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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

School of Engineering

Bachelor of Technology Degree

Program Regulations and Curriculum 2019-2023

B. Tech. (Computer Engineering)

2019-2023

Regulations No: PU/AC-20.3/SOCSE01/COM/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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PRESIDENCY UNIVERSITY Registrar BANGALORE

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, 2018 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 shall be applicable to the on-going 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 shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum**,** along with all the amendments thereto.

(e) These Regulations shall come into force from the academic year 2019-2020

Definitions:

In these Regulations, unless there is anything repugnant to the subject or context:

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 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;

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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;*

1.0 INTRODUCTION: 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 ongoing **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 Engineering, abbreviated as B. Tech. (Computer Engineering);

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

1.3.4 Bachelor of Technology in Computer Science and Engineering, abbreviated

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as B. Tech. (Computer Science and Engineering);

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

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

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

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

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

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

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

1.4 These Program Regulations shall be applicable 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 favour 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 on going Bachelor of Technology (B. Tech) Degree Programs of study as enumerated and named in Clause 1.3.

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2.0 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 tabled below:

Table 2.1
B. Tech. Degree Programs and Respective Parent Departments

S. No.	*B. Tech. Program (Branch/Discipline)*	*Parent Department*
1	B. Tech. (Civil Engineering)	Department of Civil Engineering
2	B. Tech. (Computer Engineering)	Department of Computer Science and Engineering
3	B. Tech. (Computer and Communication Engineering)	
4	B. Tech. (Computer Science and Engineering)	
5	B. Tech. (Information Science and Engineering)	
6	B. Tech. (Information Science and Technology)	
7	B. Tech. (Electronics and Communication Engineering)	Department of Electronics and Communication Engineering
8	B. Tech. (Electronics and Computer Engineering)	
9	B. Tech. (Electrical and Electronics Engineering)	Department of Electrical and Electronics Engineering
10	B. Tech. (Mechanical Engineering)	Department of Mechanical Engineering
11	B. Tech. (Petroleum Engineering)	Department of Petroleum 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. All B.Tech Programs are full time programs.

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 courses 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 Program.

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.

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, recommending revoking the admission of the candidate.

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2.2.8 The decision of the Board of Management 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 is 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. 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.

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 that 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 Program 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 fulfills 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 purpose. Further, the Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the

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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 rules 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 of 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 no provision for change of Branch thereafter under any circumstances whatsoever.

2.5.3 The student(s) 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 applicants may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the limitations as 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 Handout.

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 2.8.1.2 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.

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 final (4^{th}) year of the B.Tech Program. Students may register for Professional Practice – II in either the 7^{th} Semester or the 8^{th} Semester of the B.Tech Program, in accordance with the following guidelines:

2.8.1 *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 fulfils 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

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program shall be conducted in accordance with the Program Regulations and Internship Policy of the 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 and 3rd Year of the B.Tech Program. The nature and details of the SIC shall be approved by the concerned Departmental Academic Committee. 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(s) who receive the "NC" grade shall repeat the SIC (it may be another type of SIC as approved by the concerned DAC) until the concerned student(s) secure 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 clause 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 (or) Lecture Credit Structure (L – T – 0) or (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 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: (1) Assignment(s), (2) Quiz, (3) Technical Seminar/Report, (4) Attendance/Class participation, (5) Assessment on the self-learning topic(s), or, (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 Laboratory/Practice Based Courses with a Credit Structure of (0 – 0 – P), or (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 shall be as detailed in Table 3 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, 2017), 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 2.12.1, 2.12.2 and 2.12.3 are not suitable/ relevant for the assessing the performance in the concerned Course, the DAC shall recommend the appropriate method of assessment for the approval by the BOS.

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) and 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 Outcome Based Education policy and concepts adopted by the University. It will specify the expected Course Outcomes and the Program Outcomes met by the Course. It will also specify the mapping between the Course Outcomes and Program Outcomes.

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.

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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 Examinations, 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 are outlined in Section 18.0 of the Academic Regulations. The Rules and Guidelines for the transfer of credits specifically from the On-line Courses conducted by the Study Webs of Active-Learning for Young Aspiring Minds-National Program on Technology Enhanced Learning (SWAYAM-NPTEL) (Refer Sub-Clause 18.2 of the Academic Regulations) 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 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 and the Open Elective 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 and Open Elective 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.

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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 release a list of Open Elective courses 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.

Table 2.13.1 SWAYAM-NPTEL Course Durations and Credit Equivalence

Sl. 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 fulfill (partially or fully) the mandatory credit requirements of the Discipline Electives and/or Open Electives 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

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Table 2.13.2. Grading System for SWAYAM-NPTEL Courses		
Sl. No.	**Final Score on the SWAYAM-NPTEL Certificate**	**Grade Awarded**
1	90% and above	O
2	From 80% to 89%	A+
3	From70% 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 students 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.

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

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3. PART B: PROGRAM CURRICULUM

BACHELOR OF TECHNOLOGY DEGREE PROGRAM IN COMPUTER ENGINEERING
B.TECH (Computer Engineering)
2019-2023

B. Tech program in Computer Engineering with specialization in Data Science (DS) is a modern degree designed to meet the increasingly aggressive demand for qualified data scientists in virtually every sector of the economy. The Data Science, basically is a combination of important domains namely Mathematics, Computer Programming, Statistics and Design which is applied in order to successfully manage Digital Data. The Program offered is a modern pedagogy designed to meet the global demand for qualified Data Scientists. Data science is the creation and application of powerful new methods to collect, curate, analyze, and make discoveries from large-scale data. This new program has a dual objective: provide solid foundations in Computer Engineering and introduce Data Science and the new tools it provides to manage huge amounts of data to lead us to better understand and, ideally, solve some of the greatest challenges facing the world today in medicine and health, energy and the environment, economics and politics, and many other areas. The employment potential and career options are huge as data science impacts all sciences, business, and our everyday lives.

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, 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 Computer Engineering at Presidency University are as follows.

Program Educational Objectives (PEO)

After the completion of B.Tech. Program in Computer 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.

Program Outcomes (PO)

Graduates of the B. Tech. Program in Computer 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.

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Program Specific Outcomes (PSO)

At the end of the B. Tech. Program in Computer Engineering the students shall:

PSO1: Demonstrate proficiency in assessing data-based models and statistical analysis of data.

PSO2: Apply data science concepts and methods to solve problems in real-world context and communicate these solutions effectively.

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 (Computer Engineering) Program structure (2019-2023) consists of 180 credits. This program leads to specialization in Data Science.

