspondence between language classes and the automata that recognize them.

Topics include: Formal definitions of grammars and acceptors, Deterministic and Nondeterministic systems, Grammar ambiguity, finite state and push-down automata; normal forms; Turing machines and its relations with algorithms.

**Text Book(s):**

Peter Linz, “*An introduction to Formal Languages and Automata*”, Jones and Bartlett Publications..

**Reference Book(s)**:

1. Aho, Ullman and Hopcroft, “*Theory of Computation*”, Pearson India.

2. MichaelSipser, “*Theory of Computation*”, Cengage India

| Course Name: | Database Management Systems Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 253 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

**Course Description:** Database management lab is designed to have a real feel of database design using structured query languages, which includes use of various data definition, data manipulation commands, functions, joins, sub-queries, views ,set operations, procedures and triggers.

**Text Book(s):**

Elmasri R andNavathe S B, “*Fundamentals of Database System*”, Pearson Education.

**Reference Book(s):**

Silberschatz A, Korth H F andSudarshan S, “*Database System Concepts*”, McGraw Hill Education.

| Course Name: | Microprocessors and Micro-Controllers Lab | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 254 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description:** Familiarize the architecture of 8086 processor, assembly language programming and interfacing with various modules. Students will get hands on experience of 8086 instruction set, Addressing modes, Macro, string operations, DOS interrupt, BIOS interrupt, and interfacing using assembly language.

**Text Book(s):**

1. Muhammad Ali Mazidi, *"Microprocessors and Microcontrollers"*, Pearson.
2. Douglas V Hall, *"Microprocessors and Interfacing, Programming and Hardware"*, Tata McGraw Hill.

| Course Name: | Being Corporate Ready | | Life Skills Development | | Professional Ethics | |
|---|---|---|---|---|---|---|
| Course Code: | PPS 108 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 2 | 1 |

**Course Description**: This Course is directed towards making students perform in teams, become an asset for a team and develop the Leadership Skills needed for today's time. It gives participants an understanding of their self-esteem level and how to have high self-esteem. The Course helps the participants to understand their level of assertiveness and helps them to develop their assertiveness in different situations. This Course also includes training on how to connect to team people, how to resolve conflicts among team members and how to lead oneself and a group of people. It covers details about different types of leadership, situational leadership and the situations where these different types of leadership are applicable.

| Course Name: | Optimization Technique | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 226 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:**
Optimization is one of the most important branch of modern applied mathematics. Optimization models attempt to express, in mathematical terms, the goal of solving a problem in the best way. Various problems arising in areas of engineering design, economic theory, physical, biological and technological sciences call for minimizing or maximizing functions. The objective of the course is to provide students with the value of optimization and mathematical modeling in real life. Basic techniques to formulate single and multi-objective real problem into a mathematical model. Various techniques to solve linear and nonlinear programming problem. Various techniques to solve transportation and assignment problems.

**Reference Materials:**
**Text Book(s):**

1. H.A.Taha, Operations Research: An Introduction, Pearson Education, 9th Ed., 2012.
2. Boyd and Vandenberghe: Convex Optimization, Cambridge University Press 2004.

**Reference Books:**

1. T. Hastie, R. Tibshirani and M. J. Wainwright, Statistical Learning with Sparsity: the Lasso and Generalizations, Chapman and Hall/CRC Press, 2015.
2. E. Hazan. Introduction to Online Convex Optimization.
3. S. Boyd and L. Vandenberghe, Convex Optimization, The Cambridge University Press, 2003.
4. D. Bertsekas, Nonlinear programming, Athena Scientific, 1999.
5. Y. Nesterov, Introductory lectures on convex optimization, Kluwer-Academic, 2003.

6. E. K. P. Chong and S. H. Zak, An Introduction to Optimization, 2nd Edn., Wiley India Pvt. Ltd., 2010.
7. S. Bubeck, Convex Optimization: Algorithms and Complexity, Foundations and Trends in Machine Learning, 8(3-4): 231-357, 2015.
8. S. Sra, S. Nowozin, and S. Wright, Optimization for Machine Learning, The MIT Press, 2011.

| Course Name: | Software Engineering and Project Management | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 227 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:**

The objective of this course is to help students understand the process and fundamental principles involved in software system development and software project management. The course covers software process models, software requirement engineering processes, system analysis, design, implementation and testing aspects of software system development. The course also covers project evaluation, planning, effort estimation and risk management aspects in software project planning.

**Topics include:** Introduction to Software Engineering, Process Life Cycle Models, Requirement Analysis and Specification, User Interface Analysis and Design, Software Testing, Project Management, Project Planning, Effort Estimation Techniques, Project Scheduling, Project Metrics & Evaluation, Risk Management.

**Text book(s):**

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", VII Edition, McGraw-Hill, 2017.
2. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", VI Edition, McGraw-Hill, 2018.

