ACADEMIC REGULATIONS (BH23)
COURSE STRUCTURE AND DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

B.Tech. Four Year Degree Course

(Applicable for the batches admitted from AY 2023-24 onwards)

VISHNU
UNIVERSAL LEARNING

BVRIT H

BVRIT HYDERABAD College of Engineering for Women
(UGC Autonomous Institution | Approved by AICTE | Affiliated to JNTUH)
(NAAC Accredited – A Grade | NBA Accredited B.Tech. (EEE, ECE, CSE and IT))
Bachupally, Hyderabad -500 090
www.bvrithyderabad.edu.in

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BVRIT HYDERABAD College of Engineering for Women

VISION

To emerge as the best among the institutes of technology and research in the country dedicated to the cause of promoting quality technical education.

MISSION

At BVRITH, we strive to

- Achieve academic excellence through innovative learning practices.
- Enhance intellectual ability and technical competency for a successful career.
- Encourage research and innovation.
- Nurture students towards holistic development with emphasis on leadership skills, life skills and human values.

CORE VALUES

1. Holistic Development
2. Excellence in Education
3. Women Empowerment
4. Integrity
5. Social Responsibility
6. Accountability and Transparency
7. Freedom of Expression

Department of Computer Science and Engineering

VISION

Develop women as technocrats, researchers and entrepreneurs in the field of Computer Science and Engineering.

MISSION

M1: To impart quality education in Computer Science and Engineering by means of learning techniques and value-added courses.

M2: To inculcate professional excellence and research culture by encouraging projects in cutting-edge technologies through industry interactions.

M3: To build leadership skills, ethical values and teamwork among the students.

M4: To strengthen the collaboration of department and industry through internships, mentorships and professional body activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

After 3 to 6 years of graduation, the graduates of will be able to:

PEO-1: Develop innovative computing products by utilizing strong technical proficiency and critical thinking.

PEO-2: Productively engage in research by practicing basic principles grounded in allied areas of Computer Science and Engineering.

PEO-3: Adapt the emerging technologies to contribute technical innovations for progressive development.

PEO-4: Demonstrate professionalism, ethical attitude, teamwork and leadership skills with lifelong learning in the career.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The graduates of this program will be able to:

PSO-1: Ability to apply learned skills to build optimized solutions pertaining to Computer & Communication Systems, Data Processing and Artificial Intelligence.

PSO-2: Employ standard strategies and practices in project development using FOSS (Free Open Source Software).

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to

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

2. **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.

3. **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.

4. **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.

5. **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.

6. **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.

7. **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.

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

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

10. **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.

11. **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.

12. **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.

Academic Regulations (BH23) for B.Tech. Regular Students with effect from Academic Year 2023-24

The B.Tech. degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates, admitted to the programme and fulfill all the requirements for the award of the Degree.

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

BVRIT HYDERABAD College of Engineering for Women (Autonomous) – BVRITHCEW (A) offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under **Choice Based Credit System** (CBCS) with effect from the Academic Year 2023-24 onwards, in the following branches of Engineering.

S. No.	Branch Code	Branch Name
1	02	Electrical and Electronics Engineering (EEE)
2	04	Electronics and Communication Engineering (ECE)
3	05	Computer Science and Engineering (CSE)
4	12	Information Technology (IT)
5	66	Computer Science and Engineering (AI & ML)

2.0 Eligibility for admission

2.1 Admission to the undergraduate (UG) Programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (TGEAPCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2 The medium of instructions for the entire undergraduate programme in Engineering & Technology will be English only.

3.0 B.Tech. Programme structure

3.1 A student after securing admission shall complete the B.Tech. Programme in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech. course. Each student shall secure 160 credits (with CGPA $\geq$ 5) required for the completion of the undergraduate programme and award of the B.Tech. degree.

3.2 UGC / AICTE specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations / norms, which are listed below.

3.2.1 Semester scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each, each semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under **Choice Based Credit System** (CBCS) and **Credit Based Semester System** (CBSS) indicated by UGC, and curriculum / course structure as suggested by AICTE are followed.

3.2.2 Credit courses

All subjects / courses are to be registered by the students in a semester to earn credits which shall be assigned to each subject / course in an L : T : P : C (Lecture periods : Tutorial periods : Practical periods : Credits) structure based on the following general pattern.

- One credit for one hour / week / semester for theory / lecture (L) courses or tutorials.
- One credit for two hours / week / semester for laboratory/ practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject / Course Classification

All subjects / courses offered for the undergraduate programme in E & T (B.Tech. degree programmes) are broadly classified as follows. The BVRITHCEW (A) has followed almost all the guidelines issued by AICTE / UGC.

S. No.	Broad Course Classification	Course Group /Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry Courses
2		ES – Engineering Sciences	Includes Fundamental Engineering Courses
3		HS – Humanities and Social sciences	Includes Courses related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PC – Professional Core	Includes core courses related to the parent discipline / department / branch of Engineering.
5	Elective Courses (EℓC)	PE – Professional Electives	Includes elective courses related to the parent discipline / department / branch of Engineering.
6		OE – Open Electives	Elective offered by all the disciplines / departments / branches of Engineering.

7	Core Courses	Project Work	B.Tech. project or UG project or UG major Project or Project Stage I & II
8		Industry Training / Internship / Industry Oriented Mini-project / Mini- Project / Skill Development Courses	Industry Training / Internship / Industry Oriented Mini-Project / Mini-Project / Skill Development Courses
9		Real-time Research Project/ Field Based Project	Real-time Research Project / Field Based Project
10		Seminar	Seminar / Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
11	Minor courses	-	1 or 2 Credit Courses (subset of HS)
12	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0 Course registration

4.1 The academic section of the college invites **'registration forms'** from students before the beginning of the semester through **'online registration'**, ensuring **'date and time stamping'.** The online registration requests for any **'current semester'** shall be completed before the commencement of SEEs (Semester End Examinations) of the **'preceding semester'**.

4.2 A student can apply for on-line registration by consulting Faculty Advisor / Counselor / Head of the Department (HoD).

4.3 A student may be permitted to register for all the subjects / courses in a semester as specified in the course structure with maximum additional subject (s) / course (s) limited to 6 Credits (any 2 elective subjects), based on progress and SGPA / CGPA, and completion of the '**prerequisites'** as indicated for various subjects / courses, in the department course structure and syllabus contents.

4.4 Choice for '**additional subjects / courses'**, not more than any 2 elective subjects in any semester, must be clearly indicated.

4.5 If the student submits ambiguous choices or multiple options or erroneous entries during online registration for the subject (s) / course (s) under a given / specified course group / category as listed in the course structure, only the first mentioned subject / course in that category will be taken into consideration.

4.6 Subject / course options exercised through online registration are final and cannot be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject / course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within a week after the commencement of class-work for that semester.

4.7 Dropping of subjects / courses may be permitted, only after obtaining prior approval from the faculty counselor and HoD **'within a period of 15 days'** from the beginning of the current semester.

4.8 **Open Electives:** The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by her own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses, etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat / should not match with any category (Professional Core, Professional Electives, Mandatory Courses, etc.) of subjects even in the forthcoming semesters.

4.9 **Professional Electives:** The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0 Subjects / courses to be offered

5.1 An Elective Course may be offered to the students, only if a minimum of 30 students opt for it. The maximum strength of a section is limited to 75.

5.2 In case of options coming from students of other departments / branches / disciplines (not considering **open electives**), first priority shall be given to the student of the '**parent department'**.

6.0 Attendance requirements

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab) for that semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. **This attendance should also be included in the fortnightly upload of attendance to the Academic Section.**

6.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the Academic Council on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable for condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in no case be condoned.

6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled, including all academic credentials (internal marks, etc.) of that semester. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester, in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and / or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.**6.**

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject / course, if the student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that subject / course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-Time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if she (i) does not submit a report on Industry Oriented Mini Project / Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-Time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such **'one re-appearance'** evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	**First year first semester to first year second semester**	**Regular course of study of first year first semester.**
2	**First year second semester to second year first semester**	**(i) Regular course of study of first year second semester.** **(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
3	**Second year first semester to second year second semester**	**Regular course of study of second year first semester.**
4	**Second year second semester to third year first semester**	**(i) Regular course of study of second year second semester.** **(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
5	**Third year first semester to third year second semester**	**Regular course of study of third year first semester.**
6	**Third year second semester to fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
7	**Fourth year first semester to fourth year second semester**	**Regular course of study of fourth year first semester.**

7.4 A student (i) shall register for all courses / subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$ 5.0 (in each semester), and CGPA $\geq$ 5.0 (at the end of 8 semesters), (iv) **passes all the mandatory courses**, to successfully complete the undergraduate programme. The

performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme)**, and shall be indicated in the grade card / marks memo of IV-year II semester.

7.5 If a student registers for '**extra subjects'** (in the parent department or other departments / branches of Engineering.) other than those listed subjects totalling to 160 credits as specified in the course structure of her department, the performance in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be taken into account while calculating the SGPA and CGPA. For such '**extra subjects'** registered, percentage of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1-7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure 'C' grade or above) may reappear for that subject / course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject / course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance may be re- admitted in the same semester in the next academic year for fulfilment of academic requirements.** The academic regulations under which a student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which the student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.** The academic regulations under which the student has been readmitted shall be applicable to her.

8.0 Evaluation-Distribution and Weightage of marks

8.1 The performance of a student in every subject / course (including practicals and Project Stage - I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End- Examination).

8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) Part – A for 10 marks, ii) Part – B for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:
   a. Part-A: Objective / quiz paper for 10 marks.
   b. Part-B: Descriptive paper for 20 marks.

The objective / quiz paper is set with multiple choices, fill - in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall

contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as

2. Assignment for 5 marks. (**Average of 2 Assignments** each for 5 marks)
3. Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), her performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

There is NO Computer Based Test (CBT) for BH23 regulations.

The details of the end semester question paper pattern are as follows:

8.2.1 The Semester End Examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) **Part-A** for 10 marks, ii) **Part-B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

The duration of Semester End Examination is 3 hours.

8.2.2 For the subject, **Computer Aided Engineering Graphics**, the Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE) evaluation pattern is same as for other theory subjects.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components / procedure, expected outcome) which shall be evaluated for 10 marks
2. 10 marks for viva-voce **(**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Report / Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed by the Controller of Examinations / Chief Superintendent on the recommendation of BoS chairman of the concerned department.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment / program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment / program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal

marks), her performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:

1. I Year I Semester course (*ex.*, ***Elements of EEE / ECE / CSE*** *etc*): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e. 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

   For CSE / IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts **i) Part – A** for 20 marks, ii) **Part–B** for 20 marks with a total duration of 2 hours.

   Part A: Objective / quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks. **Part B:** Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

   The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce / PPT / Poster Presentation / Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

   For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

   a) A write-up on day-to-day experiment in the laboratory (in terms of aim, components/ procedure, expected outcome) which shall be evaluated for 10 marks
   b) **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
   c) Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for15 marks.
   d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software/Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if she (i) does not submit

a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (iii) secures less than 40% marks in this course.

8.5 There shall be Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation / semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini- Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

8.6 The UG project shall be initiated in the IV Year I Semester and the duration of the project work is one year. The student must present Project Stage - I during IV Year I Semester before II Mid examinations, in consultation with her Supervisor, the title, objective and plan of action of her Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start her project work.

8.7 UG project work shall be carried out in two stages: Project Stage - I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage - II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.8 For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

A student who has failed may reappear for the above evaluation, when it is scheduled again; if she fails in such **'one reappearance'** evaluation also, she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.9 For Project Stage –II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40

internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini Project / Internship / SDC etc. and the main Project shall be different from the topic already taken. The student is deemed to have failed, if she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project, Controller of Examinations / Chief Superintendent select an external examiner from the list of experts in the relevant branch submitted by the BoS Chairman of the concerned department.

A student, who has failed, may reappear once for the above evaluation, when it is scheduled again; if the student fails in such **'one reappearance'** evaluation also, she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.10 A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva-voce / PPT / Poster presentation / Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

A student must re-register for the failed subject (s) for 40 marks within four weeks of commencement of the class work in next academic year.
In the event of the student taking this chance, her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

8.11 For mandatory courses of Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab, a student has to secure 40 marks out of 100 marks (i.e. 40% of the 100 marks allotted) in the Continuous Internal Evaluation for passing the subject / course. These marks should also be uploaded along with the internal marks of other subjects.

8.12 No marks or letter grades shall be allotted for mandatory / non-credit courses. Only Pass / Fail shall be indicated in Grade Card.

9.0 Grading procedure

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory / Practical's, Seminar, Industry Oriented Mini Project, and Project Stage-I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item

8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	**O (Outstanding)**	**10**
80 and less than 90%	**A^+ (Excellent)**	**9**
70 and less than 80%	**A (Very Good)**	**8**
60 and less than 70%	**B^+ (Good)**	**7**
50 and less than 60%	**B (Average)**	**6**
40 and less than 50%	**C (Pass)**	**5**
Below 40%	**F (FAIL)**	**0**
Absent	**Ab**	**0**

9.3 A student who has obtained an '**F'** grade in any subject shall be deemed to have '**failed'** and is required to reappear as a **'supplementary student'** in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 To a student who has not appeared for an examination in any subject, '**Ab'** grade will be allocated in that subject, and she is deemed to have '**failed'**. A student will be required to reappear as a **'supplementary student'** in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns grade point (GP) in each subject / course, on the basis of the letter grade secured in that subject/ course. The corresponding **'credit points'** (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit Points (CP) = Grade Point (GP) x Credits….for a course

9.7 A student passes the subject / course only when **GP ≥ 5 ('C' grade or above)**

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (∑CP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

SGPA = { $\sum_{i=1}^{N} C_i G_i$} / { $\sum_{i=1}^{N} C_i$} …. for each semester

where 'i' is the subject indicator index (takes into account all subjects in a semester), 'N' is the no. of subjects '**registered'** for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

CGPA = { $\sum_{j=1}^{M} C_j G_j$} / { $\sum_{j=1}^{M} C_j$} … for all S semesters registered

(i.e., up to and inclusive of S semesters, S≥2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1^{st} semester onwards up to and inclusive of the 8^{th} semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course / Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8=32
Course 2	4	O	10	4 x 10=40
Course 3	4	C	5	4 x 5=20
Course 4	3	B	6	3 x 6=18
Course 5	3	A+	9	3 x 9=27
Course 6	3	C	5	3 x 5=15
	21			152

SGPA = 152 / 21 = 7.24

Illustration of calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course1	3	A	8	24
I	Course2	3	O	10	30
I	Course3	3	B	6	18
I	Course4	4	A	8	32
I	Course5	3	A+	9	27
I	Course6	4	C	5	20
II	Course7	4	B	6	24
II	Course8	4	A	8	32
II	Course9	3	C	5	15
II	Course10	3	O	10	30
II	Course11	3	B+	7	21
II	Course12	4	B	6	24
II	Course13	4	A	8	32
II	Course14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	**69**		**Total Credit Points**	**518**

CGPA = 518 / 69 = 7.51

The above illustrated calculation process of CGPA will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. Programme.