Table 3.1.1 summarizes 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 (Computer 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
3	Basic Sciences (BS)	9	29
4	Engineering Sciences (ES)	7	21
5	Core (Professional) Course (CC)	28	76

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			**180**
The mandatory minimum credits required for the award of the B. Tech. (Computer Engineering) Degree is 180 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 (Computer Engineering) Program.

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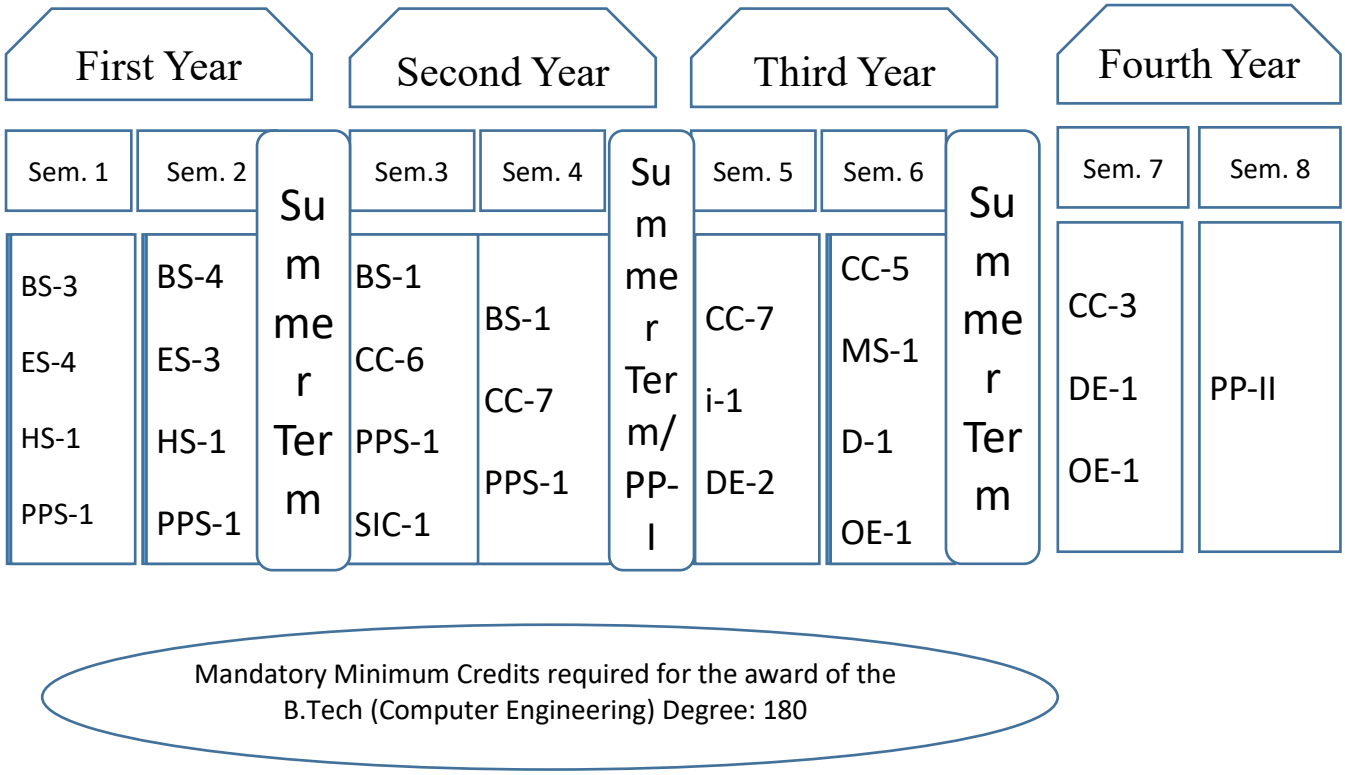
3.1.2 B.Tech (Computer Engineering) Program Suggested Year Wise Structure



Mandatory Minimum Credits required for the award of the B.Tech (Computer Engineering) Degree: 180

Nomenclature:

BS - Basic Sciences
ES - Engineering Sciences
HS – Humanities, Social Sciences and 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 180 for B.Tech (Electrical and Electronics 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	1	-
2	PHY 101	Engineering Physics	4	0	0	4	4	1	-
3	EEE 101	Elements of Electrical Engineering	3	0	0	3	3	2	-
4	CIV 101	Elements of Civil Engineering	3	0	0	3	3	2	7
5	MEC 152	Engineering Graphics	2	0	4	4	6	2	-
6	ENG 1XX	Humanities-I	2	1	0	3	3	1/3	-
7	PHY 151	Engineering Physics Lab	0	0	2	1	2	1	-
8	MEC 151	Workshop Practice	0	0	2	1	2	2	-
9	PPS 105	Building Self Confidence	0	0	2	1	2	3	-
		TOTAL	**17**	**2**	**10**	**24**	**29**		

[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.

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	1	-
2	CHE 101	Engineering Chemistry	4	0	0	4	4	1	-
3	ECE 101	Elements of Electronics Engineering	3	0	0	3	3	2	-
4	MEC 101	Elements of Mechanical Engineering	3	0	0	3	3	2	-
5	CIV 102	Environmental Science and Disaster Management	3	0	0	3	3	1	7
6	ENG 1XX	Humanities-I	1	0	2	2	3	3	-

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7	CSE 151	Computer Programming	2	0	4	4	6	3	-
8	CHE 151	Engineering Chemistry Lab	0	0	2	1	2	1	-
9	PPS 105	Building Self Confidence	0	0	2	1	2	1	8/6
		TOTAL	**19**	**1**	**10**	**25**	**30**		

[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.

II SEM - CHEMISTRY CYCLE (Jan-May)#

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	1	-
2	CHE 101	Engineering Chemistry	4	0	0	4	4	1	-
3	ECE 101	Elements of Electronics Engineering	3	0	0	3	3	2	-
4	MEC 101	Elements of Mechanical Engineering	3	0	0	3	3	2	-
5	CIV 102	Environmental Science and Disaster Management	3	0	0	3	3	1	7
6	ENG 1XX	Humanities-II	1	0	2	2	3	3	-
7	CSE 151	Computer Programming	2	0	4	4	6	3	-
8	CHE 151	Engineering Chemistry Lab	0	0	2	1	2	1	-
9	PPS 106	Effective Communication	0	0	2	1	2	1	8/6
		TOTAL	**19**	**1**	**10**	**25**	**30**		

[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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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	1	-
2	PHY 101	Engineering Physics	4	0	0	4	4	1	-
3	EEE 101	Elements of Electrical Engineering	3	0	0	3	3	2	-
4	CIV 101	Elements of Civil Engineering	3	0	0	3	3	2	7
5	MEC 152	Engineering Graphics	2	0	4	4	6	2	-
6	ENG 1XX	Humanities-II	2	1	0	3	3	1/3	-
7	PHY 151	Engineering Physics Lab	0	0	2	1	2	1	-
8	MEC 151	Workshop Practice	0	0	2	1	2	2	-
9	PPS 106	Effective Communication	0	0	2	1	2	3	-
		TOTAL	**17**	**2**	**10**	**24**	**29**		

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

The 1st year B.Tech Program structure is executed in two cycles.