**Reference book(s):**

1. Ian Sommerville, "Software Engineering", IX Edition, Pearson Education Asia, 2011.
2. Rajib Mall, "Fundamentals of Software Engineering", VI Edition, PHI learning private limited, 2014.

| Course Name: | Principles of Artificial Intelligence | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 228 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:**

This Course will introduce the basic principles in artificial intelligence. It will cover representation schemes, problem solving paradigms, constraint propagation, search strategies, knowledge representation, Probabilistic Reasoning.

**Topics include**: AI methodology and fundamentals, intelligent agents, search algorithms, game playing, supervised and unsupervised learning, uncertainty and probability theory, probabilistic reasoning in AI, Bayesian networks, statistical learning.

**Text Book(s):**

1. Stuart J. Russell and Peter Norvig, Artificial intelligence: A Modern Approach, 3rd edition, Upper Saddle River, Prentice Hall.

2. Elaine Rich, Kevin Knight and ShivashankarB.Nair, "Artificial Intelligence", TataMcGraw- Hill, Third Edition, 2009[R.N.].

**Reference Book(s):**

1. N J Nilsson (1997). Artificial Intelligence- A new synthesis, Elsevier Publications.

2. N J Nilsson (1982). Principles of Artificial Intelligence, Springer.

3. Patterson, D. W. (1990). Introduction to artificial intelligence and expert systems. Englewood Cliffs, Prentice Hall.

4. Luger, G. F. (2002). Artificial intelligence: Structures and strategies for complex problem solving, Harlow, Pearson Education.

| Course Name: | Machine Learning Using Python | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 261 | Credit Structure : | L | T | P | C |
| | | | 2 | 0 | 2 | 3 |

**COURSE DESCRIPTION:**

Machine learning (ML), a subset of Artificial Intelligence (AI), is an important set of techniques and algorithms used for solving several business and social problems. The objective of this course is to discuss machine learning model development using Python. AI and ML are important skills that every engineering graduate will require to advance in their career. Python is the leading programming language used by several organizations for creating end-to-end solutions using ML.

**Topics include:** Working with Collections and Data Frames; Regression algorithms; Classification algorithms; Optimization techniques – Gradient Descent algorithm, Gradient Descent for simple Linear Regression; Ensemble Learning – Random Forest, Boosting techniques – AdaBoost and Gradient Boosting; Grid Search for optimal parameters; Clustering algorithms;

Forecasting with Time-Series data : Auto-Regressive Integrated Moving Average Models, Recommender Systems : Association Rule Mining, Collaborative Filtering, Text Analytics – Sentiment Classification using Naïve Bayesian model.

**(i) Textbook(s)**

1. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python", Wiley, First Edition 2019.
2. Andreas C Muller, Sarah Guido, "Introduction to Machine Learning with Python :A Guide for Data Scientists", Oreilly, First Edition, 2016

**(ii) Reference Book(s)**

1. Tan P. N., Steinbach M & Kumar V. "***Introduction to Data Mining"*,** Pearson Education, 2016.
2. Giuseppe Bonaccorso, "Machine Learning Algorithms: A reference guide to popular algorithms from data science and machine learning", Packt Publishing, 2017.

| **Course Name:** | **Object Oriented Programming** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 204** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **4** | **3** |

**COURSE DESCRIPTION:**

This Course is designed for students who have prior programming experience. It introduces the concepts of object-oriented programming by focusing on the definition and use of classes along with the fundamentals of object-oriented design.

**Topics include:** Control structures and data types, Object-oriented design- encapsulation and information-hiding, classes, objects, Constructor, Array, String, Inheritance, Polymorphism, Packages, Exception Handling, Thread and GUI.

**REFERENCE MATERIALS:**

(i) "Object Oriented Programming Lab Manual" Presidency University.

**Text Book(s):**

1. Cay S Horstmann and Cary Gornell, *"CORE JAVA volume I-Fundamentals"*, Pearson.

2. Cay S Horstmann and Cary Gornell, *"CORE JAVA volume II-Advanced Features"*, Pearson.

**Reference Book(s):**

1. Herbert Schildt, *"The Complete Reference Java 2",* Tata McGraw Hill Education.

2. James W. Cooper*, "Java TM Design Patterns – A Tutorial"*, Addison-Wesley Publishers.

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| Course Name: | Internet and Web Technologies | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 324 | Credit Structure : | L | T | P | C |
| | | | 1 | 0 | 4 | 3 |

**COURSE DESCRIPTION:**

This Course deals with the programming skills that are required for developers to plan and create Web applications by writing code using current leading trends in the web domain, enhancing web pages with the use of page layout techniques, text formatting, graphics, images, and multimedia. The primary focus is on popular key technologies that will help students to build Internet- and web-based applications that interact with other applications and with databases.