9.10 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off'** values of the CGPAs will be used.

9.11 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting she passed her last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing standards

10.1 A student shall be declared successful or 'passed' in a semester, if she secures a GP ≥ 5.0 (**'C'** grade or above) in every subject / course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and she shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.0 (**'C'** grade or above) for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.), credits earned. **There is No exemption of credits in any case**.

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of degree

12.1 A student who registers for all the specified subjects / courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of B.Tech. degree in the chosen branch of Engineering selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 8.00, and fulfilling the following conditions-shall be placed in '**first class with distinction'**.

However, she

(i) Should have passed all the subjects / courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA ≥ 8.00 shall be placed in **'First Class'.**

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.00 but < 8.00 shall be placed in **'First Class'.**

12.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6.00, shall be placed in '**Pass Class**'.

12.7 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9 Award of 2-Year B.Tech. Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) up to B.Tech. II Year II Semester, if the student wants to exit the 4-Year B.Tech. Programme and *requests for the 2 –Year* B.Tech. (*UG) Diploma Certificate.*

2. The student **once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join** in B.Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B.Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, she should register for the subjects / courses in III Year I Semester before commencement of class work for that semester.*

3. *The students, who exit the 4-Year B.Tech. Programme after II Year of study and wish to re-join the B.Tech. Programme, must submit the 2 - Year* B.Tech. (*UG) Diploma Certificate awarded to her, subject to the eligibility for completion of Course / Degree.*

4. A student may be permitted to take one year break after completion of II Year II Semester or B.Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year Programme).

13.0 Withholding of results

13.1 If the student has not paid the fees to the college at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0 Transitory Regulations

A. For students detained due to shortage of attendance:

1. A student, who has been detained in I Year of R18/R22 Regulations due to lack of attendance, shall be permitted to join I Year I Semester of BH23 Regulations and

she is required to complete the study of B.Tech. Programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student, who has been detained in any semester of II, III and IV years of R18/R22 regulations for want of attendance, shall be permitted to join the corresponding semester of BH23 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The BH23 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of R18/R22 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of BH23 Regulations only after acquiring the required number of credits as per the corresponding regulations of her first admission. The total credits required are 160 including both R18/R22 & BH23 regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The BH23 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in BH23 Regulations:

1. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
2. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of her study including BH23 Regulations. **There is NO exemption of credits in any case**.
3. If a student is readmitted to BH23 Regulations and has any subject with 80% of syllabus common with her previous regulations, that particular subject in BH23 Regulations will be substituted by another subject to be recommended by the Academic Council (AC), and approved by Governing Body (GB).

Note: If a student readmitted to BH23 Regulations and has not studied any subjects / topics in her earlier regulations of study which is prerequisite for further subjects in BH23 Regulations, the concerned department HoD shall conduct remedial classes to cover those subjects / topics for the benefit of the students.

15.0 Student Transfers

15.1 There shall be no branch transfers after the completion of admission process.

15.2 The students seeking transfer to BVRITHCEW(A) from various other Universities / Institutions have to pass the failed subjects which are equivalent to the subjects of BVRITHCEW(A), and also pass the subjects of BVRITHCEW(A) which the students have not studied at the earlier institution. Further, though the students have

passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of BVRITHCEW(A), the students have to study those subjects in BVRITHCEW(A) in spite of the fact that those subjects are repeated.

15.3 The BVRITHCEW (A) will provide one chance to write the internal examinations in the equivalent subject (s) to the students transferred from other universities / institutions, as per the clearance (equivalence) letter issued by the University.

16.0 Scope

16.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the AC is final.

16.3 The AC may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the AC.

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Academic Regulations (BH23) for B.Tech. (Lateral Entry Scheme) from the AY 2024-25

1. **Eligibility for award of B.Tech. Degree (LES)**

   The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5.0 from II year to IV year B.Tech. Programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B.Tech. (Regular) shall be applicable to B.Tech. (LES).

5. **Promotion rules**

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

6. All the other regulations as applicable to B.Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

7. LES students are not eligible for 2-Year B.Tech. Diploma Certificate.

Malpractices Rules

Disciplinary Action for Malpractices / Improper Conduct in Examinations

	Nature of Malpractices / Improper conduct	Punishment
	If the student:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, she will be handed over to the police and a case is registered against her.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and allot her subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the student is to be cancelled.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester / year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, she will be handed over to the police and a case is registered against her.

4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting her to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the chief superintendent/assistant -superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walkout, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to her person or to any of her relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of her relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.

8.	Possesses any lethal weapon or fire arm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester / year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester / year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared for including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Chief Superintendent for further action to award a suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.

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Academic Regulations for B.Tech. with Minor program

1. Introduction

The philosophy behind Engineering as an academic discipline has been to orient the knowledge seekers in a manner that shatters the theoretical boundaries and pushes them into the realms of a practical world view.

The emphasis of BVRITHCEW has always been to orient the students towards the technologies that shall drive the world in the years to come; with this philosophy the Institution has decided to launch the **Bachelor of Technology in a particular branch with minor in a specified program** (Ex. B.Tech. in ECE / EEE with Minor in AI&ML) from the AY 2025-26 onwards.

The **Bachelor of Technology (B.Tech.) with Minor** program focuses on the fundamental principles of multiple Engineering disciplines, critical & analytical thinking and the ability to develop a distinctive approach to the interdisciplinary problems.

2. Objectives

The key objectives of offering B.Tech. with Minor program are:

- To expand the domain knowledge of the students in one of the other branches of engineering.
- To increase the employability of undergraduate students keeping in view of better opportunity in inter-disciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own branch of study.
- To offer the knowledge in the areas which are identified as emerging technologies / thrust areas of Engineering.

3. Minor courses and the offering departments

S. No.	Minor Program	Eligible branch of students	@Offering Department	Award of Degree
1.	Data Science	All branches, except B.Tech. in CSE (Data Science) / B.Tech. (Data Science)	CSE	"B.Tech.in branch name with Minor in Data Science"
2.	IOT	All branches, except B.Tech. in CSE (IOT) / B.Tech. (IOT)	ECE	"B.Tech. in branch name with Minor in IOT"
3.	Innovation and Entrepreneurship	All branches	Management Science / MBA	"B.Tech. in branch name with Minor in Innovation and Entrepreneurship"

Note: @As per AICTE guidelines.

4. Academic Regulations for B.Tech. Degree with Minor programs

1. The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B.Tech. program.
2. For B.Tech. with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B.Tech degree). All these 18 credits need to be completed in III year and IV year only.
3. After registering for the Minor program, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech., she will be awarded only B. Tech degree in the concerned branch.
4. There is no transfer of credits from Minor program courses to regular B.Tech. degree course & vice versa.
5. These 18 credits are to be earned from the additional courses offered by the host department in the college as well as from the MOOCs platform.
6. For the course selected under MOOCs platform following guidelines may be followed:
    a) Prior to registration of MOOCs courses, formal approval of the courses, by the Academic Council is essential. Academic Council considers the parameters viz., the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation, etc. before the issue of approval.
    b) Minimum credits for MOOCs course must be equal to or more than the credits specified in the Minor course structure provided by the University.
    c) Only Pass-grade / marks or above shall be considered for inclusion of grades in minor grade memo.
    d) Any expenses incurred for the MOOCs courses are to be met by the students only.
7. The choice to opt/ take a Minor program is purely on the choice of the students.
8. The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor program at any time; and in that case the student will be awarded only B.Tech. degree in the concerned branch on earning the required credits of 160.
9. The student can choose only one Minor program along with her basic engineering degree. **A student, who chooses an Honors program, is not eligible to choose a Minor program and vice-versa.**
10. The B.Tech. with a Minor program shall be offered from the AY 2025-26 onwards. The students, pursuing their III year I semester from the AY 2025-26 onwards can register for the Minor program if they fulfil the eligibility criteria.

11. A student can graduate with a Minor if she fulfils the requirements for her regular B.Tech. program as well as fulfils the requirements for Minor program.
12. The institute shall maintain a record of students registered and pursuing their Minor programs, minor program-wise and parent branch-wise.
13. The concerned department shall prepare the time-tables for each Minor course offered at without any overlap / clash with other courses of study in the respective semesters.

5. Eligibility conditions for the student to register for Minor course

a) A student can opt for B.Tech. degree with Minor program if she has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.

b) Prior approval of mentor and Head of the Department for the enrolment into Minor program, before commencement of III year I Semester (V Semester), is mandatory

c) If more than 50% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

6. Registration for the courses in Minor Program

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in semester.

b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied / registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum no. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is **Rs. 1000/-** per one credit.

e) A fee for late registration may be imposed as per the norms.

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Academic Regulations (BH23) for B.Tech. with Honors program

1. Objectives

The key objectives of offering B.Tech. with Honors program are:

- To expand the domain knowledge of the students laterally and vertically.
- To increase the employability of undergraduate students with expanded knowledge in one of the core Engineering disciplines.
- To provide an opportunity for the students to pursue their higher studies in wider range of specializations.

2. Academic Regulations for B.Tech. Honors degree

1) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B.Tech. program.
2) For B.Tech with Honors program, a student needs to earn additional 20 credits (over and above the required 160 credits for B.Tech. degree). All these 20 credits need to be completed in III year and IV year only.
3) After registering for the Honors program, if a student is unable to pass all courses in first attempt and earn the required 20 credits, she shall not be awarded Honors degree. However, if the student earns all the required 160 credits of B.Tech., she will be awarded only B.Tech. degree in the concerned branch.
4) There is no transfer of credits from courses of Honors program to regular B.Tech. degree course & vice versa.
5) These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related department in the college as well as from the MOOCs platform.
6) **For the courses selected under MOOCs platform following guidelines may be followed:**
    a) Prior to registration of MOOCS courses, formal approval of the courses, by the Academic Council is essential. The Academic Council considers the parameters viz., the institute / agency, offering the course, syllabus, credits, duration of the programme and mode of evaluation, etc., before the issue of approval
    b) Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Honors course structure provided by the Institution.
    c) Only Pass-grade / marks or above shall be considered for inclusion of grades in the Honors grade memo.
    d) Any expenses incurred for the MOOCS courses are to be met by the students only.

7) The choice to opt / take the Honors program is purely on the choice of the students.

8) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Honors program at any time; and in that case the student will be awarded only B.Tech. degree in the concerned branch on earning the required credits of 160.

9) The students of every branch can choose Honors program in their respective branches if they are eligible for the Honors program. A student who chooses an Honors program is not eligible to choose a Minor program and vice-versa.

10) The B.Tech. with Honors program shall be offered from the AY 2025-26 onwards. The students, pursuing their III year I semester from the AY 2025-26 onwards can register for the Honors program if they fulfil the eligibility criteria.

11) A student can graduate with Honors if she fulfils the requirements for her regular B.Tech. program as well as fulfils the requirements for Honors program.

12) The Institution shall maintain a record of students registered and pursuing their Honors programs branch-wise.

13) The department shall prepare the time-tables for each Honors program offered at their respective departments without any overlap / clash with other courses of study in the respective semesters.

3. Eligibility conditions of the students for the Honors degree

a) A student can opt for B.Tech. degree with Honors, if she passed all subjects in first attempt in all the semesters till the results announced and maintaining 7.5 or more CGPA.

b) If a student fails in any registered course of either B.Tech. or Honors in any semester of four years program, she will not be eligible for obtaining Honors degree. She will be eligible for only B.Tech. degree

c) Prior approval of mentor and Head of the Department for the enrolment into Honors program, before commencement of III year I Semester (V Semester), is mandatory.

d) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the CGPA secured by the students till II year I semester.

e) **The department concerned should be preferably NBA accredited and shall offer at least one M.Tech. Program.**

f) Successful completion of 20 credits earmarked for Honors program with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B.Tech. Program with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Honors) degree.

g) For CGPA calculation of B.Tech. course, the 20 credits of Honors program will not be considered.

4. Registration for the course in Honors program

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Honors course structure) other than the courses they have studied / registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum no. of courses for the Honors is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is **Rs. 1000/-** per one credit.

e) A fee for late registration may be imposed as per the norms.

5. The broad guidelines for the courses of Honors program, their respective credits weightage and semester-wise break-up of the course are:

S. No.	Year /Semester	Course to be chosen from/studied	Mode of Learning	No. of Credits
1	III-I	PE-I or PE-II	Blended/Conventional	3
2	III-II	Research Methodologies	Conventional	3
3	III-II	PE-III	Conventional	3
4	IV-I	PE-IV	Conventional	3
5	IV-I	PE-V	Conventional	3
6	IV-II	Technical Paper writing	Under the mentorship of a supervisor	2
7	IV-II	PE-VI or an Inter-disciplinary subject as suggested by the Academic Council	MOOCs	3
	Total Credits			20

Note:

i. Professional Elective (PE) course should be selected (which is not studied) from each Professional Electives' list provided in regular B.Tech. course.

ii. Courses can be chosen as in above table.

1. **Technical paper writing:**

   a) The student shall take up a problem / topic of engineering branches (inter-disciplinary nature) and apply the knowledge which they acquired while pursuing their engineering branch. It is expected to analyze, design and develop an application for the identified problem and write a technical paper / document.

   Alternatively, the student i) shall identify a research topic, analyze the problem, carryout the experiments, write a technical paper and publish in / communicate for a Scopus indexed journal / any journal with decent reputation or ii) Demonstrate a talent / an idea / development of an innovative product.

   b) The evaluation shall be done by the same committee which is constituted for project evaluation, along with the final semester project work.

   c) The students should start exploration for the Technical Paper Writing immediately after the semester exams of III-II semester. Only the evaluation part shall be carried in IV-II semester.

2. The institute shall offer a course on Research Methodologies by combining the students of all branches (if the number of students is more, multiple parallel sessions may be conducted). The time slots in the time-tables of respective branches should be aligned. Both the CIE and SEE for the Research Methodologies course shall be done as regular B.Tech. courses.