* The students undergoing the "Physics" cycle shall take the Courses as indicated.

The students undergoing "Chemistry" cycle shall take the Courses as indicated.

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III SEMESTER									
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	C			
1	MAT 107	Transform Techniques, Partial Differential Equations and Probability	3	1	0	4	4	1	-
2	CSE 201	**Data Structures**	3	0	0	3	3	2	-
3	CSE 222	Fundamentals of Data Analysis	2	0	2	3	4	2	-
4	CSE 203	**Discrete Mathematics**	3	1	0	4	4	1	-
5	CSE 258	**Problem Solving using Python**	1	0	4	3	5	2/3	-
6	CSE 223	**Computer Architecture and Organization**	3	0	0	3	3	2	-
7	CSE 251	Data Structures Lab	0	0	4	2	4	2	-
8	PPS 107	Design Thinking And Team Building	0	0	2	1	2	3	PE
		TOTAL	**15**	**2**	**12**	**23**	**29**		

[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.

*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	MAT 108	Numerical Methods, Probability Distributions and Sampling Techniques	4	0	0	4	4	1	-
2	CSE 224	Introduction to Data Science	3	0	0	3	3	2	-
3	CSE 210	Operating Systems	3	0	0	3	3	2	-
4	CSE 225	Introduction to Combinatorics and Graph Theory	3	0	0	3	3	2	-
5	CSE 207	Database Management Systems	3	0	0	3	3	2	-
6	CSE 208	Theory of Computation	3	1	0	4	4	2	-
7	CSE 253	Database Management Systems Lab	0	0	4	2	4	2	-

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8	CSE 260	Data Science Lab	0	0	2	1	2	2	-
9	PPS 108	Being Corporate Ready	0	0	2	1	2	3	PE
		TOTAL	**19**	**1**	**8**	**24**	**28**		

[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: Students will undergo Professional Practice-I during the summer break between the fourth and fifth semesters and the credits earned will be accounted for in the fifth semester.**

* Student has to register for university learning courses in any one semester 5/ 6 to earn the mandatory credits.

V SEMESTER									
S. No.	**COURSE CODE**	**COURSE NAME**	**CREDIT STRUCTURE**				**CONTACT HOURS**	**TYPE OF SKILL**	**COURSE ADDRESSES TO**
			L	**T**	**P**	**CREDITS**			
1	CSE 226	Optimization Techniques	3	0	0	3	3	2	_
2	CSE 227	**Software Engineering and Project Management**	3	0	0	3	3	2/3	_
3	CSE 228	**Principles of Artificial Intelligence**	3	0	0	3	3	2/3	_
4	CSE 261	Machine Learning using Python	2	0	2	3	4	2/3	_
5	CSE 204	**Object oriented Programming**	1	0	4	3	5	2	_
6	MGT 113	Engineering Economics	3	0	0	3	3	2	_
7	CSE XXX	Discipline Elective-I	3	0	0	3	5	–	–
8	CSEXXX	Discipline Elective-II	3	0	0	3	3	_	_
9	PIP 101	Professional Practice	0	0	0	5		3	_
		TOTAL	**19**	**0**	**10**	**29**	**29**		

[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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**Internal Evaluation only

VI SEMESTER									
S. No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	CREDITS			
1	CSE 219	**Big Data Analytics**	1	0	4	3	5	2	-
2	CSE 233	**Cloud Computing and Services**	3	0	0	3	3	2	-
3	CSE 232	Information Retrieval and Organization	3	0	0	3	3	2	-
4	CSE 235	Introduction to Deep Learning	3	0	0	3	3	2	-
5	CSE246	Computer Network and Simulation	2	0	2	3	4	2/3	-
6	XXX XXX	Open Elective – I	3	0	0	3	3	-	-
7	MGT 114	Business Intelligence	3	0	0	3	3	4	-
8	SIC 501	Social Immersion Course	-	-	-	1	-	-	9/7/8
		TOTAL	**18**	**0**	**6**	**22**	**24**		

[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.

VII SEMESTER									
S.No.	COURSE CODE	COURSE NAME	CREDIT STRUCTURE				CONTACT HOURS	TYPE OF SKILL	COURSE ADDRESSES TO
			L	T	P	CREDITS			
1	CSE 234	**Social Media Analytics**	2	0	2	3	4	2	-
2	CSE 384	Data Warehousing and Mining	3	0	0	3	3	2	-
3	CSE 220	**Internet of Things**	1	0	4	3	5	2	-
4	CSE XXX	Discipline Elective – III	3	0	0	3	3	-	-
5	CSE XXX	Discipline Elective – IV	1	0	4	3	5	-	-
6	XXXXXX	Open Elective – II	3	0	0	3	3	P/E	-

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		TOTAL	13	0	13	18	23		

[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.

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 above Table

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.

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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	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									

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 305	Parallel Computing	3	0	0	3	3	2	-
2	CSE 310	Mobile Applications Development	1	0	4	3	5	3	-
3	CSE 311	Web Services	1	0	4	3	5	3	-
4	CSE 313	Storage Area Networks	3	0	0	3	3	2	-
5	CSE 325	Bio Informatics	3	0	0	3	3	-	-
6	CSE 367	Data Visualization	1	0	4	3	5	2	-
7	CSE 368	Distributed Systems	3	0	0	3	3	2	-
8	NAS 3001	NASSCOM Powered DGNEXT	3	0	0	3	3	-	-
9	CSE390	Front End Full Stack Development	0	0	4	**2**	4	EM	
10	CSE391	JAVA Full Stack Development	0	0	4	**2**	4	EM	
11	CSE392	.NET Full Stack Development	0	0	4	**2**	4	EM	
12	CSE357	ETHICS IN ENGINEERING PRACTICE	2	0	0	2	2	-	
13	CSE359	DATA SCIENCE FOR ENGINEERS	2	0	0	2	2	-	

14	CSE360	INTRODUCTION TO SOFT COMPUTING	2	0	0	2	2	-	
15	CSE358	INFORMATION SECURITY-5- SECURE SYSTEM ENGINEERING	2	0	0	2	2	-	

[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 — 3.2.1

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
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.