**University. Text Book(s):**

1. Deitel, Deitel, and Nieto, "Internet and World Wide Web – How to program", Pearson Education.

**Reference Book(s):**

1. Randy Connolly,"Fundamentals of Web Development", Pearson Education
2. Robert W Sebesta, "Programming the World Wide Web", Pearson Education

**Online reference:**

1. W3schools.com
2. Developer.mozilla.org/en-US/docs/Learn

| Course Name: | Data Visualization | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 367 | Credit Structure : | L | T | P | C |
| | | | 1 | 0 | 4 | 3 |

**COURSE DESCRIPTION:**

This course provides an introduction to turning data into presentable graphics. Data Visualization is important today as the usage of data is growing in many different fields. Data visualization techniques help people to better understand this data. The goal of this course is to introduce students to data visualization including principles, techniques and algorithms for creating effective visualizations based on principles from graphic design, visual art, perceptual psychology, and cognitive science. Students will learn the value of visualization, specific techniques in data visualization, grammar of graphics and how to leverage visualization tools.

**(i) Textbook(s)**

- Ward, Matthew O., Georges Grinstein, and Daniel Keim. Interactive data visualization: foundations, techniques, and applications. CRC Press, 2010.
- Madhavan, Samir. Mastering Python for Data Science. Packt Publishing Ltd, 2015.

**(ii) Reference Book(s)**

- Wilkinson, Leland, The Grammar of Graphics, Springer-Verlag New York,2015
- Wilke, Claus O. Fundamentals of data visualization: a primer on making informative and compelling figures. O'Reilly Media, 2019.
- Tamara Munzner, Visualization Analysis and Design (VAD), CRC press, 2014
- Show Me the Numbers: Designing Tables and Graphs to Enlighten, Few, Stephen. 2nd Edition. Analytics Press.
- Interactive Data Visualization for the Web by Scott Murray 2nd Edition (2017)
- Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2016
- Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2010.
- Semiology of Graphics by Jacques Bertin (2010)
- Sosulski, K. (2018). Data Visualization Made Simple: Insights into Becoming Visual. New York: Routledge.
- Christopher M. Bishop. 2006. Pattern Recognition and Machine Learning (Information Science and Statistics). Springer-Verlag, Berlin, Heidelberg.


| **Course Name:** | **Parallel Computing** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 305** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

## COURSE DESCRIPTION

This is an introductory course to Parallel Computing. The purpose of this Course is to understand the motivation for Parallel Computing and the concept of Parallel Computing. It also exposes the various Models of Parallel Computers and their interconnections and how computations can be performed using Parallel Algorithms and Parallel Programming Models like OpenMP and MPI.

**Text Book(s):**

**T.** Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, "*Introduction to Parallel Computing",* 2nd edition. Noida , India: Pearson Education, Ltd., 2003.

**Reference Book(s):**

**R1**. Michael J Quinn, *"Parallel computing: Theory and Practice",* 2nd edition. New Delhi, India: Tata MacGraw Hill Education Private Limited, 2002.

**R2**. Michael J Quinn, *"Parallel Programming in C with MPI and OPENMP"*, Indian edition. Chennai, India: Tata MacGraw Hill Education (India) Private Limited, 2004.

**R3** Kai Hwang, Faye A. Briggs, "*Computer Architecture and Parallel Processing*", Indian edition, New Delhi, India: MacGraw Hill Education (India) Private Limited, 2012
Parallel Processing" by Kai Hwang

**R4** Peter S. Pacheco, *"An Introduction to Parallel Programming"*, Morgan Kaufmann, Burlington, USA, 2011.

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**R5** V.Rajaraman, C. Siva Ram Murthy, "*Parallel Computers: Architecture and Programming", 2nd edition,* PHI Learning Private Limited, Delhi, India, 2016.

| Course Name: | Introduction to Bio Informatics | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 325 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:**

This course is designed to provide the knowledge of the concepts related to bioinformatics. The course is aimed at understanding the DNA and Protein sequences and databases. It also deals with Pairwise comparison and calculating the scoring matrix. Further, it focuses on Sequence Alignment techniques, discovering the Motifs in the sequence. Students will also learn the overview of Structural Bioinformatics and Genome sequencing.

**Text Book(s):**

1. Bioinformatics: Sequence and Genome Analysis, David W. Mount, Cold Spring Harbor Laboratory Press, 2004.
2. Introduction to Bioinformatics, Arthur Lesk, Fifth Edition, Oxford University Press, 2019

**Reference Book(s):**

1. Bioinformatics Methods and Applications, S. C. Rastogi, N.Mendiratta, P.Rastogi, Fourth Edition, Prentice Hall India.
2. Bioinformatics Algorithms- An Active Learning Approach, Phillip Compeau & Pavel Pevzner, 2nd Edition, Vol. I & II, Active Learning Publishers, 2015

| Course Name: | Distributed Systems | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 368 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:** This course is designed to provide the knowledge of the concepts related to distributed system. The course is aimed at understanding the foundations of distributed systems. It also deals with Peer to peer services and to understand about the system level and support required for distributed system. Further, it focuses on Synchronization, Process and Resource Management. Students will also learn the overview of Distributed system.

**Topics include:** Introduction to Distributed Systems, Communication in Distributed System, Peer to peer services and file system, Synchronization, Process and resource Management.

**Text Book(s):**

T1: George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

**Reference Book(s):**

R1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Ninth edition, Prentice Hall of India, 2007.

R2. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Second Edition, Pearson Education, 2007.