3. If the blended course option is chosen, for the subject in III-I semester, the learning should be partially in online mode and partially in offline mode. The external evaluation shall be done as regular B.Tech. courses; however, for the CIE component, online assessment should also be taken into account while finalizing the internal marks by the course teacher.

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Academic Regulations for B.Tech. - MOOCs

1. Introduction

As per NEP, to inculcate the habit of self-learning and in compliance with the UGC guidelines, MOOC (Massive Open Online Courses) have been introduced.

The proposed MOOCs would be additional choices, proposed by concern department BoS (having credits >= the required credits) and approved by the Academic Council, in all the elective group courses subjected to the availability in the MOOC platforms during the respective semesters.

After the approval, at the beginning of the semester, the concerned departments shall declare the list of permitted courses to the student.

The progress of the MOOCs shall be monitored by the course coordinator of the department, nominated by the concerned HoD.

2. Eligibility

A student is eligible to register for OE / PE in Third Year First semester by having a CGPA of ≥ 6.5 without any active backlogs up to II Year I Semester. Similarly, the eligibility to register for OE / PE, in the Third Year Second semester by having a CGPA of ≥ 6.5 without any active backlogs up to II Year II Semester and to register for OE / PE, in the Fourth Year First semester by having a CGPA of ≥ 6.5 without any active backlogs up to III Year I Semester.

3. Course Registration

Students interested in pursuing MOOCs shall register the course title at their department office before the start of the semester.

A student can register at most two MOOCs throughout the course of study after approval from Faculty Advisor / Counselor / HoD.

Detailed guidelines regarding credit transfer of the courses pursued through MOOC (NPTEL-SWAYAM) shall be issued time to time by the Institution.

Academic Regulations for B.Tech. - Acceleration of Course Work

1. Introduction

In order to allow the bright and motivated students, a provision is made to complete the final semester three elective subjects in advance. These subjects are offered through MOOCs / additional subjects and credit transfer is permitted.

These credits are shown in the Final Semester Grade card in order to calculate SGPA and CGPA. This provision is made to allow the students for industry internship or to undertake projects in industry in the final semester.

2. Eligibility

A student is eligible to register for OE / PE in Third Year First semester by having a CGPA of ≥ 6.5 without any active backlogs up to II Year I Semester. Similarly, the eligibility to register for OE / PE, in the Third Year Second semester by having a CGPA of ≥ 6.5 without any active backlogs up to II Year II Semester and to register for OE / PE, in the Fourth Year First semester by having a CGPA of $\geq$ 6.5 without any active backlogs up to III Year I Semester.

3. Course Registration

A student can register at most two additional PE / OE in a semester after approval from Faculty Advisor / Counselor / HoD.

These additional courses have to be completed either through regular class work / MOOCs as per the directions of College Academic Committee.

The list of electives offered will be notified by the departments at the time of course work registration.

COURSE STRUCTURE (BH23 Regulations)
Applicable from AY 2023-24 Batch

I Year I Semester

S.No.	Code	Title	L	T	P	Credits
1	MA101BS	Matrices and Calculus	3	1	0	4
2	CH102BS	Engineering Chemistry	3	1	0	4
3	CS103ES	Programming for Problem Solving	3	0	0	3
4	EC104ES	Electronic Devices and Circuits	2	0	0	2
5	ME105ES	Computer Aided Engineering Graphics	1	0	4	3
6	CS106ES	Elements of Computer Science and Engineering	0	0	2	1
7	CH107BS	Engineering Chemistry Laboratory	0	0	2	1
8	CS108ES	Programming for Problem Solving Laboratory	0	0	2	1
9	CS109ES	IT Workshop	0	0	2	1
		Induction Program	0	0	0	0
		Total	12	2	12	20

I Year II Semester

S.No.	Code	Title	L	T	P	Credits
1	MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	PH202BS	Applied Physics	3	1	0	4
3	EE203ES	Basic Electrical Engineering	2	0	0	2
4	ME204ES	Engineering Workshop	0	1	3	2.5
5	EN205HS	English for Skill Enhancement	2	0	0	2
6	CS206ES	Python Programming Laboratory	0	1	2	2
7	PH207BS	Applied Physics Laboratory	0	0	3	1.5
8	EN208HS	English Language and Communication Skills Lab	0	0	2	1
9	EE209ES	Basic Electrical Engineering Laboratory	0	0	2	1
		Total	10	4	12	20

II Year I Semester

S.No.	Code	Title	L	T	P	Credits
1	IT301PC	Digital Electronics	3	0	0	3
2	CS302PC	Data Structures	3	0	0	3
3	CS303PC	Discrete Mathematics	3	0	0	3
4	CS304PC	Database Management Systems	3	0	0	3
5	CS305PC	Object Oriented Programming through Java	3	0	0	3
6	CS306PC	Data Structures Lab	0	0	3	1.5
7	CS307PC	Object Oriented Programming through Java Lab	0	0	3	1.5
8	CS308PC	Database Management Systems Lab	0	0	2	1
9	CS309PC	Data visualization-R Programming/Power BI	0	0	2	1
10	*MC310	Gender Sensitization Lab	0	0	2	0
		Total	15	0	12	20

II Year II Semester

S.No.	Code	Title	L	T	P	Credits
1	CS401PC	Software Engineering	3	0	0	3
2	MA402BS	Computer Oriented Statistical Methods	3	1	0	4
3	CS403PC	Operating Systems	3	0	0	3
4	SM404MS	Business Economics & Financial Analysis	3	0	0	3
5	CS405PC	Computer Organization and Architecture	3	0	0	3
6	CS406PC	Operating Systems Lab	0	0	2	1
7	CS407PC	Node JS/ ReactJS/ Django	0	0	2	1
8	CS408PC	Real-time Research Project / Societal Related Project	0	0	4	2
9	*MC409	Environmental Science	3	0	0	0
		Total	18	1	8	20

III Year I Semester

S.No.	Code	Title	L	T	P	Credits
1	CS501PC	Design and Analysis of Algorithms	3	1	0	4
2	CS502PC	Computer Networks	3	0	0	3
3	CS503PC	DevOps	3	0	0	3
4		Professional Elective-I	3	0	0	3
5		Professional Elective-II	3	0	0	3
6	CS504PC	DevOps Lab	0	0	2	1
7	EN505HS	Advanced English Communication Skills Lab	0	0	2	1
8	CS506PC	UI design-Flutter	0	0	2	1
9	CS507PC	Computer Networks Lab	0	0	2	1
10	*MC509	Constitution of India	3	0	0	0
		Total	18	1	8	20

III Year II Semester

S.No.	Code	Title	L	T	P	Credits
1	CS601PC	Machine Learning	3	0	0	3
2	CS602PC	Formal Languages and Automata Theory	3	0	0	3
3	CS603PC	Artificial Intelligence	3	0	0	3
4		Professional Elective–III	3	0	0	3
5		Open Elective - I	3	0	0	3
6	CS604PC	Machine Learning Lab	0	0	2	1
7	CS605PC	Artificial Intelligence Laboratory	0	0	2	1
8		Professional Elective – III Lab	0	0	2	1
9	CS606PC	Industrial Oriented Mini Project/ Internship/ Skill Development Course (Big data-Spark)	0	0	4	2
10	*MC607	Intellectual Property Rights	3	0	0	0
		Total	18	0	10	20

IV Year I Semester

S.No.	Code	Title	L	T	P	Credits
1	CS701PC	Cryptography and Network Security	3	0	0	3
2	CS702PC	Compiler Design	3	0	0	3
3	SM703MS	Organizational Behavior	3	0	0	3
4		Professional Elective-IV	3	0	0	3
5		Open Elective-II	3	0	0	3
6	CS704PC	Cryptography and Network Security Lab	0	0	2	1
7	CS705PC	Compiler Design Lab	0	0	2	1
8	CS706PC	Project Stage-I	0	0	6	3
		Total	15	0	10	20

IV Year II Semester

S.No.	Code	Title	L	T	P	Credits
1		Professional Elective-V	3	0	0	3
2		Professional Elective–VI	3	0	0	3
3		Open Elective–III	3	0	0	3
4	CS801PC	Project Stage–II including Seminar	0	0	22	11
		Total	9	0	22	20

Professional Electives

Professional Elective-I	**CS511PE**	Graph Theory
	CS512PE	Distributed Databases
	CS513PE	Data Mining
	CS514PE	Optimization Techniques
Professional Elective-II	**CS521PE**	Computer Graphics
	CS522PE	Information Retrieval Systems
	CS523PE	Data Analytics
	CS524PE	High Performance Computing
Professional Elective-III	**CS611PE**	Full Stack Development
	CS612PE	Scripting Languages
	CS613PE	Internet of Things
	CS614PE	Software Testing Methodologies
Professional Elective-III Lab	**CS621PE**	Full Stack Development Lab
	CS622PE	Scripting Languages Lab
	CS623PE	Internet of Things Lab
	CS624PE	Software Testing Methodologies Lab
Professional Elective-IV	**CS711PE**	Quantum Computing
	CS712PE	Advanced Operating Systems
	CS713PE	Cloud Computing
	CS714PE	Advanced Algorithms
Professional Elective-V	**CS811PE**	Mobile Application Development
	CS812PE	Agile Methodology
	CS813PE	Natural Language Processing
	CS814PE	Software Process & Project Management
Professional Elective-VI	**CS821PE**	Distributed Systems
	CS822PE	Deep Learning
	CS823PE	Block Chain Technologies
	CS824PE	Cyber Security and Forensics

Open Electives

Open Electives	Department Offering	Course Code	Course Name
OE-I	EEE	EE600OE	Renewable Energy Sources
		EE601OE	Green Energy Technologies
		EE602OE	Fundamentals of Electric Vehicles
	ECE	EC600OE	Microcontrollers
		EC601OE	Fundamentals of IoT
		EC602OE	VLSI Design
	CSE/ CSE (AIML) /IT	CS600OE	Problem Solving using Data Structure
		CS601OE	Introduction to Java Programming
		CS602OE	Fundamentals of AI
OE-II	EEE	EE700OE	Utilization of Electrical Energy
		EE701OE	Electric Drives and Control
		EE702OE	Principles of Power Systems
	ECE	EC700OE	Electronic Sensors
		EC701OE	Digital Image Processing
		EC702OE	Principles of Communications
	CSE/ CSE (AIML) /IT	CS700OE	Scripting Languages
		CS701OE	Database Management Systems
		CS702OE	Machine Learning
OE-III	EEE	EE800OE	Basics of Power Plant Engineering
		EE801OE	Energy Sources and Applications
		EE802OE	Battery Management Systems
	ECE	EC800OE	Electronic Measurements and Instrumentation
		EC801OE	Embedded System Design
		EC802OE	FPGA based System Design
	CSE/ CSE (AIML) /IT	CS800OE	Operating Systems
		CS801OE	Software Engineering
		CS802OE	Computer Networks

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
MA101BS	**Matrices and Calculus**	3	1	0	4

Pre-Requisite: Mathematical Knowledge at pre-university level

Course Description: The course contains various topics related to Rank of the Matrix and their related properties, Echelon form, Normal form, Solving linear system of equations, Eigen values and vectors, Reduction of Quadratic form to canonical forms, Mean value theorems, Improper Integration and their applications of beta, gamma functions, Maxima and minima of functions of two variables and three variables, Partial Differentiation, Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration, Evaluation of triple Integrals.

Course Outcomes: After completion of this course, the student will be able to

C101.1	Apply matrix techniques to solve system of linear equations.
C101.2	Find the Eigen values and Eigen vectors and reduce the Quadratic form to canonical Form.
C101.3	Apply Mean value theorems for given functions.
C101.4	Evaluate the improper integrals using Beta and Gamma functions.
C101.5	Find the extreme values of functions of two variables with/ without constraints.
C101.6	Evaluate the multiple integrals and apply the concept to find areas, volumes.

Unit – I Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss – Jordan method, System of linear equations: Solving system of Homogeneous and Non – Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

Unit – II Eigen Values and Eigen Vectors

Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley – Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley – Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Unit – III Single Variable Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series, Maclaurin Series. Definition of Improper Integrals: Beta, Gamma functions and their properties, Relation between Beta & Gamma functions and their applications.

Unit – IV Multivariable Calculus (Partial Differentiation and Applications)

Definitions of Limit and continuity. Partial Differentiation: Introduction to Partial Differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers**.**

Unit – V Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Change of variables (Cartesian to polar) for double integrals. Evaluation of triple integrals (Cartesian Coordinates) Applications: Areas (by double integrals) and volumes (by triple integrals).

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, 36th Edition, 2010, Khanna Publishers.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics,5th Edition, Narosa Publications ,2016.

REFERENCE BOOKS

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CH102BS	**Engineering Chemistry**	3	1	0	4

Pre-Requisite: Fundamental knowledge and solid understanding of chemistry

Course Description: Engineering Chemistry is a fundamental course designed to provide students with a solid foundation in the principles and applications of chemistry relevant to engineering disciplines. The course aims to equip students with the knowledge and skills necessary to understand the chemical properties of materials, analyze chemical reactions, and apply chemical concepts in engineering practice.

Course Outcomes: After completion of this course, the student will be able to

C102.1 Analyze the basic properties of water and its usage in domestic and industrial purposes.

C102.2 Inspect the working principles and reaction mechanisms of various energy storage devices

C102.3 Acquire the basic knowledge of electrochemical procedures related to corrosion and its control.

C102.4 Impart the fundamental knowledge and sustainability implemented through smart engineering materials.

C102.5 Distinguish various energy sources to prioritise eco-friendly fuels for environmentally sustainable development.

C102.6 Discriminate the limitations of conventional basic engineering materials for developing multiphase materials.

Unit – I Water and Its Treatment

Hardness of water – Types of hardness, Units, Estimation of hardness of water by complexometric method; numerical problems. Potable water and its specifications – Steps involved in the treatment of potable water – Disinfection of potable water by ozonation and chlorination - breakpoint chlorination. Defluoridation – Determination of F^- ion by ion – selective electrode method. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water – Calgon conditioning – Phosphate conditioning – Colloidal conditioning, External treatment methods – Softening of water by ion- exchange processes. Desalination of Brackish water – Reverse osmosis.

Unit - II Battery Chemistry and Corrosion

Introduction to Electrochemistry – Galvanic Cells, Electrode Potentials, Nernst Equation, EMF of the cell, Cell representation. Classification of batteries – primary, secondary, flow and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Zn-air, $Pb/HClO_4$ and Lithium-ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells – Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion. Types of corrosion: Galvanic, Water line and Pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods – Cathodic protection – Sacrificial anode and impressed current methods.