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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 296	Data Structures Using C	3	0	0	3	3	2	-
2	CSE 297	Social Network Analytics	3	0	0	3	3	2/3	-
3	CSE 397	Digital and Mobile Forensics	3	0	0	3	3	2	-
4	CSE 298	Database Management Systems	3	0	0	3	3	2	-
5	CSE 398	Multimedia and Animation	3	0	0	3	3	2	-
6	CSE 299	Data Analytics Using R	3	0	0	3	3	2/3	-
7	CSE 399	Data Visualisation	3	0	0	3	3	2/3	-

8	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	-
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	-
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									

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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.

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Course Name:	Engineering Physics

Course Code:	PHY 101	Credit Structure :	L	T	P	C
			4	0	0	4

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.

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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.

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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.

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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**

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.

Course Name:	**Fundamentals of Data Analysis**					
Course Code:	**CSE 222**	**Credit Structure :**	**L**	**T**	**P**	**C**
			2	**0**	**2**	**3**

Course Description:

This course is designed to provide the core concepts of data analysis in the Excel environment. Initially train them with basic Excel functionalities, then progressively increase the difficulty as they move along in the course, capping with advanced techniques through case studies. Mastering the core concepts and techniques of data analysis in Excel, will help the students to apply their knowledge to a wide range of business applications. Excel is still the most popularly used tool by analysts in all industries.

The topics include, All about data, basic Excel functions and techniques, analysis techniques to datasets, manipulate and prepare datasets, Visualize data through conditional formatting and charts, organize data interactively with tables and pivot tables- implement scenarios with what-if analysis-analyze data with statistical and probabilistic add-in tools - optimize formula results with solver/goal seek add-in. Build presentation ready dashboards ,create own formulas in Excel ,turn real world data into business insights , learn to use appropriate charts in Excel.

Text Book(s):

1. Data Analysis and business modelling using Microsoft Excel – Hansa Lysander-PHI

Reference book(s):

2. Excel Data Analysis-visual blue print –Paul McFedries –Wiley
3. Data Analysis using Excel

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

Course Name:	Problem Solving Using Python					
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 Architecture and Organization				
Course Code:	CSE 223	Credit Structure:	L	P	C
			3	0	3

Course Description: This course covers basics of modern computer organization and architectures. The emphasis is on understanding the interaction between computer hardware and software at various levels. The students will learn the operational concepts of computer technology, performance evaluation, instruction set architecture, computer arithmetic, data path and control unit design of basic processing unit and enhancing performance with pipelining.

Topics: Basic Structure of computers, Evolution of computer systems (RISC vs. CISC), Performance, Instruction set Architecture (ISA), Memory operations, Instruction formats, Addressing modes, I/O Devices and Interrupts, Computer Arithmetic, Basic Processing Units, Single and Multiple Bus organization, Memory organization, Parallelism in uniprocessor systems, Principles of Pipelining.

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:	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.

Books:

1. **Textbook(s)**

   Design Thinking & Team Building Training Manual

2. **Reference Book(s)**

Emrah Yayici, "Design Thinkking Methodology Book"

Diane Deacon and Mike Vance, *"Think Out Of The Box"*

John Adair, *"Decision Making and Problem Solving Strategies"*

John Adair *"The Art Of Creative Thinking*

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

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Course Description: The objective of the course is to equip the students with adequate knowledge of numerical methods, probability distributions and statistical sampling techniques which will enable them to formulate and solve problems concerning real-world engineering applications numerically as well as statistically. This course provides an introduction to basic numerical methods to deal with algebraic and

transcendental equations, system of equations, interpolation, differentiation and integration. This course also provides an introduction to numerical solution of ordinary differential equations by means of Taylor's series method, modified Euler's method and Runge-Kutta methods. Besides, since the study of probability and statistics is of great use in understanding and modeling phenomena that exhibit random behavior, the course also aims at introducing students to quantitative uncertainty analysis and risk assessment for engineering applications in terms of discrete and continuous probability distributions, and small and large sampling techniques.

Text Book(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: 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.
T3: Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley& Sons (India), 2014.
T4: B.S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers.

Reference Book(s):

R1: B.S. Grewal, Numerical methods in engineering and science, 10th Edition, Khanna publishers, 2016.
R2: Kishor S Trivedi, "Probability and Statistics with reliability, Queuing and Computer Science Applications", John Wiley & Sons, 2ndedition, 2008.

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 Data Science					
Course Code:	CSE 224	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description: Data Science is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from data in various forms, both structured and unstructured. This is an introductory course to data science and it covers the mathematical foundations of data science, techniques for data collection, pre-processing and visualizing data. **Concepts discussed in this course will be supplemented with hands on data science tools in Data Science Lab course**.

Topics include: **Mathematical foundations of data science** – A brief introduction, data , types of variables-continuous and discrete variables, **Getting data** – Data Collection, web scrapping; **Pre-processing data** - Cleaning, Munging, Manipulation, Rescaling and dimensionality reduction; **Visualizing data** – histograms, line charts, pie charts, multiple bar graphs, box plots and scatter plots**. Exploratory data analysis.**

Text Book(s)

1.Joel Grus, “Data Science From Scratch”, O'Reilly, First Edition, 2015.

2.Roger peng, “Exploratory data analysis using R “, Lean publishing.

Reference Book(s):

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.

2.Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)

3.David M Diez, Christopher D Barr and Mine Cetinkya Rundel, “Introductory Statistics with Randomization and Simulation”, First Edition. 2015

1.

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:	Graph Theory					
Course Code:	CSE 225	Credit Structure :	L	T	P	C
			3	1	0	4

Course Description: Graph Theory is a mathematical technique used extensively in Computer Science and Information Technology. The intension of this course is to introduce the subject of graph theory to computer science students in a thorough way.

While the course will cover all elementary concepts such as coloring, covering, hamiltonicity, planarity, connectivity and so on, it will also introduce the students to some Applications.

Topics include. Graph theory- trees and networks, Euler formula, Hamilton paths, planar graphs and coloring problem, the use of trees in sorting and prefix codes, algorithms on networks such as shortest path, minimal spanning tree and min-flow max-cut algorithms.

Text Book(s):

K H Rosen,"*Discrete Mathematics*", McGraw Hill.

Reference Book(s):

1. Harris, Hirst, andMossinghoff, *"Combinatorics and Graph Theory"*, Springer.

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2. Girmaldi, "*Graph Theory and Combinatorics"*, Pearson Education.