R3. Liu M.L., "Distributed Computing, Principles and Applications", First Edition, Pearson Education, 2004.

R4. Nancy A Lynch, "Distributed Algorithms", Second Edition, Morgan Kaufman Publishers, USA, 2003.

**Web Reference(s):**

1. NPTEL Videos- https://nptel.ac.in/courses/106/106/106106107/
2. https://www.youtube.com/watch?v=2L7jnaXuOc8
3. https://www.youtube.com/watch?v=bnrD2n55dfk

| Course Name: | Computer Networks and Simulation | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 246 | Credit Structure : | L | T | P | C |
| | | | 2 | 0 | 2 | 3 |

**Course Description**:

The main emphasis of this course is on the organization and management of networks. The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of LAN systems.

Topics include: fundamental concepts on data communication and the design, deployment, and management of computer networks. Components, protocols and standards, network and protocol architecture, open systems interconnection, communication model, error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing, and local and remote procedures.

**Text Book(s):**

1. Behrouz A. Forouzan, Data Communications and Networking 4E, 4th Edition, Tata McGraw-Hill, 2013.

**Reference Book(s):**

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

| Course Name: | Data Mining | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 307 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**Course Description:** This Course covers theory and practice of extremely large information storage (warehousing) and analysis (mining) mechanisms, with data growing at exponential rates knowledge gathering and exploration techniques are essential for gaining useful intelligence.
Topics include: Data Model for Data Warehouses, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, OLAP query processing. Data mining-Fundamentals, data mining process and system architecture, relationship with data warehouse and OLAP systems, data pre-processing. Mining Techniques and Application: association rules, mining spatial databases, mining multimedia databases, web mining, mining sequence and time-series data, text mining.

**Text Book(s):**

T1. Tan P. N., Steinbach M & Kumar V. "*Introduction to Data Mining"* ,Pearson Education, 2016.

**Reference Book(s):**

1. Han J & Kamber M, "*Data Mining: Concepts and Techniques",* Elsevier, Second Edition, 2006
2. G K Gupta, "*Introduction to Data Mining with Case Studies*", PHI, Third Edition, 2014.
3. Alex Berson and Stephen J. Smith, *"Data Warehousing, Data Mining and OLAP"*, Tata McGraw – Hill.

| **Course Name:** | **Digital Entrepreneurship** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **MGT 113** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

## COURSE DESCRIPTION:

The course aims to strengthen the capabilities of participants to use disruptive digital technologies to design innovative and viable business models, processes, services, products and strategies. This course specifically focused on learning lean startup principles, how to identify potential new venture ideas that boost market growth, state customer value propositions and economic value. The course deals with the competencies needed to become an innovative, opportunity-driven, market-ready and entrepreneurial manager. This course examines successful strategies, business models, frameworks, funding process, barriers and risks for introducing break-through products and services. Topics include business model innovation, strategic leadership, human centered and design-driven innovation and change management.

**Text Book**

Rogers. D., "*Digital Transformation Playbook – Rethink Your Business for the Digital Age"*, Columbia Business School Publishing, 2016.

**Reference Books**

**(iii)** Mayer, M. H., "*New Venture Creation: An Innovator's Guide to Entrepreneurship"*, 2nd Edition, Sage Publication, 2013.

**(iv)** Kuratko, D. F., & Rao, T. V., "*Entrepreneurship: A South Asian Perspective"*, Cengage Learning India Pvt. Ltd, Delhi, 2016.

**(v)** Kim, C. W.; "*Blue Ocean Strategy*", HBR Publishing House, 2005.

**(vi)** Dayer, J.Gregersen, H. and Christensen, C., "*The Innovator's DNA - Mastering the Five Skills of Disruptive Innovators"*, HBR Press, 2011.

**(vii)** Osterwalder, A. and Pigneur, Y., "*Business Model Generation: A Handbook for Visionaries, Game Changes, and Challengers",* John Wiley & Sons, 2010

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| Course Name: | Business Intelligence | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | MGT 114 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:**

Introduction to Business Intelligence /Data Analytics provides the student with a broad overview of the modern Analytics landscape, including the tools and techniques that are successfully utilized by 21st century organizations. Students learn about the history and evolution of Data Analytics (DA), Business Analytics (BA), and Business Intelligence (BI), from standardized reporting to a flexible, integrated *Information Ecosystem* that provides modern decision makers with essential, accurate, and timely information. The emphasis of this course centers on the proper deployment and use of DA, BA, and BI techniques and technologies to best meet the information requirements of modern decision makers. An overview of current DA, BA, and BI tools is also provided, including Data Warehousing, Data Mining, OLAP, and Business Performance Management (BPM).