Unit– III Polymeric Materials

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene Plastics: Definition and characteristics – thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics – preparation – properties and applications of Buna–S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans–polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages – Polylactic acid and poly vinyl alcohol and their applications.

Unit – IV Energy Sources

Calorific value of fuel – HCV, LCV – Dulong's formula. Classification- solid fuels: coal – analysis of coal – Proximate and Ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages. Hydrogen as fuel-Production, Storage & applications**.**

Unit – V Engineering Materials

Composites: Introduction – Constituents of composites – advantages, classification and constituents of composites. Applications of composites.

Smart Materials and Engineering Applications: Smart Materials – Classification – (Piezo electric materials, Shape Memory Alloys, Thermoresponse Materials, Magnetorhetroic Materials, Smart Polymers) SMAs – Nitinol. Thermoresponse materials – Poly vinyl amides.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants – mechanism of lubrication (thick film, thin film and extreme pressure) – properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS

1. P.C.Jain and M. Jain,Engineering Chemistry, Dhanpatrai Publishing Company, 2010.
2. Shashi Chawla, Engineering Chemistry, Dhanpatrai and Company (P) Ltd. Delhi ,2011.
3. Shikha Agarwal, Engineering Chemistry, Cambridge University Press, Delhi,2015.
4. B. Rama Devi, Vemkata Ramana Reddy and Rath, Engineering Chemistry, Cengage learning, 2016.

REFERENCE BOOKS

1. Jaya Shree Anireddy, Textook of Engineering Chemistry by Wiley Publications. Jaya Shree Anireddy, Textbook of Engineering Chemistry, 1st Edition, Wiley, 2018.
2. M. Thirumala Chary, E. Laxminarayana, K.Shashikala, A Textook of Engineering Chemistry by Pearson Publishers, 2021.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CS103ES	**Programming for Problem Solving**	3	0	0	3

Course Description: The course contains topics related to fundamentals of problem solving using structured programming approach. It introduces standard programming techniques like alternation, iteration and recursion using C. It aims on using arrays, pointers and structures to formulate algorithms and programs. The course also covers files, searching and sorting problems.

Course Outcomes: After completion of this course, the student will be able to

C103.1 Understand the basics of algorithms and flowcharts for solving problems.

C103.2 Implement control structures using C programming language.

C103.3 Apply the knowledge of derived data types & use of preprocessor commands to solve problems.

C103.4 Explore dynamic memory allocation and file handling functions using C.

C103.5 Develop reusable code using the concept of modular programming.

C103.6 Demonstrate various searching and sorting techniques along with their time complexities.

Unit – I Introduction to Programming

Introduction to Programming: Compilers, compiling and executing a program. Representation of Algorithm - Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming.

Introduction to C Programming Language: Variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments.

Unit – II Arrays, Strings, Structures and Pointers

Arrays: One and Two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings.
Structures: Defining structures, initializing structures, unions, Array of structures.

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type.

Unit – III Preprocessor and File handling in C

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

Unit – IV Functions and Dynamic Memory Allocation

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions.

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types**.**

Unit – V Searching and Sorting

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

TEXT BOOKS

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning (3rd Edition).
3. B.W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI/Pearson Education.

REFERENCE BOOKS

1. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
2. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
3. Stephen G. Kochan, Programming in C, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
5. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
6. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivert, Clifford Stein, Introduction to Algorithms, 4th Edition, MIT Press.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
EC104ES	**Electronic Devices and Circuits**	**2**	**0**	**0**	**2**

Course Description: This course provides an in-depth understanding of the principles, operation, and design of electronic devices and circuits, equipping students with the knowledge and skills necessary to analyze, design, and troubleshoot electronic systems.

Course Outcomes: After completion of this course, the student will be able to

C104.1 Analyze the characteristics of PN junction diode.

C104.2 Construct diode circuits for various applications.

C104.3 Illustrate the transistor working in different configurations.

C104.4 Differentiate between FET and BJT devices.

C104.5 Illustrate the operation and characteristics of special purpose diodes.

C104.6 Use diode and transistor as switches in electronic circuits.

Unit – I Diodes

Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

Unit – II Diode Applications

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper- Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

Unit – III Bipolar Junction Transistor (BJT)

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times.

Unit – IV Junction Field Effect Transistor (FET)

Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

Unit – V Special Purpose Devices

Zener Diode - Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Schottky diode.

TEXT BOOKS

1. Jacob Millman, Electronic Devices and Circuits, McGraw Hill Education.
2. Robert L. Boylestad, Louis Nashelsky - Electronic Devices and Circuits theory, 11th Edition, Pearson, 2009.

REFERENCE BOOKS

1. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly, Basic Electronics - Principles and Applications, Cambridge, 2018,.
3. Thomas L. Floyd, Electronic Devices, 9th Edition, Pearson, 2012.
4. A. Anand Kumar, Pulse and Digital Circuits - PHI Learning.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
ME105ES	**Computer Aided Engineering Graphics**	**1**	**0**	**4**	**3**

Course Description: To develop the ability of visualization of different objects through technical Drawings and to acquire computer-aided drafting skills for the communication of concepts, ideas in the design of engineering products.

Course Outcomes: After completion of this course, the student will be able to

C105.1 Construct different types of non circular curves and scales used in various engineering applications.

C105.2 Analyze the projections of points and lines.

C105.3 Analyze the projections of planes and solids.

C105.4 Apply different types of sectional planes to get the interior features of the objects by means of sectional views.

C105.5 Develop the surfaces to fabricate the objects.

C105.6 Identify orthographic, Isometric projections and various CAD commands.

Unit – I

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Geometrical Constructions.
Scales: Plain & diagonal.
Conic Sections: Conic Sections including the rectangular hyperbola – General methods only.
Cycloidal curves: Cycloid, Epicycloid and Hypocycloid - General methods only.

Unit – II

Orthographic Projections: Principles of orthographic projections – conventions Projections of points in all positions.
Projection of straight lines: Line inclined to one reference plane and with two reference planes.

Unit – III

Projections of Planes: Projections of Plane geometric figures.
Projections of Regular Solids: Projections of solids (prisms, pyramids, cylinders and cones) in simple position and axis inclined to one reference plane and with two reference plane.
Introduction to computer aided drafting: (For internal evaluation weightage only) Introduction to AutoCAD Software: The Menu System, Toolbars (Standard, Object Properties, Draw).

Unit – IV

Section of Regular Solids: Section or Sectional views of Right Regular Solids, Prism, Cylinder, Pyramid and Cone.

Development of Surfaces of Right Regular Solids.

Unit – V

Isometric Projections: Principles of Isometric Projection – Isometric Scale Isometric Views – Isometric views of Lines, Planes and Simple Solids only. Orthographic Views: Conversion of Isometric Views to Orthographic Views and Vice - Versa.

Auto CAD Software: (For internal evaluation weightage only)

Toolbars (Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

TEXT BOOKS

1. Engineering Drawing, Bhatt,53rd Edition, Bhatt N. D/ Charotar Publishing house Pvt LTD., 2016.
2. Engineering drawing & Graphics Using AutoCAD, Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS

1. Basan Agarwal and C M Agarwal, Engineering Drawing, 3 rd Edition McGraw Hill.
2. Venugopal.K, Engineering Drawing and Graphics plus Autocad, New Age International(P) Ltd. NewDelhi,2010.
3. Engineering Graphics and Design, WILEY, Edition 2020.
4. M. B. Shah, B.C Rane, Engineering Drawing, /Pearson/
5. N. S Parthasarathy, Engineering Drawing, and Vela Murali, Oxford
6. K. Balaveera Reddy ct al, Computer Aided Engineering Drawing –CBS Publishers.

ONLINE RESOURCES

1. www.engineeringdrawing.org
2. Engineering Graphics and Design – Course(nptel.ac.in)

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CS106ES	**Elements of Computer Science and Engineering**	0	0	2	1

Course Description: To provide an overview of the subjects of computer science and engineering. Discuss about software installation and hardware assembling. Advanced topics related to computer science are discussed.

Course Outcomes: After completion of this course, the student will be able to

C106.1 Understand the purpose of various components of a basic computer, significance of essentials in software development.

C106.2 Understand the functionalities of various operating systems.

C106.3 Understand the basics of organization and management of databases.

C106.4 Understand the types of connectivity, applications and security issues, fundamentals of self - driven systems.

Unit – I Basics of a Computer

Basics of a Computer – Hardware, Software, Generations of computers. Hardware – functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software – systems software, application software, packages, frameworks, IDEs.

Task 1: Demonstrate assembling of computer by detaching and reassembling.

Unit – II Software development

Software development – Waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures.

Task 2: Draw flowchart to find the biggest of three numbers.

Task 3: Write algorithm to find the roots of a quadratic equation.

Unit – III Operating Systems

Operating systems: Functions of operating systems, types of operating systems, Device & Resource management.

Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services.

Task 4: Demonstrate the installation of any one operating system.

Task 5: Demonstrate creating a table and insert records with any one dbms application.

Unit – IV Networks

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks, 5Gcommunication.

World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.

Security – Information security, cyber security, cyber laws.

Task 6: Demonstrate LAN connections and Proxy settings.

Task 7: Create a web page with self data and photo.

Unit – V Autonomous Systems

Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, natural language processing, image and video processing, Game Development, Cloud Basics.

Task 8: Demonstrate any one AI tool to perform tasks.

TEXT BOOK

1. G. Michael Schneider, Invitation to Computer Science, Macalester College, Judith L Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

REFERENCE BOOKS

1. Reema Thareja, Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2. Peter Norton, Introduction to computers 8th Edition, Tata McGraw Hill.
3. Anita Goel, Computer Fundamentals, Pearson Education India, 2010.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CH107BS	**Engineering Chemistry Laboratory**	0	0	2	1

Pre-Requisite: Fundamental knowledge of quantitative and qualitative analysis

Course Description: The Engineering Chemistry Laboratory is a practical course designed to provide students with hands - on experience in conducting chemical experiments relevant to engineering applications. This laboratory - based course aims to reinforce the theoretical concepts learned in the engineering chemistry lecture course and develop students' practical skills in chemical analysis, synthesis, and material testing.

Course Outcomes: After completion of this course, the student will be able to

C107.1 Analysis of materials using small quantities of materials involved for quick and accurate results

C107.2 Interpret a new application by the analysis of physical principle involved in various instruments.

C107.3 Develop experimental skills in building technological advances by qualitative and quantitative analysis of materials.

C107.4 Learn and apply basic techniques used in chemistry laboratory for preparation, purification and identification.

LIST OF EXPERIMENTS

1. Determination of total hardness of water by complexometric method using EDTA.
2. Estimation of concentration of an acid by Conductometric titrations.
3. Estimation of concentration of an acid by pH metry.
4. Estimation of Concentration of Ferrous Iron (II) by Potentiometry using $KMnO_4$.
5. Estimation of Concentration of Fluoride ion by UV-Visible spectrometer.
6. Determination of viscosity of lubricant oil by using Ostwald’s viscometer.
7. Preparation of Bakelite.
8. Determination of rate of corrosion of mild steel in presence and absence of inhibitor.
9. Determination of Acid value of given coconut oil.
10. Proximate analysis of solid fuel- Coal

VIRTUAL LAB EXPERIMENTS

1. Batteries for Electric Vehicles.
2. Conducting Polymers-Study and Working.
3. Smart Materials-Engineering Applications.
4. Construction of Fuel Cell & It's Working.

TEXT BOOKS

1. P. Aparna, B. Ramadevi, Laboratory Manual in Engineering Chemistry, S. Chand Publications, New Delhi, 2022.
2. Vogel's Textbook of Practical Organic Chemistry 5^{th} edition.
3. A.I. Vogel, Inorganic Quantitative analysis by ELBS Publications.
4. V.K Ahluwalia, College Practical Chemistry by Narosa Publications Ltd., New Delhi 2007.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CS108ES	**Programming for Problem Solving Laboratory**	**0**	**0**	**2**	**1**

Course Description: This Course introduces the importance of programming, C language constructs, and program development. It introduces standard programming techniques like alternation, iteration and modular programming.

Course Outcomes: After completion of this course, the student will be able to

C108.1 Build programs using control structures to solve simple mathematical problems.

C108.2 Apply the concepts of user defined, pre-defined and file handling functions.

C108.3 Develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.

C108.4 Develop searching and sorting algorithms using C programs.

LIST OF PROGRAMS

Cycle 1:

Practice session

a. Write a simple program that prints the results of all the operators available in C (including pre/post increment, bitwise and/or/not, etc.). Read required operand values from standard input.

b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

Simple numeric problems:

a. Write a program for finding the max and min from the three numbers.

b. Write the program for the simple, compound interest.

c. Write a program that declares Class awarded for a given percentage of marks, where mark=70% = Distinction. Read percentage from standard input.

d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
5 x 1 = 5
5 x 2 = 10

e. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2) at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

c. Write a program that finds if a given number is a prime number.

d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

g. Write a C program to find the roots of a Quadratic equation.

h. Write a C program to calculate the following, where x is a fractional value. 1-
x/2 +x^2/4-x^3/6.

i. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+.....+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Cycle 2:

Arrays, Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single-dimensional array.

c. Write a C program that uses functions to perform the following:

(i) Addition of Two Matrices.

(ii) Multiplication of Two Matrices.

(iii) Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.

d. Write C programs that use both recursive and non-recursive functions.

   (i) To find the factorial of a given integer.

   (ii) To find the GCD (greatest common divisor) of two given integers.