3. J Nestril and etal, *"Introduction to Discrete Mathematics"*, Oxford University Press.

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.

Reference Book(s):

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

Course Name:	Data Science Lab					
Course Code:	CSE 260	Credit Structure :	L	T	P	C
			0	0	2	1

Course Description: This course is a supplementary for the Introduction to Data Science course. Programming exercises will be covered on the following topics using Python programming language: - basics of Python programming, decision control statements, functions and modules, strings, file handling, Python data structures, Introduction to Packages – NumPy, Xlrd, matplotlib and Pandas. Getting data from files and web scrapping, preprocessing and data visualization.

Text Book(s)

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

2. Joel Grus, "Data Science From Scratch", O'Reilly, First Edition, 2015.

Course Name:	Being Corporate Ready					
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.

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Course Name:	Computer Networks					
Course Code:	CSE 211	Credit Structure :	L	T	P	C
			3	0	0	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. Larry L, Peterson and Bruce S. Davie, *"Computer Networks: A system Approach",* Elsevier.
2. A. S. Tannenbum, D. Wetherall, *"Computer Networks",* Prentice Hall.

Reference Book(s):

1. FredHalsall, *"Computer Networks",* Addison – Wesley Pub. Co.
2. Behrouz A. Forouzan, *"Data Communications and Networking"*, Tata McGraw-Hill.
3. Tomasi, *"Introduction To Data Communications and Networking"*, Pearson.
4. William Stallings, *"Data and Computer Communications"*, Prentice Hall.

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.

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Course Name:	Object Oriented Analysis and Design					
Course Code:	CSE 213	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description: The Course covers the analysis and design methodology in sufficient depth to convey a good understanding of object oriented analysis and design using the unified process. Student should be able to analyze requirements using a use case model, identify the classes and their responsibilities, using interaction models to capture the requirements and the design of the solution. The application of the design axioms and the iterative nature of the process are emphasized.
Topics include:Object Oriented Information Systems, Software Development Life Cycle, Object Oriented Methodologies, Unified Modelling Language (UML), Object Oriented Analysis, Object Oriented Design, Access layer and View Layer, Application of Design Patterns, Architecture and Framework, Software Quality Assurance.

TextBook(s):

Simon Bennett, Steve McRobb, Ray Farmer, *"Object Oriented Systems Analysis and Design using UML"*, McGrawHill Education

Reference Book(s):

1. Craig Larman, *"Applying UML and Patterns*", Pearson Education.
2. Grady Booch, *"Object Oriented Analysis and Design with Applications"*, Addison-Wesly.
3. Ali Behrami, *"Object Oriented Systems Development using Unified Modeling Language ",*McGraw Hill International Edition.

Course Name:	**Principles of Programming Languages**					
Course Code:	**CSE 214**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description: The Course covers features of programming languages and introduces different programming paradigms, and their semantics.
Topics include: Data types and Data Abstraction, Scope and Parameter passing and Concurrency related features. Various aspects of runtime environments like global and local data, code, function call stacks, dynamically allocated data, exceptions and threads, formal elements of lambda calculus, functional paradigm .Logic programming paradigm, Scripting as a paradigm. Domain specific languages.

Text Book(s):

Robert W. Sebesta, *"Concepts of Programming Languages"*, The Benjamin Cummings Publishing Company, Inc.

Reference Book(s):

1. Ravi Sethi , *"Programming Languages: Concepts and Constructs"* Addison Wesley.
2. Aho, Lam, Sethi and Ullman, *"Compilers Principles, Techniques, and Tools"*. Pearson Education.

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:	**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.

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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:	Entrepreneurship					
Course Code:	MGT 101	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description: The objective of the Course on entrepreneurship will be on creating a learning system through which engineering students can acquaint themselves for starting new ventures and introducing new product and service ideas.

Entrepreneurship is the most powerful economic fore known to humankind. The process of transforming creative ideas into commercially viable business continues to be a major force in today's world economy. Successful entrepreneurship requires more than merely luck and money. It is a cohesive process of creativity, risk taking, and planning. This Course gives an overall basic framework for understanding the process of entrepreneurship.

The Course includes topics such as Understanding the entrepreneurial mind set, Launching Entrepreneurial Ventures, The Search for Entrepreneurial Capital, Formulation of Entrepreneurial Plan.

Text Book(s):

D.F. Kuratko, T V Rao,*" Entrepreneurship- A South Asian Perspective",*Cengage Learning**.**

Reference Book(s):

1.Robert D. Hisrich, Michael P. Peters and Dean A. Shepherd, *"Entrepreneurship"*, McGraw-Hill International.

2. Thomas W. Zimmerer, Norman M. Scarborough, *"Essentials of Entrepreneurship and Small Business Management"*, Pearson International Edition.

Course Name:	Professional Practice - I					
Course Code:	PIP 101	Credit Structure :	L	T	P	C
			-	-	-	5

Course Description: The Professional Practice (PP) links the university with the professional world, by infusing the reality of the world of work into the educational process. The classroom is shifted for a period of two months in PP- I and another two months in PP-II to a professional location where the students, under the supervision of the faculty, are involved in applying the knowledge acquired in the classroom to finding solutions to real life problems. The PP programme has two components, namely PP-I of two months duration implemented during the summer following the 2nd year and PP- II two months duration implemented during either of the semesters of the final year.

PP-I is the first exposure to the world of work, necessary for the subsequent problem solving experience during PP-II. It is implemented at large industrial complexes, research and development centres, software development houses, pharmaceutical companies, etc. While the general aim of PP-I is to afford an opportunity for the student to learn how work is organized and carried out; by a process of observation and participation, the learning can be quite varied and exhaustive depending on the nature of the organization. It provides an opportunity for a detailed understanding of vast engineering operations and its various facets such as inventory, productivity, management, information systems, human resource development, etc.

Course Name:	**Cryptography and Network Security**					
Course Code:	**CSE 215**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description: The Course covers the principles and practice of cryptography and network security, focusing in particular on the security aspects of the web and Internet.

Topics include: The cryptographic tools such as shared key encryption, public key encryption, key exchange, and digital signature are explored. The use and utilization of the internet protocols and applications such as SSL/ TLS, IPSEC, Kerberos, PGP, and S/ MIME,SET are reviewed. System security issues such as viruses, intrusion and firewalls.

Text Book(s):

1. William Stallings, *"Cryptography and Network Security - Principles and Practices"*, Prentice Hall
2. Wade Trappe, Lawrence C Washington, *"Introduction to Cryptography With Coding Theory"*, Pearson.