**Textbook:**

1. *Business Intelligence, Analytics, and Data Science: A Managerial Perspective* - Fourth Edition, by Sharda, Delen, & Turban (Pearson/Prentice Hall, 2018)

**References**

1. Business Intelligence Guidebook: From Data Integration to Analytics
2. Business Intelligence and Analytics: Systems for Decision Support (10th Edition)
3. Successful Business Intelligence, Second Edition: Unlock the Value of BI & Big Data

| Course Name: | Information Retrieval | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | MGT 114 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSEDESCRIPTION**

The Course studies the theory, design and implementation of Text-based information systems. The Information Retrieval core concepts of the course include statistical characteristics of text, representation of information needs and documents. Several important retrieval models (Basic IR Models, Boolean Model, TF-IDF (Term Frequency/Inverse Document Frequency) Weighting, Vector Model, Probabilistic Model, Latent Semantic Indexing Model, Neural Network Model). Retrieval Evaluation, Retrieval Metrics, Text Classification and Clustering algorithms, Web Retrieval and Crawling. Recommender Systems: Basics of Content-based Recommender Systems, Content-based Filtering, Collaborative Filtering, Matrix factorization models and neighbourhood models.

**TEXT BOOKS:**

*1.Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.Link: https://people.ischool.berkeley.edu/~hearst/irbook/*

*2.Ricci, F, Rokach, L. Shapira, B.Kantor, —Recommender Systems Handbook, First Edition, 2011.*

*3.C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.Link: https://nlp.stanford.edu/IR-book/*

**REFERENCES:**

1.Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.
2.Jian-Yun Nie Morgan & Claypool-Cross-Language Information Retrieval,Publisher series 2010.

| **Course Name:** | **Big Data Analytics** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE 219** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **1** | **0** | **4** | **3** |

**Course Description:** This Course shall provide the fundamental knowledge to equip students being able to handle real world big data problems including the three key sources of Big Data: people, organizations, and sensors. With the advance of IT storage, processing, computation, and sensing technologies, Big Data has become a novel norm of life.

Topics include: Big data and its importance, Four v's , big data analytics and applications. Big data technologies, data discovery, open source technology for big data analytics, cloud and big data, predictive analytics, mobile business intelligence and big data ,crowd sourcing analytics, inter- and trans-firewall analytics, information management, Processing big data, Hadoop mapreduce, implementation of big data analytics, big data convergence, analytics business maturity model. big data tools and techniques, installing and user defined functions, data processing operators, Sample projects using tools.

**Text Book(s):**

1. Big Data and Analytics- Seema Acharya, Subhashini Chellappan-2015, Wiley Publication.
2. Analytics in a Big data world- Bart Baesens- Wiley Publication.

**Reference book (s):**

1. Big data analytics, Radha Shankarmani and Vijalakshmi 2nd edition , Wiley Publications.
2. Big data, Anil Maheshwari, Mc Graw-Hill Education.
3. Tom White, "Hadoop: The Definitive Guide", O'reilly.

3. Tom White, *"Hadoop: The Definitive Guide"*, O'reilly.

| Course Name: | Internet of Things | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 220 | Credit Structure : | L | T | P | C |
| | | | 1 | 0 | 4 | 3 |

**Course Description:** The Internet of Things (IoT) is an emerging paradigm combining heterogeneous devices at an unprecedented scale, thereby enabling individuals and organizations to gain greater value from networked connections among people, processes, data, and things. The Internet of Things (IoT) is a Course of objects interacting with people, with information systems, and with other objects. The Course will focus on creative thinking, IoT concepts. IoT technologies.

Topics include: IoT definition and characteristics, physical design , Logical design , IoT enabling technologies, levels and Deployment, Domain specific IoTs, IoT and M2M, Simple Network Management Protocol, Iot platforms Design Methodology, IoT physical devices and Endpoints-introduction to Raspberry Pi, Cloud storage Models and Communication APIs, Tools for IoT and case studies

**Text book(s):**

ArshdeepBahga and Vijay Madisetti,*"Internet of Things a hands –on approach"*. University press

**Reference Book(s):**

1. RajkumarBuyya, Amir VahidDastjerdi, *"Internet of Things: Principles and Paradigms",* Morgan Kaufmann.
2. Adrian McEwen, Hakim Cassimally, *"Designing the Internet of Things",* Wiley.

| Course Name: | Natural Language Processing | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 266 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

## COURSE DESCRIPTION

The primary focus of the course will be on understanding various NLP tasks, the algorithms for effectively solving these problems, and methods for evaluating their performance. There will be a focus on statistical and neural-network learning algorithms that train on (annotated) text corpora to automatically acquire the knowledge needed to perform the task.

**Text Book(s):**

Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition Daniel Jurafsky and James H Martin 2nd Edition Prentice Hall 2008

Natural Language Understanding James Allen 2nd Edition Benjamin /Cummings publishing company 1995

| Course Name: | INTRODUCTION TO DEEP LEARNING- | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 235 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 4 | 3 |

**COURSE DESCRIPTION:** This course introduces students to fundamental concepts of deep neural networks and state of the art approaches to developing deep learning models to solve real world applications forvarious domains like imagerecognition, natural language processingetc.Topics include fundamental concepts of deep neural networks, Convolutional Neural Networks, Recurrent Network structures, Deep Unsupervised Learning, General Adversarial Networks and applications in various problem domains.

## Text Books:

1.Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press.