   (iii) To find x^n.

e. Write a program for reading elements using a pointer into an array and display the values using the array.

f. Write a program for display values in reverse order from an array using a pointer.

g. Write a program through a pointer variable to sum of n elements from an array**.**

Files:

a. Write a C program to display the contents of a file to standard output device.

b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d. Write a C program that does the following:

   It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function).
   The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

c. Write a C program that uses functions to perform the following operations:

d. To insert a sub-string into a given main string from a given position.

e. To delete n Characters from a given position in a given string

f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn ‘t contain ch.

h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1          *          1
1 2        * *        2  3
1 2 3      * * *      4  5  6
```

Sorting and Searching

a. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.

b. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.

c. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d. Write a C program that sorts the given array of integers using selection sort in descending order.

e. Write a C program that sorts the given array of integers using insertion sort in ascending order.

f. Write a C program that sorts a given array of names.

TEXT BOOKS

1. Jeri R. Hanly and Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson.
2. B. A. Forouzan and R.F. Gilberg, C Programming and Data Structures, 3rd Edition, Cengage Learning.

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, 16th Impression, Pearson.
5. Stephen G. Kochan, Programming in C, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, Mc Graw-Hill.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CS109ES	**IT Workshop**	0	0	2	1

Pre-Requisite: Elements of Computer Science and Engineering.

Course Description: This course describes various OS installation procedures. It enables the student to get hands on with various Productivity tools including Word, Excel, PowerPoint and Latex. It introduces the concepts of the Internet & World Wide Web.

Course Outcomes: After completion of this course, the student will be able to

C109.1 Demonstrate the step-by-step installation process of the Operating System.

C109.2 Evaluate the credibility and reliability of online sources found through search engines.

C109.3 Use productivity tools like Word processors, PowerPoint and Latex to perform various tasks.

C109.4 Apply the knowledge of Excel functions for performing calculations and plotting to represent the input data.

LIST OF EXPERIMENTS / PROGRAMS

Cycle 1:

PC Hardware

Task 1: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 2: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task 1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and

how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block activex downloads to avoid viruses and/or worms.

Cycle: 2

LaTeX and WORD

Task 1: **Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a Project Certificate. Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Using LaTeX and Word Creating Project Abstract. Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Cycle: 3

Excel Orientation

The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel – average, std. deviation, Count function, Renaming and Inserting worksheets, Hyper linking

Task 2: Formatting - Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

Task 3: Data consolidation and validation - Charts, Calculating GPA, LOOKUP/ VLOOKUP, Pivot Table

PowerPoint & Presentation using Latex

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

Task 4: Create a Presentation: Features to be covered: -Templates, Slide Transitions, and Customization Options, Image formats and provides options for Resizing, Positioning, and Captioning images, hyperlink and Animations and Multimedia elements such as Videos and Audio clips, enabling you to create dynamic and interactive presentations on Real Time Scenario.

REFERENCE BOOKS

1. Vikas Gupta, Comdex Information Technology course tool kit, WILEY Dreamtech.
2. Cheryl A Schmidt, The Complete Computer upgrade and repair book, 3rd Edition, WILEY Dreamtech.
3. ITL Education Solutions limited, Introduction to Information Technology, Pearson Education.
4. Kate J. Chase, PC Hardware - A Handbook –PHI (Microsoft).
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. David Anfinson and Ken Quamme, IT Essentials PC Hardware and Software Companion Guide Third Edition – CISCO Press, Pearson Education.
7. Patrick Regan, IT Essentials PC Hardware and Software Labs and Study Guide, Third Edition, CISCO Press, Pearson Education.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
MA201BS	**Ordinary Differential Equations and Vector Calculus**	3	1	0	4

Pre-Requisite: Mathematical Knowledge at pre-university level

Course Description: This course contains various topics related to Exact differential equations, Orthogonal trajectories, Newton's law of cooling, growth and decay, Second order linear differential equations with constant coefficients and their models, Equations reducible to linear ODE with constant coefficients, Applications to Electric Circuits, Laplace Transforms and their application, Vector point functions and scalar point functions, Vector Integral theorems and their applications, Vector Differentiation.

Course Outcomes: After completion of this course, the student will be able to

C201.1	Solve first order Ordinary differential equations by analytical methods.
C201.2	Solve higher Ordinary differential equations by analytical methods.
C201.3	Find Laplace and inverse Laplace transform of given functions and solve ODEs by applying Laplace Transform
C201.4	Calculate divergence, curl of a vector point function and gradient of scalar point function.
C201.5	Apply and verify Gauss, Green's & Stoke's theorems and find volume, surface of the solid and work done by force.
C201.6	Evaluate the line, surface & volume integrals and converting them from one to another.

Unit – I First Order ODE

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

Unit – II Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin, *cos ax*, polynomials in x, $e^{ax}V$(x), and x V(x), Method of variation of parameters. Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits.

Unit – III Laplace Transforms

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of

functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

Unit – IV Vector Differentiation

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

Unit – V Vector Integration

Line, Surface and Volume Integrals, Vector Integral theorems: Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010,
2. R. K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCES BOOKS

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, 2006, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
PH102BS	**Applied Physics**	**3**	**1**	**0**	**4**

Course Description: This course consists of principles of Quantum mechanics with advanced topics in their respective engineering branches. It introduces the principles of semiconductors and some widely used semiconductor devices for various applications. It introduces fundamental concepts related to the dielectric, magnetic and energy harvesting materials. It introduces the importance of Lasers, optical fibers with propagation characteristics. It also introduces the fundamentals of nanotechnology and various material growth and characterization techniques.

Course Outcomes: After completion of this course, the student will be able to

C102.1 Understand the physical world from a fundamental point of view by the concepts of quantum mechanics and classify the solids.

C102.2 Identify the role of semiconductor devices in science and technology applications.

C102.3 Explore the fundamental properties of dielectric and magnetic materials for device applications.

C102.4 Understand various aspects of Lasers and their applications in diverse fields.

C102.5 Explain the principle of optical fibers and their significance in communication

C102.6 Appreciate the features and applications of nanomaterials.

Unit – I Quantum Mechanics and Band Theory of Solids

Quantum Mechanics: Introduction, blackbody radiation – Stefan - Boltzmann's law, Wein's and Rayleigh - Jean's law (qualitative) – Planck's radiation law – photoelectric effect – De – Broglie hypothesis – matter waves – Davisson and Germer experiment – Heisenberg uncertainty principle – time independent Schrodinger wave equation – Born interpretation of the wave function - particle in a 1-D potential well.

Unit – II Semiconductors and Devices

Intrinsic and extrinsic semiconductors – Hall effect – construction, working principle and characteristics of P-N Junction diode, Zener diode and Bipolar Junction Transistor (BJT) – direct and indirect band gap semiconductors – LED – photodiodes: PIN photodiode, avalanche photodiode (APD) and solar cells: structure, materials, working principle and characteristics.

Unit – III Dielectric and Magnetic Materials

Dielectric Materials: Basic definitions – types of polarizations (qualitative) – ferroelectric, piezoelectric and pyroelectric materials – applications - liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Origin of the magnetic moment – classification of magnetic materials – domain theory of ferromagnetism – hysteresis – soft and hard magnetic materials – magnetostriction, magnetoresistance – applications – magnetic field sensors and multiferroics.

Unit – IV Lasers and Fiber Optics

Lasers: Laser beam characteristics – three quantum processes – Einstein coefficients and their relations - laser components – lasing action - pumping methods – Types of Lasers: Ruby laser, Nd:YAG laser, He-Ne laser, CO2 laser – semiconductor laser – applications.

Fiber Optics: Introduction – total internal reflection – construction of optical fiber – acceptance angle - numerical aperture – classification of optical fibers – losses in optical fiber – optical fiber for communication system – advantages and applications.

Unit – V Nanotechnology

Introduction – Nanoscale, surface-to-volume ratio, quantum confinement – bottom-up approach: sol-gel and precipitation methods – top-down approach: ball milling, physical vapor deposition (PVD) and chemical vapor deposition (CVD) – characterization techniques – XRD, SEM &TEM - applications of nanomaterials.

TEXT BOOKS

1. M. N. Avadhanulu, P.G. Kshirsagar and TVS Arun Murthy, A Text book of Engineering Physics - S, Chand Publications, 11th Edition 2019.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
3. Donald A, Neamen, Semiconductor Physics and Devices: Basic Principle, Mc Graw Hill 4th Edition, 2021.
4. Narasimha Reddy Katta, Essentials of Nanoscience & Nanotechnology, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS

1. H.C. Verma, Quantum Physics, TBS publications, 2nd Edition, 2012.
2. Halliday, Resnick and Walker, Fundamentals of Physics, John Wiley & Sons, 11th Edition, 2018.
3. Aliaksandr S. Bandarenka, Energy Materials a short introduction to functional Materials for Energy conversion and storage, CRC Press Taylor & Francis Group Energy Materials Taylor & Francis Group, 1st Edition, 2022.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EE203ES	**Basic Electrical Engineering**	2	0	0	2

Course Description: Basic Electrical Engineering is a professional engineering subject that deals with the study and application of electrical engineering. A good grasp of the fundamentals of Electrical Engineering is an absolute necessity to become a good engineer in any discipline. Our day-to-day life is completely dependent on electricity. A reasonable understanding on the basics of electricity is therefore important for every engineer. This course deals with the basics of DC and AC circuit analysis under steady state and transient conditions. The basic knowledge on the constructional details and working principles of the commonly used DC and AC machines are included in the course. This course also gives an overview of the components in electrical installations.

Course Outcomes: After completion of this course, the student will be able to

C203.1 Analyze DC electric circuits with basic electrical components.

C203.2 Analyze single phase and three phase AC circuits.

C203.3 Illustrate the performance of transformers.

C203.4 Explain the construction of DC and AC machines.

C203.5 Explain the working Principle of DC and AC machine.

C203.6 Differentiate various components in electrical installations.

Unit – I D.C. Circuits

Electrical circuit elements (R, L and C), voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation - Network reduction techniques, Mesh Analysis, Super-Mesh Analysis, Nodal Analysis and Super-Node Analysis. Superposition, Thevenin and Norton Theorems. (Problems with independent sources). Time-domain analysis of first-order RL and RC circuits.

Unit – II A.C. Circuits

Representation of sinusoidal waveforms, peak, R.M.S, and average values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single -phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit – III Transformers

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Working principle of Auto-transformer and three-phase transformer connections.

Unit – IV Electrical Machines

Construction and working principle of dc motor, performance characteristics of dc shunt motor. Generation of rotating magnetic field, Construction and working principle of a three-phase induction motor, Significance of torque-slip characteristics, Single-phase induction motor - Capacitor-start Capacitor run motor (elementary treatment only). Construction and working principle of synchronous generator.

Unit – V Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Types of Cables, Earthing. Elementary calculations for energy consumption, power factor improvement, Applications of Batteries as Energy storage devices.

TEXT BOOKS

1. D.P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 4th Edition, Tata McGraw Hill, 2019,
2. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, Basic Electrical Engineering, 2nd Edition, S. Chand, 2019.

REFERENCE BOOKS

1. MS Naidu and S Kamakshaiah, Basic Electrical Engineering, 2nd Edition, Tata McGraw Hill, 2008.
2. D.C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009.
3. M. S. Sukhija, T. K. Nagsarkar, Basic Electrical and Electronics Engineering, 1st Edition, Oxford, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, Basic Electrical Engineering, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, Fundamentals of Electrical Engineering, 2nd Edition, Oxford University Press, 1996.
6. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.
7. V. D. Toro, Electrical Engineering Fundamentals, 2nd Edition, Pearson Education India, 2015.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
ME204ES	**Engineering Workshop**	0	1	3	2.5

Course Description: This course demonstrates about how different working tools, machinery and equipment are operated, applied and used. Acquire the essential knowledge necessary to manufacture a variety of engineering products. To provide students with hands- on practice using a variety of engineering materials, tools, equipment and processes that is widely utilized in the engineering field. To encourage optimism, cooperation, accuracy and safety at work. To gain knowledge of various hand-powered tools, their uses and how they function.

Course Outcomes: After completion of this course, the student will be able to

C204.1 Distinguish carpentry, fitting, blacksmithy and welding manufacturing processes.

C204.2 Develop house hold and engineering goods from metallic sheets in tin smithy.

C204.3 Apply basic electrical engineering knowledge for house wiring practice.

C204.4 Construct a sand mould for a given pattern using foundry tools.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

Cycle 1:

1. Tin Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
2. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern).
3. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
4. Blacksmithy – (Round to Square, Fan Hook and S-Hook)

Cycle 2:

1. Fitting – (V-Fit & Dovetail Fit & Square fit).
2. House-wiring – (Parallel & Series, Two-way Switch and Tube Light).
3. Welding Practice – (Arc Welding & Gas Welding)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting, Power tools in construction and Wood Working

TEXT BOOKS

1. B. L Juneja, Workshop Practice / Cengage.
2. K. Venugopal, Workshop Manual / Anuradha

REFERENCE BOOKS

1. Kannaiah, Work shop Manual - P, K.L Narayana /Scitech.
2. Venkat Reddy Workshop Manual / BSP.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EN205HS	**English for Skill Enhancement**	2	0	0	2

Course Description: With the growing importance of English as a tool for global technical communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop the linguistic, communicative, creative and critical thinking competencies of Engineering students. In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development.

Course Outcomes: After completion of this course, the student will be able to

C205.1 Apply English language effectively in spoken and written forms

C205.2 Analyze the given texts and essence of poem, respond appropriately

C205.3 Apply various grammatical structures in personal and academic fronts.

C205.4 Develop appropriate vocabulary for professional communication

C205.5 Make use of competency in various forms of academic and professional writing.

C205.6 Improve language skills for the enhancement of employability opportunities.

Unit – I Toasted English by R. K. Narayan

Vocabulary: The concept of Word Formation, Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and prepositions.

Reading Skills: Reading and Its Importance – Techniques for Effective Reading.

Writing Skills: Sentence Structures – Use of Phrases and Clauses in Sentences – Importance of Proper Punctuation – Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph – Creating Coherence – Organizing Principles of Paragraphs in Documents.

Unit – II Appro JRD by Sudha Murty

Vocabulary: Words Often Confused, Homophones, Homonyms and Homographs & collocations.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun and Subject - verb Agreement.

Reading Skills: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice.

Writing Skills: Nature and Style of Writing.

Unit – III The Character of a Happy Life by Sir Henry Wotton (Poem)

Vocabulary: Words Often Misspelt, - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses

Reading Skills: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing Skills: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

Unit – IV Art and Literature by Abdul Kalam

Vocabulary: Standard Abbreviations in English.

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading Skills: Reading Techniques- Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice.

Writing Skills: Writing Practices - Essay Writing-Writing Introduction, Body and Conclusion

Unit – V Go, Kiss the World by Subroto Bagchi

Vocabulary: Technical Vocabulary and their Usage.