Reference Book(s):

1. R.Rajaram, *"Network Security and Cryptography"* SciTech Publication.
2. AtulKahate, *"Cryptography and Network Security"*, Tata McGraw-Hill.
3. BruceSchneier, *"Applied Cryptography"*, John Wiley and Sons Inc.

Course Name:	**Compiler Design**					
Course Code:	**CSE 217**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**1**	**0**	**4**

Course Description: The Course is intended to teach the students the basic techniques that underlie the practice of Compiler Construction. The Course will introduce the theory and tools that can be employed in order to perform syntax-directed translation of a high-level programming language into an executable code.

Topics include: Introduction to Compilers, Language translators: compilers and interpreters. Lexical Analysis, Role of the parser ,semantic analysis, Intermediate Code Generation, Code Optimization, DAG representation of Basic Blocks, Global optimization, Peephole Optimization.

Text Book(s):

1. Alfred V. Aho, Jeffrey D Ullman, *"Compilers: Principles, Techniques and Tools"*, Pearson
2. Dhamdhere, D. M., *"Compiler Construction Principles and Practice"*, Macmillan India Ltd.

Reference Book(s):

1. Jean Paul Tremblay, Paul G Serenson, *"The Theory and Practice of Compiler Writing",* BS Publications.
2. C. N. Fischer and R. J. LeBlanc, *"Crafting a compiler with C",* Benjamin Cummings.
3. HenkAlblas and Albert Nymeyer, *"Practice and Principles of Compiler Building with C"*, PHI.
4. Kenneth C. Louden, *"Compiler Construction: Principles and Practice",* Thompson Learning.

Course Name:	**Internet Technologies**					
Course Code:	**CSE 256**	**Credit Structure :**	**L**	**T**	**P**	**C**
			1	**0**	**4**	**3**

Course Description: This Course introduces students to basic web design using Hypertext Markup Language (HTML) and Cascading Style Sheets (CSS). Throughout the Course students are introduced to planning and designing effective web pages; implementing web pages by writing HTML and CSS code; enhancing web pages with the use of page layout techniques, text formatting, graphics, images, and multimedia; and producing a functional, multi-page website.

Topics include: introduction to internet, browser and search engines, Internet Protocols, JAVA and HTML tools for Internet programming, scripting languages – Java Script, CSS, dynamic paging, Introduction to Dreamweaver-PHP,Server Side Programming tools, web database and XML.

Text book(s):

1. Deitel, Deitel and Nieto, *"Internet and World Wide Web – How to program"*, Pearson Education.
2. Elliotte Rusty Harold, *"Java Network Programming"*, O'Reilly Publishers.

Reference book(s):

1. R. Krishnamoorthyand S. Prabhu, *"Internet and Java Programming"*, New Age International.
2. Thomno A. Powell, *"The Complete Reference HTML and XHTML", fourth edition*, Tata McGraw Hill.

Course Name:	**Network Programming Lab**					
Course Code:	**CSE 257**	**Credit Structure :**	**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**

Course Description: Network Programming intends to explore the opportunities for developing, maintaining and supporting distributed and network applications. The Course covers the basics of computer networks to designing and implementing network servers such as web and mail server.

Topics include: Overview of computer networks; inter-process communication; network programming; Socket interface; client-server computing model; design issues, concurrency in server and clients; external data representation; remote procedure calls. The network programming paradigms such as RPC are also studied. Various well known protocols like TELNET, HTTP, FTP, SMTP, NFS etc are discussed to demonstrate the network programming concepts.

Text Book(s):

1. Stevens, R.W., *"Unix Network Programming, Vol-I Networking APIS : Sockets and XTI"*, Prentice-Hall of India.
2. Stevens, R.W., *"Unix Network Programming: Vol-II Inter Process Communications"*, Prentice-Hall of India.

Reference Book(s):
1. Michael Kerrisk,*"The Linux Programming Interface: Linux and UNIX System Programming Handbook*", No Starch Press
2. W.R. Stevens, *"Advanced Programming in the UNIX Environment* ", Addition Wisley.

Course Name:	**Engineering Economics**					
Course Code:	**MGT 102**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description: The objective of this Course is to enable engineering students to analyze cost / revenue data and make an economic analysis, which can help in the decision making process either to justify or reject alternative projects. This Course is designed to present the concepts and techniques of economic analysis needed in the decision making process. The emphasis is on the analytical analysis of money and its impact on decision making
The Course introduces the student to the discipline of economics and its application in the field of engineering. The Course examines the concept of time value of money and how engineers can apply it for making economic decisions. It also explains how interest rates and different compounding periods influence the value of various capital expenditures. The Course also deals with the effect of depreciation, taxes and inflation on capital expenditure decisions. .
Text Book (s):
Niall M Fraser, "*Engineering Economics"*, Pearson.
Reference Book (s):
1. Jose Sepulveda, " *Schaum's Outline of Engineering Economics"*, McGraw-Hill.
2. Tara Chand*, "Engineering Economics" ,*Vol-1, Nem Chand and Brothers.

Course Name:	**Human Computer Interaction**					
Course Code:	**CSE 218**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**02**	**3**

Course Description: The Course is intended to introduce the students to the basic concepts of human-computer interaction. It will cover the theory and methods that exist in the field. Human-computer interaction is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design, and many other areas.HCI is concerned with the joint performance of tasks by humans and machines. It stresses the importance of good interfaces and the relationship of interface design to effective human interaction with computers. Specifically**,** we concentrate on so-called interactive systems.
Topics include: Human Perception, Ergonomics, Cognition, and Psychology, Task Analysis, User Interface Design, Interface Programming, System Evaluation. Types of Applications Covered: Information Presentation, Graphical User Interfaces, The Web Mobile Devices, Groupware, Spoken Language Interfaces and Multi-Modal Interaction.

Text Book(s):

1. Ben Shneiderman and Catherine Plaisant, *"Designing the User Interface"*. Addison Wesley.
2. Dix A. et al. *"Human-ComputerInteraction"*, Prentice Hall.

Reference Book(s):

Yvonne Rogers, Helen sharp, Jenny Preece, *"Interaction Design: Beyond Human Computer interaction"*, Wiley.

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:	**Professional Practice - II**					
Course Code:	**PIP 102**	**Credit Structure :**	**L**	**T**	**P**	**C**
			-	**-**	**-**	**15**

Course Description: Professional Practice- II is the necessary for the subsequent problem solving experience after PP-I. Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems.