2.Artificial Neural Networks B. YagnaNarayana, PH

## Reference Books:

1.Deep Learning with Pythons, byFrancois Chollet, Manning Publications
2.Deep Learning by John D. Kelleher,MIT Press Essential Knowledge series
3.Hands-OnMachine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools andTechniques to Build Intelligent Systems by Aurelian Geron, Shroff/O'Reill
4.Practical Deep Learning for Cloud, Mobile, and Edge: Real-World AI & Computer-Vision Projects Using Python, Keras&TensorFlow by AnirudhKoul , Siddha Ganju , et al., Shroff/O'Reilly
5.Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
6.Python for Data Analysis -Wes McKinney, O'Reilly Media, Inc.7.Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.
8.Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press. 1995.

| Course Name: | SOFT COMPUTING | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 231 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION**

Soft computing is an emerging approach to computing which parallel the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision. Soft computing is based on some biological inspired methodologies such as genetics, evolution, ant's behaviors, particles swarming, human nervous systems, etc. Now, soft computing is the only solution when we don't have any mathematical modeling of problem solving (i.e., algorithm), need a solution to a complex problem in real time, easy to adapt with changed scenario and can be implemented with parallel computing. It has enormous

applications in many application areas such as medical diagnosis, computer vision, hand written character recondition, pattern recognition, machine intelligence, weather forecasting, network optimization, VLSI design, etc.

Topics to include: Introduction of Soft computing, Soft computing techniques, Neural Network, Unsupervised learning in Neural Network, Adaptive Resonance Theory, Fuzzy systems, Fuzzy rule base system, Genetic algorithm, Evolutionary Computing: Concepts & Applications.

**REFERENCE MATERIALS:**

**Text book(s):**


1. Fakhreddine O. Karray, and Clarence W. De Silva. Soft computing and intelligent systems design: theory, tools, and applications. Pearson Education, 2004.
2. Sivanandam, S. N., and S. N. Deepa. *Principles of soft computing.* John Wiley & Sons, 3rd Edition,2009.


**Reference book(s):**


1. Kumar S., "Neural Networks - A Classroom Approach", Tata McGraw Hill, 2004.
2. Ross T. J., "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
3. Eiben A. E. and Smith J. E., "Introduction to Evolutionary Computing", Second Edition, Springer, Natural Computing Series, 2007.


| Course Name: | web data mining | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE 327 | Credit Structure : | L | T | P | C |
| | | | 3 | 0 | 0 | 3 |

**COURSE DESCRIPTION:** Web mining refers to the automatic discovery of interesting and useful patterns from the data associated with the usage, content, and the linkage structure of Web resources. It has quickly become one of the most popular areas in computing and information systems because of its direct applications in e-commerce, e-CRM, Web analytics, information retrieval/filtering, Web personalization, and recommender systems. Employees knowledgeable about Web mining techniques and their applications are highly sought by major Web companies such as Google, Amazon, Yahoo, MSN and others who need to understand user behavior and utilize discovered patterns from terabytes of user profile data to design more intelligent applications. In this course, we will consider techniques from machine learning, data mining, text mining, and databases to extract useful knowledge from Web data, which could be used for site management, automatic personalization, recommendation, and user profiling.

**REFERENCE MATERIALS:**

**Textbooks:**


1. **Web Data Mining: Exploring Hyperlinks, Content, and Usage Data**, by Bing Liu, 2nd Edition, Springer, 2011




**Reference book:**

2. **Web Mining:** Applications and Techniques by Anthony Scime
3. **Mining the Web:** Discovering Knowledge from Hypertext Data by Soumen Chakrabarti

| **Course Name:** | Programming in GO | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | CSE 399 | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**Description:**

This course will provide an introduction on how to write computer programs using a programming language designed by Google named "Go" to students of Engineering. This module includes both lecture hours and hands-on sessions. Topics covered in this course are Program Structure; data types; Composite Types; functions; methods; structs, interfaces; Concurrency, Packages and applications of Go. In the hands-on session students are required to solve problems based on the above concepts to illustrate the features of this programming language.

**Proposed Text Books:**

- John Badner, "Learning Go: An Idiomatic Approach to real World Go Programming", Oreilly, 2021

**Reference Book:**

- Alan A.A. Donovan and Brian W. Kernighan, "The Go Programming Language", Addison Wesley, 2016

| **Course name** | **Data Warehousing and Mining** | | | | | |
|---|---|---|---|---|---|---|
| **Course code** | **CSE 384** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**COURSE DESCRIPTION**

The course is an intermediary course and aims to provide students with an in-depth understanding of design and implementation of data warehousing and data mining. The course will help students to enhance their understanding of various classification, clustering and outlier analysis methods. An interest to understand the concepts of data warehousing, data mining and a desire to be a successful data scientist are key to enable students to complete the course successfully.

Topics include: Data Model for Data Warehouses, data extraction, cleansing, transformation and loading, data cube computation, materialized view selection, OLAP query processing. Data mining-Fundamentals. Mining Techniques and Application: Classification, Clustering, Outlier analysis.