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

Reading Skills: Reading Comprehension- Exercises for Practice.

Writing Skills: Technical Reports - Introduction – Characteristics of a Report – Categories of Formats - Structure of Reports (Manuscript Format) - Types of Reports - Writing a Report.

TEXT BOOKS

1. English: Language, Context and Culture *by* Orient Black Swan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS

1. Liss and Davis (OUP) by Effective Academic Writing
2. Richards, Jack C. Interchange Series Introduction, 1,23. Cambridge University Press, 2022.
3. Wood, F.T., Remedial English Grammar, Macmillan, 2007.
4. Chaudhuri, Santanu Sinha , Learn English: A fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.). Sage Publications India Pvt.Ltd, 2018.
5. Technical Communication, Wiley India Pvt. Ltd,2019.

6. Vishwmohan, Aysha, English for Technical Communication for Engineering Students. MC Graw-Hill Education India Pvt. Ltd,2013.
7. Swan, Michael., Practical English Usage, Fourth Edition, Oxford University Press., 2016.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
CS206ES	**Python Programming Laboratory**	0	1	2	2

Course Description: This Course Covers Installation procedure of python and packages. Course focuses on implementation of different control structures, data structures and Files in Python. It also helps to implement GUI applications using TKinter.

Course Outcomes: After completion of this course, the student will be able to

C206.1 Build basic programs using fundamental programming constructs.

C206.2 Explore Strings, Lists, Tuples and Dictionaries in Python

C206.3 Develop reusable code and GUI application using standard Library.

C206.4 Implement File I/O and Digital Logic Gates using Python

LIST OF EXPERIMENTS

Cycle 1:

Week - 1:

1. (i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   (ii) Start the Python interpreter and type help () to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3. (i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   (ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points.
4. Read name, address, email and phone number of a person through keyboard and print the details.

Week - 2:

1. Find the Euclidean distance with the given values and check the validity of values to find the distance.
2. Generate a random number between 1-10 and ask the user to guess the number. Give chance for 3 times. If guessed correctly, then congratulate otherwise print message as sorry.
3. Accept a string and generate the combinations of string until the source string doesn't repeat.
4. Generate prime numbers of Fibonacci series between 1-50.

Week - 3:

1. (i) Write a program to convert a list and tuple into arrays.

   (ii) Write a program to find common values between two arrays.

2. Write a program to add comma separators in a given big number as per the standard American convention. Ex: i/p: 100000000 o/p: 100,000,000.

3. Write a program to convert given formula 3X+4Y as 3*X+4*Y and 3(X+Y) as 3*X+3*Y etc.

Week - 4:

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.

2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

3. (i) Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
   (ii) The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
   (ii) Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

4. (i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'.
   (ii) Remove the given word in all the places in a string?
   (iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

5. Write a recursive function that generates all binary strings of n-bit length.

Week - 5:

1. (i) Write a python program that defines a matrix and prints.
   (ii) Write a python program to perform addition of two square matrices.
   (iii) Write a python program to perform multiplication of two square matrices

2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

3. Use the structure of exception handling all general purpose exceptions.

Cycle 2:

Week - 6:

1. (i) Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
   (ii) Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
   (iii) Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
   (iv) Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritance.

3. Write a python code to read a phone number and email-id from the user and validate it for correctness

Week - 7:

1. Write a Python code to merge two given file contents into a third file.

2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

3. Write a Python code to Read text from a text file, find the word with most number of occurrences.

4. Write a function that reads a file file1 and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Week - 8:

1. Import Numpy, Plotpy and Scipy and explore their functionalities.
2. Install Numpy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR.
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder.
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS

1. Brian R. Overland and John Bennett, Supercharged Python: Take your code to the next level, O'reilly.
2. Mark Lutz, Learning Python, O'reilly.

REFERENCE BOOKS

1. Dr. Mohd. Abdul Hameed, Python for Data Science, 1st Edition, Wiley Publications, 2021.
2. Vamsi Kurama, Python Programming: A Modern Approach, Pearson.
3. Sheetal Taneja, Naveen Kumar, Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Pearson.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
PH207BS	**Applied Physics Laboratory**	0	0	3	1.5

Course Description: This course is designed for students to provide an opportunity for learning through observation, interpretation and application. It includes the instruments related to the Hall Effect, Photoelectric Effect, dielectric constant and B-H curve experiments and their measurements. It introduces the characteristics of various devices such as P-N junction diode, Zener diode, BJT, LED, solar cell, LASERs and optical fibers, measurement of energy gap and resistivity of semiconductor materials.

Course Outcomes: After completion of this course, the student will be able to

C207.1 Estimate the work function of metal using Photoelectric effect and identify the type of semiconductor material whether it is n-type or p-type by Hall effect.

C207.2 Determine energy gap and resistivity of semiconductors and draw the characteristics of semiconductor and optoelectronic devices.

C207.3 Understand the electrical and magnetic properties of materials.

C207.4 Demonstrate the working principle of lasers and optical fibers.

LIST OF EXPERIMENTS

1. Determination of work function of a metal and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient, carrier concentration and carrier mobility of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE / CB configurations).
6. V-I and L-I characteristics of light emitting diode (LED).
7. V-I Characteristics of solar cell.
8. Determination of energy gap of a semiconductor using p-n junction diode.
9. Determination of the resistivity of semiconductor by two probe method.
10. Study B-H curve characteristics of a magnetic material.
11. Determination of dielectric constant of a given material.
12. a) Determination of the beam divergence of a given LASER beam.
    b) Determination of acceptance angle and numerical aperture of an optical fiber.

Note: Any 8 experiments are to be performed.

REFERENCE BOOK

1. S. Balasubramanian, M.N. Srinivasan, “A Textbook of Practical Physics”, S. Chand Publishers, 2017.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EN208HS	**English Language and Communication Skills Lab**	0	0	2	1

Course Description: The course aims an in-depth look into English articulation and its sound system, thus developing your sensitivity to all aspects of English pronunciation. Students develop their listening skills to appreciate its role in the LSRW skills approach to language and improve their pronunciation. Students able to express themselves fluently and appropriately in social and professional contexts.

Course Outcomes: After completion of this course, the student will be able to

C208.1 Understand the nuances of English language through audio - visual experience.

C208.2 Apply soft skills effectively while working in group activities.

C208.3 Create Neutralize accent for intelligibility.

C208.4 Understand and Discuss with clarity and confidence which in turn enhances their employability skills

Listening Skills

Objectives

1. To enable students, develop their listening skills to appreciate its role in the LSRW skills approach to language and improve their pronunciation.
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions.

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content.
- Listening to fill up information.
- Intensive listening.
- Listening for specific information.

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts.
2. To enable students express themselves fluently and appropriately in social and professional contexts.

- Oral practice: Just A Minute (JAM) Sessions.
- Describing objects/situations/people.
- Role play – Individual/Group activities.
- Group Discussions.
- Debate.

EXERCISE - I

CALL Lab:

Understand: Listening Skill – Its importance – Purpose – Process – Types – Barriers – Effective Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants –Minimal Pairs – Consonant Clusters – Past Tense Marker and Plural Marker – *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language – Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session – Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

EXERCISE - II

CALL Lab:

Understand: Structure of Syllables – Word Stress – Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent – Contractions – Stress Shift – Weak Forms and Strong Forms – Intonation in context – *Testing Exercise.*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play – Expressions in Various Situations – Making Requests and Seeking Permission – Telephone Etiquette.

EXERCISE - III

CALL Lab:

Understand: Errors in Pronunciation – Neutralizing Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation – *Testing Exercises*

ICS Lab:

Understand: Descriptions – Narrations – Giving Directions and Guidelines –Blog Writing – Netiquette

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding in a forum – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

EXERCISE - IV

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests – *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Structured Talks – signposting in speech – Non – verbal Communication – Presentation Skills.

Practice: Making a Short Speech – Extempore – Making a Presentation

EXERCISE – V

CALL Lab:

Understand: Listening for Inference *(focus on implicit meaning)*

Practice: Listening Comprehension Tests –*Testing Exercises*

ICS Lab:

Understand: Introduction to Group Discussion & Interview Skills

Practice: Group Discussion & Mock Interviews

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL)Lab:**

   The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

   System Requirement (Hardware component):

   Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

   i) Computers with Suitable Configuration
   ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab:**

   The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

   Source of Material (Master Copy):

   - *Exercises in Spoken English. Part 1, 2, 3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor – made to suit the contents of the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All.
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS

1. English Language Communication Skills – Lab Manual cum Workbook, Cengage Learning, India ,2022.
2. Shobha, KN & Rayen, J. Lourdes Communicative English – A workbook, Cambridge University Press,2019.
3. Kumar, Sanjay & Lata, Pushp. Communication skills: A workbook, Oxford University Press ,2019.
4. Board of Editors. ELCS Lab Manual: A workbook for CALL and ICS Lab Activities ,2016.
5. Mishra, Veerendra et al. English Language Skills: A Practical Approach Cambridge University Press, 2020.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EE209ES	**Basic Electrical Engineering Laboratory**	0	0	2	1

Course Description: BEE lab is part of the curriculum for the first year students. The lab is intended for introducing the basic methods and instruments used for measuring the electrical quantities to the newly joined students. The experiments are modeled in such a way that it can be used as a learning aid for the students, as it goes in hand with the theory.

Course Outcomes: After completion of this course, the student will be able to

C209.1 To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.

C209.2 To Analyze the transient responses of first order circuits.

C209.3 To Evaluate the performance of Transformers through various testing methods.

C209.4 To Evaluate the performance of DC and AC Motors by direct testing methods.

The following experiments are required to be conducted as compulsory.

PART-A

1. Verification of KVL and KCL.
2. Verification of Thevenin's and Norton's theorem.
3. Transient Response of Series RL and RC circuits for DC excitation.
4. Resonance in series RLC circuit.
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer.
7. Performance Characteristics of a DC Shunt Motor.
8. Torque-Speed Characteristics of a Three - Phase Induction Motor.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

PART-B

1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star).
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit.
5. No-Load Characteristics of a Three-phase Alternator.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
IT301PC	**Digital Electronics**	3	0	0	3

Course Description: This course provides thorough understanding of basic concepts required for digital system design.

Course Outcomes: After completion of this course, the student will be able to

C301.1 Apply the concepts of number systems, and codes in digital system design.

C301.2 Minimize Boolean expression using various techniques.

C301.3 Design combinational logic circuits for given specifications.

C301.4 Design Shift Registers and Counters using flip-flops.

C301.5 Implement logic functions using PLDs and Illustrate the functionality of various memories.

C301.6 Design and optimize asynchronous sequential circuits.

Unit – I Boolean Algebra and Logic gates

Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic. Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

Unit – II Gate-Level Minimization

The map method, Four-variable map, Five – Variable map, product of sums simplification Don't – care conditions, NAND and NOR implementation other Two – level implementations, Exclusive – Or function.

Unit– III Combinational Logic

Combinational Circuits, Analysis procedure, Design procedure, Binary Adder – Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers.

Unit – IV Sequential Logic

Sequential circuits, latches, Flip-Flops, Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers, Shift Registers, Ripple counters, Synchronous counters, other counters.

Unit – V Memories and Asynchronous Sequential Logic

Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction
Read-only memory, Programmable logic Array Programmable Array logic, Sequential Programmable Devices.
Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example..

TEXT BOOKS

1. M. Morris Mano, Digital Design, Third Edition, Pearson Education/PHI.
2. Albert Paul Malvino and Donald P. Leach, Digital Principles and Applications, 2011, TATA McGraw Hill.
3. Roth, Fundamentals of Logic Design, 5th Edition, Thomson.

REFERENCE BOOKS

1. Zvi. Kohavi, Switching and Finite Automata Theory, Tata McGraw Hill.
2. C.V.S. Rao, Switching and Logic Design, Pearson Education
3. Donald D. Givone, Digital Principles and Design, Tata McGraw Hill.
4. M. Rafiquzzaman, Fundamentals of Digital Logic and Microcomputer Design, 5th Edition, John Wiley.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS302PC	Data Structures	3	0	0	3

Pre-Requisite: Programming for Problem Solving

Course Description: This course covers linear data structures such as stack, queue and linked lists. Discuss various operations on non-linear data structures like trees and graphs. Introduces various sorting techniques and pattern matching algorithms.

Course Outcomes: After completion of this course, the student will be able to

C302.1 Implement various operations on linear data structures to solve real world problems.

C302.2 Design solutions using Dictionaries, Hash Tables and time complexity.

C302.3 Implement various kinds of trees and its operations.

C302.4 Describe graph representations and implement traversals.

C302.5 Implement various sorting algorithms.

C302.6 Demonstrate the Pattern matching algorithms and Tries.

Unit – I Introduction to Data Structures

Introduction to Data Structures: abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks – Operations, array and linked representations of stacks, stack applications, Queues – operations, array and linked representations.

Unit – II Dictionaries, Hash Tables and Complexity

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash Table Representation: hash functions, collision resolution- separate chaining, open addressing – linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

Introduction to complexity**:** The Growth of Functions, asymptotic notations.

Unit– III Search Trees

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B – Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red – Black, Splay Trees.

Unit – IV Graphs &Sorting

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

Unit – V Pattern Matching and Tries

Pattern Matching and Tries: Pattern matching algorithms -Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS

1. E. Horowitz, S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
2. A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, Data Structures using C PHI/ Pearson Education.

REFERENCE BOOK

1. R. F. Gilberg and B. A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS303PC	**Discrete Mathematics**	3	0	0	3

Course Description: Discrete mathematics is the study of mathematical structures that are discrete, separated or distinct. The course covers formal logic notation, inference mechanisms, sets, functions, relations, algebraic structures, permutations and combinations, counting principles, elementary graph theory.

Course Outcomes: After completion of this course, the student will be able to

C303.1 Read, comprehend, and construct mathematical arguments for proofs.

C303.2 Model real-world problems using graphs and trees.

C303.3 Work and Apply Discrete Structures.

C303.4 Apply combinations and permutations to various problems.

C303.5 Solve problems using Binomial and Multinomial Theorems.

C303.6 Ability to analyze and solve counting problems on finite and discrete structures

Unit – I Mathematical logic

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

Unit – II Graph Theory

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

Unit– III Set Theory

Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions, Partial ordering.

Unit – IV Elementary Combinatorics

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems.

Unit – V Advanced Counting Techniques

Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations, Divide-and - Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion - Exclusion, Applications of Inclusion - Exclusion.

TEXT BOOKS

1. J.P. Tremblay, R. Manohar, Discrete Mathematical Structures with Applications to Computer Science: , 1st ed, McGraw-Hill.
2. Mott, Abraham Kandel, Teodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians Joe l. 2nd Edition, Prentis Hall of India.

REFERENCE BOOKS

1. Ralph. P.Grimad, Discrete and Combinatorial Mathematics - an applied introduction:, 5th Edition Pearson Education.
2. Thomas Kosy, Discrete Mathematical Structures, Tata McGraw Hill publishing co.
3. Kenneth H Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, TMH.
4. Richard Johnsonbaugh, Discrete Mathematics, 7th Edition, Pearson Education.
5. Edgar G. Goodaire, Michael M. Parmenter, Discrete Mathematics with Graph Theory.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS304PC	Database Management Systems	3	0	0	3

Course Description: The course focuses on database management systems, its architecture and various applications. This course contains the topics related to conceptual data modeling, relational data model, relational query languages, relational database design and transaction management and files. The course also focuses on the fundamentals of knowledge base and relational database management systems, and the current developments in database theory and the practice.

Course Outcomes: After completion of this course, the student will be able to

C304.1 Understand the basic concepts of DBMS.

C304.2 Design conceptual models using ER Diagram and normalize the model.

C304.3 Impose constraints on relations.

C304.4 Implement the procedural and non-procedural languages on database.

C304.5 Understand the recovery and concurrency control techniques.

C304.6 Describe file organization techniques and tree-based indexing structures.

Unit – I Database Management Systems, Database Design and ER Model

Introduction to Database Management Systems: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS.
Database Design and ER Model: Entities, Attributes, Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Database Design and ER Diagrams, Conceptual Design with the ER Model.

Unit – II Schema Refinement and Relational Model

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.
Relational Model: Introduction to Relational Model, Constraints on the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design.

Unit– III Formal Query Languages and SQL

Formal Relational Query Languages: Relational Algebra, Relational Calculus - Tuple relational Calculus, Domain relational calculus.
Structured Query Language: Form of basic SQL query, DDL Commands, DML Commands, UNION, INTERSECT and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, Introduction to views, destroying/altering tables and views, triggers and active databases.

Unit – IV Transaction Management

Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation-Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

Unit – V File Organization

File Organization: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes-Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+Trees: A Dynamic Index Structure.

TEXT BOOKS

1. Silberschatz, Korth, Database System Concepts, 3rd Edition, McGraw hill.
2. Raghurama Krishnan, and Johannes Gehrke, Tata McGraw Hill, Database Management Systems.

REFERENCE BOOKS

1. Peter Rob & Carlos Coronel, Database Systems design, Implementation and Management, 7th Edition.
2. Elmasri Navrate, Fundamentals of Database Systems, Pearson Education.
3. C. J. Date, Introduction to Database Systems, Pearson Education.
4. S. Shah and V. Shah, The XTeam, Oracle for Professionals, SPD.
5. Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI.
6. M.L. Gillenso, Fundamentals of Database Management Systems.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS305PC	Object Oriented Programming through Java	3	0	0	3

Pre-Requisite: C programming

Course Description: This course contains Object oriented principles, java basics. Discuss file handling operations and inter process communication through threads. Implement applications using GUI components.

Course Outcomes: After completion of this course, the student will be able to

C305.1	Illustrate Object Oriented concepts and basics of java programming.
C305.2	Explore the concepts of Inheritance, packages and Interfaces.
C305.3	Implement the concepts of exception handling and util package.
C305.4	Apply the knowledge of multithreading to solve problems related to IPC.
C305.5	Design GUI applications using event handling concepts & AWT.
C305.6	Develop look and feel GUI applications using applets and swing.

Unit – I Object oriented thinking and Java Basics

Object oriented thinking and Java Basics – Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

Unit – II Inheritance, Packages and Interfaces

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

Unit– III Exception handling, Multithreading and java.util

Exception handling -- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util –Linked List, Hash Table.

Multithreading–Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, auto boxing, annotations, generics.

Unit – IV GUI & Event Handling

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

Unit – V Applets Programming & Swing

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.
Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Java the complete reference,7th Edition, Herbert schildt TMH .
2. T. Budd, Understanding OOP with Java, updated Edition, Pearson Education.
3. R. Nageswara Rao, Core Java (an Integrated approach), DreamTech Press, 2009.

REFERENCE BOOKS

1. J. Nino and F.A. Hosch, An, John wiley & sons. An Introduction to programming and OO design using Java,
2. T. Budd, An Introduction to OOP, Third Edition, Pearson Education.
3. Y. Daniel Liang, Introduction to Java programming, Pearson Education.
4. R.A. Johnson, Thomson, An introduction to Java programming and Object-Oriented Application Development.
5. R.A. Johnson, Thomson, Object Oriented Programming with Java, TMH.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS306PC	Data Structures Lab	0	0	3	1.5

Course Description: This course focuses on implementation of linear data structures and sorting algorithms. Course also deals operations related to different height balanced trees, graph traversing and pattern matching algorithms.

Course Outcomes: After completion of this course, the student will be able to

C306.1 Implement with various kinds of linked list and their operations

C306.2 Design programs to implement stack and queue ADT

C306.3 Implement programs for sorting algorithms

C306.4 Implement trees and graph traversal and pattern matching algorithms

LIST OF PROGRAMS

Cycle 1:

1. Write a program that uses functions to perform the following operations on singly linked list. :
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked List. :
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked List :
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using i) Arrays ii) Pointers.
5. Write a program that implement Queue (its operations) using i) Arrays ii) Pointers.
6. Write a program that implements hashing.

Cycle 2:

7. Write a program that implements the following sorting methods to sort a given list of integers in ascending order.
   i) Quick sort ii) Heap sort iii) Merge sort.
8. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
9. Write a program to implement
   i) Binary Search tree ii) BTrees iii) B+ Trees iv) AVL trees v) Red - Black trees.
10. Write a program to implement the graph traversal methods.
11. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt.

TEXT BOOKS

1. E. Horowitz, S. Sahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
2. A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, Data Structures using C, PHI/ Pearson Education.

REFERENCE BOOK

1. R. F. Gilberg and B. A. Forouzan, Data Structures: A Pseudocode Approach with C, 2nd Edition, Cengage Learning.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS307PC	**Object Oriented Programming through Java Lab**	0	0	3	1.5

Course Description: This Course introduces Implementing oops principles, implementing various collections and multi-threading concepts. Design GUI using awt, swing and applets and also applying various events on GUI.

Course Outcomes: After completion of this course, the student will be able to

C307.1 Make use of JDK, Eclipse platform for developing java programs using Oops.

C307.2 Build programs using abstract classes and multithreading concepts.

C307.3 Develop programs using GUI components and event handling.

C307.4 Design look and feel GUI using swing and applets.

LIST OF PROGRAMS

Cycle 1:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

3. A) Develop an applet in Java that displays a simple message.
   B) Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named “Compute” is clicked.

4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

6. Write a Java program for the following:
   Create a doubly linked list of elements.
   Delete a given element from the above list.
   Display the contents of the list after deletion.

Cycle 2:

7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.

8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.

10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

11. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

12. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.

13. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

REFERENCE BOOKS

1. P. J. Deitel and H. M. Deitel, Java for Programmers, 10th Edition, Pearson education.
2. Bruce Eckel, Thinking in Java, Pearson Education.
3. D. S. Malik and P. S. Nair, Java Programming, Cengage Learning.
4. Cay S. Horstmann and G Cornell, Core Java, Volume 1, 9th Edition, Pearson.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS308PC	Database Management System Lab	0	0	2	1

Course Description: This course aims to provide a deep understanding of concept design, modelling, and practical implementation of databases. Course explores the proficiency in writing and executing Data Definition Language (DDL), Data Manipulation Language (DML) commands, querying, subqueries, aggregate functions, normalization, triggers, procedures, and cursors.

Course Outcomes: After completion of this course, the student will be able to

C308.1 Create conceptual design for the real world problems using ER Diagrams.

C308.2 Convert the conceptual model into relational and normalize.

C308.3 Apply DDL and DML commands on given database

C308.4 Implement Triggers, Procedures and Cursors.

LIST OF PROGRAMS

Cycle 1:

1. Concept design with E-R Model.
2. Relational Model.
3. Normalization.
4. Practicing DDL commands.
5. Practicing DML commands.

Cycle 2:

1. a. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
   b. Nested, Correlated sub queries
2. Queries using Aggregate functions, GROUPBY, HAVING and Creation and dropping of Views.
3. Triggers (Creation of insert trigger, delete trigger, update trigger).
4. Procedures.
5. Usage of Cursors.

TEXT BOOKS

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, Tata Mc Graw Hill.
2. Silberschatz, Korth, Database System Concepts, V edition, Mc Graw Hill.

REFERENCE BOOKS

1. Peter Rob & Carlos Corone, Database Systems design, Implementation, and Management, l7th Edition.
2. Elmasri Navrate, Fundamentals of Database Systems, Pearson Education.
3. C.J. Date, Introduction to Database Systems, Pearson Education.
4. The X Team, S. Shahand Vaishali. Shah, Oracle for Professionals, SPD.
5. Nilesh Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI.
6. M.L. Gillenson, Fundamentals of Database Management Systems, Wiley Student Edition.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
CS309PC	**Data Visualization - R Programming / Power BI**	0	0	2	1

Course Description: This course contains topics related to effective use of Business Intelligence technology and to apply data visualization. It helps to discern patterns and relationships in the data, build dashboard applications, and communicate the results clearly and concisely.

Course Outcomes: After completion of this course, the student will be able to

C309.1 Understand how to import data into Tableau.

C309.2 Understand Tableau concepts of Dimensions and Measures.

C309.3 Develop Programs and understand how to map Visual Layouts and Graphical Properties.

C309.4 Create Dashboard, custom charts, and, publish to tableau online for any realtime dataset.

LIST OF PROGRAMS

Cycle 1:

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?

2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps), Using the Show me panel.

3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.

4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.

5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.

6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.

Cycle 2:

7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.

8. Creating Dashboards &Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing &Publishing your Visualization.

9. Tableau file types, publishing to Tableau Online, sharing your visualizations, printing and exporting.

10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

11. Visualize various data patterns taking any dataset from Kaggle.

REFERENCE BOOKS

1. Brett Powell, Microsoft Power BI cookbook, 2nd Edition.
2. Roger D. Peng, R Programming for Data Science.
3. Norman Matloff, The Art of R Programming, Cengage Learning India.

B.Tech. II Year I Semester

Course Code	Course Title	L	T	P	Credits
* MC310	**Gender Sensitization Lab**	0	0	2	0

Course Description: This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Course Outcomes: After completion of this course, the student will be able to

C310.1 Students will have developed a better understanding of important issues related to gender in contemporary India.

C310.2 Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.

C310.3 Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.

C310.4 Students will acquire insight into the gendered division of labour and its relation to politics and economics.

UNIT-I Understanding Gender

Introduction: Introduction to Gender, What is Gender, Why should we study it. Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste: Different Masculinities.

UNIT-II Gender Roles And Relations

Two or Many? -Struggles with Discrimination- Missing Women-Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences - Gender Spectrum: Beyond the Binary.

UNIT – III Gender And Labour

Division & Valuation of Labour - Housework: The Invisible Labor - “My Mother doesn’t Work.” “Share the Load.” - Work: Its Politics and Economics - Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT – IV Gender - Based Violence

Sexual Harassment: Say No! -Sexual Harassment, not Eve – teasing - Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking Out Is Home a Safe Place? - When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim - "I Fought for my Life…." Additional Reading: The Caste Face of Violence.

UNIT – V Gender And Coexistence

Gender Issues - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks The Brave Heart.

TEXT BOOKS

1. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, Towards a World of Equals: A Bilingual Textbook on Gender, 2015, Telugu Akademi, Hyderabad, Telangana.

REFERENCE BOOKS

1. Menon, Nivedita, Seeing like a Feminist, New Delhi: Zubaan-Penguin Books, 2012.
2. Abdulali Sohaila, "I Fought For My Life…and Won," Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

E-TEXT BOOKS

1. Abdulali Sohaila, I Fought For My Life…and Won, Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

B. Tech. II Year II Sem

Course Code	Course Title	L	T	P	Credits
CS401PC	**Software Engineering**	3	0	0	3

Course Description: This course discusses principles of software engineering, process models and software requirements. Also explores design principles, testing strategies and risks in software development.

Course Outcomes: After completion of this course, the student will be able to

C4091.1 Illustrate software process framework and models for the development of software application.

C401.2 Analyze and validate the requirement engineering strategy for developing software requirement specification documents.

C401.3 Choose an appropriate model to create an architectural design.

C401.4 Apply various testing strategies to verify the software quality.

C401.5 Illustrate the importance of framework for product metrics.

C401.6 Identify the risk strategy and QA techniques for developing quality software.

UNIT – I Introduction to Software Engineering:

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering - a layered technology, a process framework, the capability maturity model integration (CMMI).

Process models: The waterfall model, Spiral model and Agile methodology.

UNIT – II Requirement Engineering

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III Design Engineering

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT – IV Testing

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT – V Risk Management

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM.

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS

1. Roger S. Pressman, Software Engineering, A Practitioner's Approach, Sixth Edition, McGraw Hill International Edition.
2. Ian Sommerville, Software Engineering, Seventh Edition, Pearson Education.

REFERENCE BOOKS

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison Wesley.
2. James F. Peters, Witold Pedrycz, Software Engineering, An Engineering approach, John Wiley.
3. Waman S Jawadekar, Software Engineering Principles and Practice, The McGraw Hill Education.
4. Meiler Page-Jones, Fundamentals of Object-Oriented Design using UML, Pearson Education.

B. Tech. II Year II Sem

Course Code	Course Title	L	T	P	Credits
MA402BS	**Computer Oriented Statistical Methods**	3	1	0	4

Pre-Requisite: Mathematics courses of first year of study.

Course Description: The course contains the theory of Probability, Probability distributions of single variable, the sampling theory, testing of hypothesis and making statistical inferences, Methods of Estimation, Stochastic process and Markov chains.

Course Outcomes: After completion of this course, the student will be able to

C222.1 Distinguish between discrete and continuous random variables

C222.2 Analyze and interpret statistical data using appropriate probability distributions

C222.3 Apply sampling distributions in real world problems

C222.4 Estimate the value for a given parameter by choosing appropriate method

C222.5 Apply suitable test to accept or reject a given hypothesis

C222.6 Apply Stochastic process and Markov process to solve various problems

Unit – I Probability

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule, Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions and Continuous Probability Distributions.

Unit – II Expectation and Discrete Distributions

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem. Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

Unit – III Continuous and Sampling Distributions

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions. Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F- Distribution.