3.3 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

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

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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: Introduction 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**				
Course Code:	**CSE 311**	**L**	**T**	**P**	**C**
		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

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:	Programming in Python					
Course Code:	CSE317	Credit Structure :	L	T	P	C
			1	0	4	3

Course Description:

Python software provides the opportunity for the students of Computer Science engineering to develop scripts using its powerful programming features. This course enables the students to familiarize the Python IDLE and write simple Python code using the Python Shell. The students will also be trained on developing Python scripts using its powerful programming features like lists, sets, tuples and dictionaries.

Text Book(s):

1. Charles DierbachIntroduction to computer Science using python wiley
2. Mark Lutz, Learning Python, 5th Edition, O'Reilly
3. Al Sweigart, Invent Your Own Computer Games with Python, 4th Edition, 2016, No Starch Press.

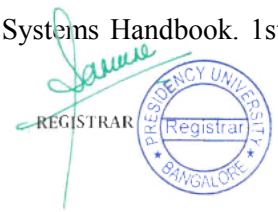
Course Name:	Information Retrieval					
Course Code:	CSE318	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description:

Basic information retrieval concepts: Boolean retrieval- Index construction and Compression; Text and vector space classification: Scoring, term weighting- The vector space model for scoring; **Recommender systems:** Collaborative recommendation- Content based recommendation-Knowledge based recommendation- Hybrid recommendation Systems; Web search and link Analysis: Search Engine Architecture- Web characteristics- The search user experience- Web crawlers and indexes- Hub and Authorities- HITS algorithm.

Text Books:

1. C. D. Manning, P. Raghavan and H. Schutze. Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Ricci, F.; Rokach, L.; Shapira, B.; Kantor, P.B. (Eds.), Recommender Systems Handbook. 1st Edition, 2011, 845 p. 20 illus., Hardcover, ISBN: 978-0-387-8581973.



Reference Books:

1. Modern Information Retrieval, Ricardo Baeza-Yates and Berthier Ribeiro-Neto, Addison-Wesley, 2000.

2. Search Engines: Information Retrieval in Practice by Bruce Croft, Donald Metzler, and Trevor Strohman, Addison-Wesley, 2009.
3. Cross -Language Information Retrieval by By Jian - Yun Nie Morgan & Claypool Publisher series 2010
4. Multimedia Information Retrieval by Stefan M. Rüger Morgan & Claypool Publisher series 2010.
5. Information Retrieval: Implementing and Evaluating Search Engines by S. Buttcher, C. Clarke and G. Cormack, MIT Press, 2010.
6. Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data by B. Liu, Springer, Second Edition, 2011.

Course Name:	**Machine Learning**					
Course Code:	**CSE319**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description:
The Course aims at to introduce students to the concepts and techniques of Machine Learning, study the various probability based learning techniques and the graphical models of machine learning algorithms. This course includes the theoretical versus practical spectrum. Concepts behind several machine learning algorithms without going deep into the mathematics, gaining practical experience by applying them. Covering Pattern recognition and artificial intelligence perspectives and to have a thorough understanding of the Supervised and Unsupervised learning techniques, building ensembles, and practical limitations of predictive models. Correlations and regressions.

Text book/Reference Book(s):

1. Ethem Alpaydin, *Introduction to Machine Learning*, Second Edition.
2. Stephen Marsland, *Machine Learning: An Algorithmic Perspective*, Springer, 2014.

Course Name:	**Graphics Programming**					
Course Code:	**CSE320**	**Credit Structure :**	**L**	**T**	**P**	**C**
			2	**0**	**2**	**3**

Course Description:

The Course is intended to teach students the basic techniques to stimulate the human visual sense by introducing the visual forms of communication between user and the computer. The course will introduce the concepts not just about creating little 3-eyed aliens, but all aspects of computer data storage, from scientific visualization, to 3D modelling, to statistical results.

Topics include: 3D Mathematics, 2D Graphics, Animation, 3D Graphics Pipeline, Data representation for graphics, Lighting and Textures, Vertex buffer objects and Pixel buffer objects, Management of graphical assets, Advanced surface descriptions including normal mapping, Ray Tracing, WebGL, Shadows and reflections

Text Book(s):

1. Computer Graphics with OpenGL, 3/E Donald D Hearn & M. Pauline Baker, Publisher: Prentice Hall.

Reference Book(s):

1. OpenGL Programming Guide, VI edition, Jackie Neider, Tom Davis, Mason Woo. Shreiner, Addison-Wesley Publishing Company
2. Interactive Computer Graphics A Top-Down Approach with OpenGL -Edward Angel, 5th Edition, Addison-Wesley, 2008.

Course Name:	**Robotic Process Automation**					
Course Code:	CSE 321	Credit Structure	L	T	P	C
			3	0	0	0

Course Description:

Robotic Process Automation (RPA) enables automating business processes using software robots. Software robots interpret, trigger responses, and communicate with other systems just like humans do. Robotic processes and intelligent automation tools can help businesses improve the effectiveness of services faster and at a lower cost than current methods. *Robotic Process Automation* (*RPA*) is an advanced technology that automates huge quantities of redundant tasks by applying artificial intelligence (AI). *RPA* can be used for *processing* transactions, manipulating data, triggering responses and communicating with other digital systems.

Topics to Include:

Introduction Robotic Process Automation, UiPath programming techniques to deploy robot configurations, data extraction techniques, Debug a programmed robot including logging and exception handling, Maintain code version and source control, Record and Play, Data Manipulation, Taking Control of the Controls, Handling User Events and Assistant Bots, Exception Handling, Debugging, and Logging, Managing and Maintaining the Code, Deploying and Maintaining the Bot.

Text Book(s):

1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing.(2018)
2. Richard Murdoch, "Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant".

Reference(s):

1. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Kindle Edition.
2. Srikanth Merianda, "Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation, Kindle Edition.

Course Name:	**Agile Technology**				
Course Code:	**CSE 322**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Description

The course will address what agile methods are, how they are implemented, and their impact on software engineering. A variety of agile methods will be described, but the focus will be on XP (Extreme Programming) and Scrum models. Issues associated with planning and controlling agile projects, along with the implications of empowered teams on the customer-supplier dynamic, will give a fuller picture of how the agile practices are realized. The course will conclude with a discussion of agile testing and some of the issues facing organizations adopting agile methods.

Topics include: Introduction to Agile technology, Big Picture of Agile Requirements, User Stories, Agile Estimating and Velocity, Understanding XP, XP Lifecycle, Adopting XP, Pair Programming, Collaborating with XP, Version Control, SCRUM Model, SPRINT, Role of Scrum Master, SCRUM Metrics, Staffing and Metrics, Test-driven development, testing tools.