**Text Books:**

T1. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", McGraw Hill, 2016

T2. Jiawei Han, Micheline Kamber, Jian Pei, "Data-Mining.-Concepts-and-Techniques ", The-Morgan-Kaufmann, 3rd-Edition-Morgan-Kaufmann, 2012

**Reference Books:**

R1. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World", Pearson, 2016

R2. Tan P. N, Steinbach M and Kumar V, "Introduction to Data Mining", Pearson Education, 2016

| **Course name** | **Social Media Analytics** | | | | | |
|---|---|---|---|---|---|---|
| **Course code** | **CSE 234** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **2** | **0** | **2** | **3** |

The rapid growth of social media has given the mass consumers a powerful tool to create knowledge and propagate opinions. At the same time, social media has created an unprecedented opportunity for companies to engage real-time interactions with consumers. In addition, the size and richness of social media data has provided companies an unusually deep reservoir of consumer insights to transform the business and marketing operations. The social media analytics course will enable students to grasp the analytics tools to leverage social media data. The course will introduce tools such as engagement analytics, sentiment analysis, topic modeling, social network analysis, identification of influencers and evaluation of social media strategy.

**Text Books:**

T1. 1. Matthew A. Russell & Mkihail Klassen, Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, GitHub, and More, 3rd Edition (O'Reilly, 2019).

| **Course name** | **INTRODUCTION TO DEEP LEARNING** | | | | | |
|---|---|---|---|---|---|---|
| **Course code** | **CSE 235** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **3** | **0** | **0** | **3** |

**COURSE DESCRIPTION:**

This course introduces students to fundamental concepts of deep neural networks and state of the art approaches to developing deep learning models to solve real world applications for various domains like image recognition, natural language processing etc.

Topics include fundamental concepts of deep neural networks, Convolutional Neural Networks, Recurrent Network structures, Deep Unsupervised Learning, General Adversarial Networks and applications in various problem domains.

**Text Books:**

T1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

**Reference Books:**

T1. Deep Learning with Pythons, by Francois Chollet, Manning Publications, 2017

T2. Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems by Aurelian Geron, Shroff/O'Reilly, 2017.

| Course name | Natural Language Processing | | | | | |
|---|---|---|---|---|---|---|
| Course code | CSE 243 | Credit Structure: | L | T | P | C |
| | | | 2 | 0 | 0 | 2 |

**COURSE DESCRIPTION**

The course is an introductory course on Natural Language Processing (NLP), which is a branch of Artificial Intelligence. The primary focus of the course will be on understanding various NLP tasks, the algorithms for effectively solving these problems, and evaluating their performance. There will be a focus on statistical and deep learning algorithms, as well as natural language toolkits (Eg. Spacy, NLTK, etc.).

**Text Book(s):**

T1. Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Daniel Jurafsky and James H Martin. 2nd Edition. Prentice Hall. 2008

T2. Foundations of Statistical Natural Language Processing. Chris Manning and Heinrich Schutze. 1st Edition. MIT Press. 1997.

| Course name | Front-end Full Stack Development | | | | | |
|---|---|---|---|---|---|---|
| Course code | CSE 390 | Credit Structure: | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

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**COURSE DESCRIPTION**

This intermediate course enables students to perform front-end full stack development, with emphasis on employability skills. The course covers key technologies and architectures that enables the student to

design and implement front-end. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.

**Text Book(s):**

T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015
T2. Northwood, Chris, "The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", APress, 2018

| Course name | Java Full Stack Development | | | | | |
|---|---|---|---|---|---|---|
| Course code | CSE 391 | Credit Structure: | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

**COURSE DESCRIPTION**

This advanced level course enables students to perform full stack development using Java, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using Java, and the related technologies/tools like Java EE, Java Persistence, Hibernate, Maven, Spring Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.

**Text Book(s):**

T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015

| Course name | .NET Full Stack Development | | | | | |
|---|---|---|---|---|---|---|
| Course code | CSE 392 | Credit Structure: | L | T | P | C |
| | | | 0 | 0 | 4 | 2 |

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**COURSE DESCRIPTION**

This advanced level course enables students to perform full stack development using .NET, with emphasis on employability skills. The key technologies used for Full Stack development is based on either Java technology or .NET technology. In this course, the focus is on using .NET and the related technologies/tools like C#, ASP.NET, Entity Framework Core, etc. On successful completion of this course, the student shall be able to pursue a career in full-stack development. The students shall develop strong problem-solving skills as part of this course.

**Text Book(s):**

T1. Fender, Young, "Front-end Fundamentals", Leanpub, 2015

T2. Valerio De Sanctis, "ASP.NET Core 5 and Angular: Full-stack web development with .NET 5 and Angular 11", 4th Edition, Packt, 2021.

| **Course Name:** | **ETHICS IN ENGINEERING PRACTICE** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE357** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **2** | **0** | **0** | **2** |

**Course Description:** The course deals with the responsibilities of an engineer towards the society. Engineering as a profession is meant to serve the public by strictly adhering to codes of conduct and placing paramount the health, safety and welfare of public. Engineering ethics is the study of moral issues and decisions confronting individuals and organizations engaged in engineering and the study of related questions about the moral ideals, character, policies and relationships of people and corporations involved in technological activity. To prepare students for their professional responsibilities as Engineers. To help them recognize and think through ethically significant problem situations that are common in Engineering and to evaluate the existing ethical standards for Engineering Practice.