Text book(s):

1. James Shore and Shane Warden, "*The Art of Agile Development*", O'Reilly Publisher, 2008.
2. Kenneth S. Rubin, "Essential SCRUM – A Practical Guide to the most popular Agile Process", Addison Wesley, 2013.

Reference Book(s):

1. Dean Leffingwell, "*Agile Software Requirements: Lean Requirements Practices for Teams, Programs, and the Enterprise*", Addison-Wesley Professional; 1st edition, 2011.
2. Craig Larman, "*Agile and Iterative Development: A Manager's Guide*", Addison Wesley, 2004.
3. Kent Beck and Cynthia Andres, "*Extreme Programming Explained: Embrace Change*", 2nd Edition, Pearson Education, 2004.

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):

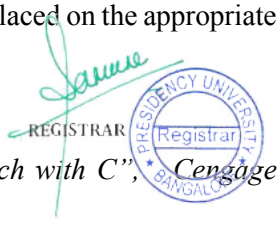
1. NPTEL Videos- https://nptel.ac.in/courses/106/106/106106107/
2. https://www.youtube.com/watch?v=2L7jnaXuOc8
3. https://www.youtube.com/watch?v=bnrD2n55dfk

3.4 COURSES FOR OPEN ELECTIVES

Course Name:	**Data Structures**					
Course Code:	**CSE402**	**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.

Course Name:	**Social Network Analytics**					
Course Code:	**CSE404**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description: The Course Social Network Analysis is to provide students with essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks. The Course presents mathematical methods and computational tools for Social Network Analysis (SNA). Students learn how to identify key individuals and groups in social systems, to detect and generate fundamental network structures, and to model growth and diffusion processes in networks.
Topics include: Introduction to social network analysis, Descriptive network analysis, Network structure, Node centralities and ranking on network, Network communities , Affiliation networks , Information and influence propagation on networks , Network visualization , Social media mining , SNA in real world.

Text Book(s):

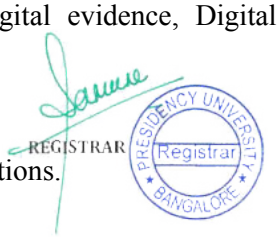
StanleyWasserman and Katherine Faust. "*Social Network Analysis.Methods and Applications*." Cambridge University Press.

Reference Book(s):

1. David Easley and John Kleinberg. "*Networks, Crowds, and Markets: Reasoning About a Highly Connected World*." Cambridge University Press.
2. Eric Kolaczyk, Gabor Csardi. "*Statistical Analysis of Network Data with R (Use R!)*".Springer.

Course Name:	**Digital and Mobile Forensics**					
Course Code:	**CSE405**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description: The use of Mobile phones and digital devices across the globe has increased dramatically. These devices are more susceptible to information security attacks and thus they also possess huge evidences which shall be used during crime scene investigation. This makes the Course on mobile and digital forensics an inevitable one for the security professionals. This Course on mobile and digital forensics will provide a better understanding on different forms of evidences in many digital devices, collection and interpretation of the same.
Topics include: Wireless technologies and security-wireless protocols, wireless threats, cell phones and GPS, SMS and data interception in GSM. Mobile phone forensics - files present in SIM card, device data, external memory dump, Android forensics. Digital forensics:- evaluating digital evidence, Digital forensics examination principles.



Text Book(s):

Gregory Kipper, "*Wireless Crime and Forensic Investigation*", Auerbach Publications.

Reference Book(s):

1.Losif I. Androulidakis, "*Mobile phone security and forensics: A practical approach*", Springer publications.
2. Andrew Hoog, "*Android Forensics: Investigation, Analysis and Mobile Security for Google Android*", Elsevier publications.
3. Angus M.Marshall, " *Digital forensics: Digital evidence in criminal investigation*", John – Wiley and Sons.

Course Name:	**Database Management Systems**					
Course Code:	**CSE406**	**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 and Sudarshan 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:	**Multimedia and Animations**					
Course Code:	**CSE 407**	**Credit Structure :**	**L**	**T**	**P**	**C**
			3	**0**	**0**	**3**

Course Description: This Course aims to equip students with the fundamental skills in traditional and digital Multimedia and Animation techniques. It emphasizes on practical applications. It will also help the students to develop creativity and conceptualizing ability, effective communication and presentation skills. Topics include: Introduction to multimedia, Design fundamentals, Image editing techniques, Graphic design techniques, Fundamentals of engineering graphics. Fundamentals of art , Concepts of storyboarding, Principles of animation, Interactive animation techniques, Programming fundamentals, 2D Animation. Digital Media Fundamentals, Modellingand Texturing, Audio Editing Techniques, Video Editing Techniques, Lighting and Rendering,3D Animation.

Text Book(s):

RalfSteinmentz , klaraNaestedt, "*Multimedia Fundamentals: Vol 1- Media Coding and Content processing"*, PHI.

Reference Book(s):

1. Prabhat K. Andleigh, kiranThakrar, "*Multimedia Systems Design"*, PHI.
2. Ze-Nian Li-Mark S Drew, *"Fundamentals of Multimedia"*, PHI.
3. Donald Hearn and M.Pauline Baker, "*Computer Graphics C Version*", Pearson Education.

Course Name:	Programming in Java					
Course Code:	CSE 408	Credit Structure :	L	T	P	C
			3	0	0	3

Course Description: This Course is designed for students who have basic programming knowledge. It introduces the object-oriented programming concept using Java.

Topics include: Introduction to JAVA, Class Fundamentals, Method Overriding, Inheritance, Packages, Exception Handling, Multithreading, Input and Output Stream Classes, Utility Packages, Applets, Swings, Database Connectivity, Servlet and JSP.

Text book(s):

1. Y. Daniel Liang "Introduction to Java Programming" 10th Edition, PEARSON

Reference book(s)

1. Herbert Schildt, "Java 2: The Complete Reference", 9th Edition, McGraw Hill Education, 2014

2. Cay S Horstmann and Gary Cornell, *"CORE JAVA volume II-Advanced Features"*. Prentice Hall.
3. Paul Deitel Harvey Deitel, "*Java How to Program"*, Pearson Education.
4. http://docs.oracle.com/javase/tutorial/

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

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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

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 enable 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.

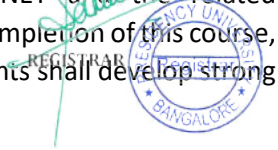
Text Book(s):

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

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

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:

3.0 Introduction to Linear Algebra - by Gilbert Strang

4.0 Applied Statistics and Probability for Engineers – by Douglas Montgomery

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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)

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:

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/

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