**Text/ Reference Books:**

1. Ethics in Engineering practice and Research (2nd Edition) by Caroline Whitbeck Cambridge
2. Ethics in Engineering MW Martin and R Schinzinger MC Graw Hill
3. Engineering Ethics and Environment P A Vesilind and AS Gunn Cambridge

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| **Course Name:** | **DATA SCIENCE FOR ENGINEERS** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE359** | **Credit Structure :** | **L** | **T** | **P** | **C** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **2** | **0** | **0** | **2** |

**Course Description:** The course deals with the study of data to extract meaningful insights for business. The course introduces R as a programming language, mathematical foundations required for data science, first level algorithms, data analytics problem solving framework and practical capstone case study.

**Text/ Reference Books:**

1. Introduction to Linear Algebra - by Gilbert Strang
2. Applied Statistics and Probability for Engineers – by Douglas Montgomery

| **Course Name:** | **INTRODUCTION TO SOFT COMPUTING** | | | | | |
|---|---|---|---|---|---|---|
| **Course Code:** | **CSE360** | **Credit Structure :** | **L** | **T** | **P** | **C** |
| | | | **2** | **0** | 0 | **2** |

**Course Description:** The course deals with soft computing based on some biological inspired methodologies such as genetics, evolution, ant's behaviors, particles swarming, human nervous systems, etc. Now, soft computing is the only solution when we don't have any mathematical modeling of problem solving (i.e., algorithm), need a solution to a complex problem in real time, easy to adapt with changed scenario and can be implemented with parallel computing. It has enormous applications in many application areas such as medical diagnosis, computer vision, hand written character recondition, pattern recognition, machine intelligence, weather forecasting, network optimization, VLSI design, etc.

**Text/ Reference Books:**

1. An Introduction to Genetic Algorithm Melanic Mitchell (MIT Press)
2. Evolutionary Algorithm for Solving Multi-objective, Optimization Problems (2nd Edition), Collelo, Lament, Veldhnizer (Springer)
3. Fuzzy Logic with Engineering Applications Timothy J. Ross (Wiley)
4. Neural Networks and Learning Machines Simon Haykin (PHI)

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| Course Name: | INFORMATION SECURITY-5 -SECURE SYSTEM ENGINEERING | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE358 | Credit Structure : | L | T | P | C |
| | | | 2 | 0 | 0 | 2 |

**Course Description:** The course deals with the overview of security and its aspects. Then goes through the different threats, and methods to protect the information. This course gives an overview of cryptography and discusses the various techniques related with it. The students who wish to enhance their knowledge on recent trends of IT and Computers and those who wish to understand the term information or cyber security are equally benefitted with the contents of this course

**Text/ Reference Books:**


1. W. Stallings, Cryptography and Network Security Principles and Practices, 4th Ed., Prentice-Hall of India, 2006.
2. C. Pfleeger and S.L. Pfleeger, Security in Computing, 3rd Ed., Prentice-Hall of India, 2007.
3. D. Gollmann, Computer Security, John Wiley and Sons, NY, 2002.
4. J. Piwprzyk, T. Hardjono and J. Seberry, Fundamentals of Computer Security, Springer-Verlag Berlin, 2003.
5. J.M. Kizza, Computer Network Security, Springer, 2007.
6. M. Merkow and J. Breithaupt, Information Security: Principles and Practices, Pearson Education, 2006.


| Course Name: | Technical Training | | | | | |
|---|---|---|---|---|---|---|
| Course Code: | CSE501 | Credit Structure : | L | T | P | C |
| | | | 0 | 0 | 6 | 3 |

**Course Description:** The course primarily deals with the preparation for the placements. A comprehensive coding ability is what is expected of a student ready for a professional career. This course covers the basics of programming and gradually progress to become expert programmer. Since most of the companies prefer Java as a programming language especially wrt fresher, this course fundamentally deals with Java Programming and Object Oriented Concepts.

**Text/ Reference Books:**

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## Text Books:


1. **Cay S Horstmann and Cary Gornell, *"CORE JAVA volume I-Fundamentals"*, Pearson 2016.**

2. **Cay S Horstmann and Cary Gornell, *"CORE JAVA volume II-Advanced Features"*, Pearson 2017.**


## References


1. **Herbert Schildt, *"The Complete Reference Java 2",* Tata McGraw Hill Education, 10th Edition 2017.**

2. **James W. Cooper, *"Java TM Design Patterns – A Tutorial"*, Addison-Wesley Publishers 2000.**


## Web resources:

1. https://www.udemy.com/course/object-oriented-programming-oops-concepts-in-english/
2. https://archive.nptel.ac.in/courses/106/105/106105191/