Unit – IV Sample Estimation and Tests of Hypotheses

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.

Statistical Hypothesis: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean, Two samples: tests on two means, One sample: test on a single proportion. Two samples: tests on two proportions, Two- sample tests concerning variances.

Unit – V Stochastic Processes and Markov Chains

Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
3. S.D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi.

REFERENCE BOOKS

1. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.
3. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.

B. Tech. II Year II Sem

Course Code	Course Title	L	T	P	Credits
CS403PC	**Operating Systems**	3	0	0	3

Pre-Requisites: 1. Programming for Problem Solving

2. Elements of Computer Science and Engineering

Course Description: This course covers concepts viz., CPU Scheduling, Process Management, Synchronization, Virtual Memory, Memory Allocation Methods, File Management etc,.

Course Outcomes: After completion of this course, the student will be able to

C403.1 Understand basic concepts of System Structures, Process and Threads.

C403.2 Evaluate CPU scheduling algorithms and deadlock handling mechanisms.

C403.3 Apply various mechanisms to achieve synchronization.

C403.4 Identify suitable mechanism for Inter Process Communication.

C403.5 Choose appropriate Memory Management techniques.

C403.6 Implement efficient File Management techniques through System Calls.

Unit – I Introduction

Introduction: System Structures, Operating System Services, User OS Interface, System Calls and Types, System Programs.

Process: Process Concept, Process Scheduling, Operations on Processes.

Multithreaded Programming: Overview, Multithreading Models.

Unit – II CPU Scheduling

CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling. System Call Interface for Process Management-fork, exit, wait, waitpid, exec

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

Unit – III Process management and Synchronization

Process Management and Synchronization: The Critical Section Problem, Synchronization, Hardware, Semaphores, Classical Problems of Synchronization, Monitors.

Inter Process Communication Mechanisms: IPC using Pipes, FIFOs, Message Queues, Shared Memory.

Unit – IV Memory Management and Virtual Memory

Memory Management: Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation.

Virtual Memory: Demand Paging, Page Replacement, Page Replacement Algorithms.

Unit – V File System Interface and operations

File System Interface: Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management.

File Operations: Usage of open, create, read, write, close, lseek, stat, ioctl system calls

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Principles - Sixth Edition, John Wiley.
2. W. Richard Stevens, Stephen A. Rago, Advanced Programming in the UNIX Environment, Pearson Education.

REFERENCE BOOKS:

1. William Stallings, Operating Systems - Internals and Design Principles, Fifth Edition- 2005, Pearson Education/PHI.
2. Crowley, Operating System A Design Approach, TMH.
3. Andrew S. Tanenbaum, Modern Operating Systems, 2nd edition, Pearson/PHI
4. Kernighan and Pike, UNIX programming environment, PHI/ Pearson Education
5. U. Vahalia, UNIX Internals - The New Frontiers, Pearson Education
6. Andrea Arpaci-Dusseau and Remzi Arpaci-Dusseau, Operating Systems: Three Easy Pieces.

B. Tech. II Year II Sem

Course Code	Course Title	L	T	P	Credits
SM404MS	**Business Economics & Financial Analysis**	3	0	0	3

Course Description: The course contains various topics related to forms of Business and the impact of economic variables on the Business. It includes the Demand, Supply, Production, Cost, Market Structure and Pricing aspects in business. The Students can study the firm's financial position by analyzing the Financial Statements of a Company which can be used in their engineering career development.

Course Outcomes: After completion of this course, the student will be able to

C404.1 Understand the Economic Concepts in business decision making process.

C404.2 Familiarize with the cost concepts, market structures.

C404.3 Make use of break-even analysis, CVP Analysis, pricing strategies.

C404.4 Examine financial accounting and analyze various financial statements.

C404.5 Interpret various financial statements by applying different types of ratios.

C404.6 Examine the usefulness of Investment decisions of a company

Unit – I Introduction To Business And Economics

Business: Introduction to business, Structure of Business Firm, Types of Business Entities: Sole Proprietorship, Partnership, Limited Liability Company & Co-operatives, Sources of Capital for a Company: Conventional, Non-Conventional Sources of Finance. Theory of Firm.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

Unit – II Demand And Supply Analysis

Demand: Demand Determinants, Law of Demand

Elasticity of Demand: Elasticity, Types of Elasticity, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

Unit – III Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Perfect competition, Monopoly, Oligopoly, Monopolistic Competition: Features and Price Determination.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

Unit – IV Financial Accounting

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

Unit – V Financial Analysis Through Ratios

Concept of Ratio Analysis, Importance, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS

1. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.
2. D.D.Chaturvedi, S.L.Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
3. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.

REFERENCE BOOKS

1. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.
2. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
3. D.M. Mithani, Managerial Economics: Theory and Applications, Himalaya Publishing House, 2017.

B. Tech. II Year II Sem

Course Code	Course Title	L	T	P	Credits
CS405PC	**Computer Organization and Architecture**	3	0	0	3

Pre-Requisites: 1. Elements of Computer Science and Engineering

2. Digital Electronics

Course Description: The course introduces computer design, organization, and architectural concepts, usage of register transfer language, instruction sets. It also consists of hardware algorithms on diverse topics such as computer arithmetic, memory organization, IO organization, Parallel processing and Vector processing enabling students to understand fundamental computing principles effectively.

Course Outcomes: After completion of this course, the student will be able to

C405.1 Apply the knowledge of computer design, organization, and architectural concepts to implement Micro-operations.

C405.2 Design a suitable Control unit for a decided set of Instructions.

C405.3 Design Hardware and Algorithms for manipulation of data, represented in different formats.

C405.4 Implement data transfer with appropriate IO Interface and Interrupt mechanism.

C405.5 Choose suitable type of Memory for a given purpose.

C405.6 Perform Parallel Processing using suitable mechanism.

Unit – I Introduction

Introduction: Definition of Computer Organization, Computer Design and Computer Architecture and types of architecture- Von-Neumann Architecture, Harvard Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt

Unit – II Microprogrammed Control, Central Processing Unit and Reduced Instruction Set Computer

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Unit – III Data Representation and Computer Arithmetic

Data Representation: Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – Point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Unit – IV Input-Output Organization and Memory Organization

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Main Memory, Associate Memory, Cache Memory.

Unit – V Pipeline and Vector Processing and Multi Processors

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

TEXT BOOKS

1. M. Morris Mano, Computer System Architecture, Third Edition, Pearson/PHI.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, 5th Edition, McGraw Hill Education.

REFERENCE BOOKS

1. William Stallings, Computer Organization and Architecture, Sixth Edition, Pearson/PHI.
2. Andrew S. Tanenbaum, Structured Computer Organization, 4th Edition, PHI/Pearson.
3. David A. Patterson, John L. Hennessy, Computer Organization and Design, The Hardware /Software Interface, 4th Edition.

B.Tech. II Year II Semester

Course Code	Course Title	L	T	P	Credits
CS406PC	**Operating Systems Lab**	0	0	2	1

Course Description: This Course compliments the Operating Systems syllabus. Students will be able to simulate and implement Operating Systems Concepts such as CPU Scheduling, Process Management through System Calls, Deadlock Management, Inter Process Communication, Semaphores, Memory Management, File Management, etc.,

Course Outcomes: After completion of this course, the student will be able to

C406.1 Evaluate CPU Scheduling Algorithms and Memory management techniques.

C406.2 Construct deadlock detection and avoidance algorithms.

C406.3 Solve classical problems of synchronization using semaphores.

C406.4 Evaluate Inter process communication mechanisms.

LIST OF PROGRAMS

CYCLE 1:

1. Write a program to simulate the following CPU Scheduling algorithms.
   a) FCFS b) SJF c) Round Robin d) priority
2. a) Write a program to implement Process management system calls viz., fork, exit, wait, waitpid, exec.
   b) Write a program to implement I/O system calls viz., open, read, write, close, seek, stat, opendir, readdir.

CYCLE 2:

3. Write a program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a program to implement the Producer–Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write a program to illustrate the following IPC mechanisms
   a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write a program to simulate the following memory management techniques
   a) Paging b) Segmentation
7. Write a program to simulate Contiguous Memory Allocation techniques
   a) First-Fit b) Best-Fit c) Worst-fit
8. Write a program to stimulate Page Replacement Algorithms
   a) FCFS b) LRU c) Optimal

TEXT BOOKS

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating System Principles - Sixth Edition, John Wiley.
2. W. Richard Stevens, Stephen A. Rago, Advanced Programming in the UNIX Environment, Pearson Education.

REFERENCE BOOKS

1. William Stallings, Operating Systems – Internals and Design Principles, Fifth Edition– 2005, Pearson Education/PHI.
2. Crowley, Operating System - A Design Approach TMH.
3. Andrew S Tanenbaum, Modern Operating Systems, 2nd edition, Pearson/PHI
4. Kernighan and Pike, UNIX Programming Environment, PHI/Pearson Education
5. U. Vahalia, UNIX Internals: The New Frontiers, Pearson Education

B.Tech. II Year II Semester

Course Code	Course Title	L	T	P	Credits
CS407PC	**Node JS/ React JS/Django**	0	0	2	1

Pre-Requisite: Object Oriented Programming through Java

Course Description: This course used to develop dynamic web applications using different frameworks and deploy them.

Course Outcomes: After completion of this course, the student will be able to

C407.1 Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.

C407.2 Demonstrate Advanced features of JavaScript and learn about JDBC.

C407.3 Develop Server – side implementation using Java technologies.

C407.4 Develop the server – side implementation using Node JS.

EXERCISES:

CYCLE - 1

WEEK – 1

1. Build a responsive web application for E-Book management system with registration, login, catalog and cart pages using CSS3 features, flex and grid. Description of application given in Ebook system of Software Engineering.
2. Make the above web application responsive web application using Bootstrap framework for E-ticketing system. Description of application given in E-ticketing of Software Engineering.

WEEK - 2

3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.

WEEK - 3

5. Develop a java standalone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.

WEEK - 4

6. Create an xml for the bookstore. Validate the same using both DTD and XSD. Description of application given in Book Bank of Software Engineering.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.

CYCLE-2

WEEK-5

8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)

WEEK-6

9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)

WEEK-7

11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.

WEEK-8

13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into Github.
15. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days using react application.

REFERENCE BOOKS:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press

B.Tech. II Year II Semester

Course Code	Course Title	L	T	P	Credits
*MC409	**Environmental Science**	3	0	0	0

Course Description: This course enables the students engage with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The course requires that students identify and analyze natural and human-made environmental problems, evaluate the relative risks associated with these problems. It provides the scope to examine alternative solutions for resolving or preventing them. It is essentially a multidisciplinary approach that brings out an appreciation of our natural world and human impact on its existence and integrity. Its components include Biology, Geology, Chemistry, Physics, Engineering, Sociology, Health, Anthropology, Economics, Statistics, Computers and Philosophy.

Course Outcomes: After completion of this course, the student will be able to

C409.1 Analyze the important components of environment.

C409.2 Illustrate the major environmental effects of exploiting natural resources.

C409.3 Utilize environmental laws for the protection of forest and wildlife.

C409.4 Categorize different types of pollutions and their control measures and discover effective methods of waste management.

C409.5 Identify global environmental problems and come out with best possible solutions.

C409.6 Illustrate green environmental issues.

Unit – I Ecosystems

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnifications, ecosystem value, services and carrying capacity, Field visits

Unit – II Natural Resources: Classification of Resources

Natural Resources: Classification of Resources: Living and Non-Living resources,

water resources: use and over utilization of surface and ground water, floods and droughts.

Dams: benefits and problems.

Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources,

Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies

Unit – III Biodiversity and Biotic Resources

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation.

Unit – IV Environmental Pollution and Control Technologies: Environmental Pollution

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.

Water pollution: Sources and types of pollution, drinking water quality standards.

Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.

Noise Pollution: Sources and Health hazards, standards**.**

Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management.

Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. **Green Environmental Issues:** Clean development mechanism, carbon foot printing, carbon credits, carbon sequestration and Polluter pay principle

Unit – V Environmental Policy, Legislation & EIA

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS

1. Erach Bharucha. Textbook of Environmental Studies for Undergraduate Courses. 1st edition, Universities press, 2005.
2. Anubha Kaushik, C.P. Kaushik. Perspectives in Environmental Studies. 4th edition, New age international publishers
3. S.Deswal and A.Deswal. A basic course in environmental studies. 2nd edition, Dhanapathi rai & Co.,2004.
4. Benny joseph. Environmental studies. 3rd edition, McGraw Hill Education (India) Private Limited.

REFERENCE BOOKS

1.Daniel B.Botkin and Edwards A.Keller. Environmental science. 8th edition, Wiley India (P) Ltd.

2. Richard T. Wright. Environmental Science: towards a sustainable future. 4th edition, PHL Learning Private Ltd.

3. P.D.Sharma. Ecology and Environment. 5th edition, Rastogi Publications.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS501PC	**Design and Analysis of Algorithms**	3	1	0	4

Pre-Requisite: Data Structures

Course Description: This course covers performance of algorithms, algorithmic design paradigms, modelling of problems using disjoint sets, priority queues and graphs, classification of problems into P & NP classes.

Course Outcomes: After completion of this course, the student will be able to

C501.1 Analyze the performance of the algorithms and represent using relevant notations.

C501.2 Apply the concepts of disjoint sets and priority queues to solve real world problems.

C501.3 Choose appropriate algorithmic design paradigms to solve various real world problems.

C501.4 Identify the issues in graph connectivity and resolve them.

C501.5 Reduce the search space of a problem using bounding functions.

C501.6 Categorize problems into NP hard & NP Complete.

Unit – I Introduction Algorithms and Sets

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations, Amortized Analysis.

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue - Heaps, Heapsort.

Unit – II Divide and Conquer & Greedy Method

Divide and conquer: General method, Applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

Greedy method: General method, Applications-Job sequencing with deadlines, knapsack problem, Single source shortest path problem.

Unit – III Dynamic Programming

Dynamic Programming: General method, Multistage Graph problem, Applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

Unit – IV Traversals & Backtracking

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

Backtracking: General method, applications, n-queen's problem, sum of subsets problem, graph Coloring, Hamiltonian cycles.

Unit – V Branch and Bound & P and NP Problems

Branch and Bound: General method, applications - Traveling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK

1. Ellis Horowitz, Satraj Sahni and Rajasekharan, Fundamentals of Computer Algorithms, University press, 1998.

REFERENCE BOOKS

1. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson education.
2. T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, Third edition, PHI Pvt. Ltd./ Pearson Education.
3. M.T. Goodrich and R. Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, John Wiley and sons.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS502PC	**Computer Networks**	**3**	**0**	**0**	**3**

Pre-Requisites: 1. Elements of Computer Science and Engineering
2. Data Structures

Course Description: This course covers concepts viz., basic taxonomy and terminology of the computer networking and enumerates the layers of OSI model and TCP/IP model. Design issues and Protocols related to Data link layer, Network layer, Transport layer and Application layer.

Course Outcomes: After completion of this course, the student will be able to

C502.1 Analyze pros and cons of the components, reference models and various transmission media.

C502.2 Analyze various link control and access control mechanisms available in the data link layer.

C502.3 Grasp the foundational principles, challenges, and mechanisms of the network layer in computer networks.

C502.4 Choose the appropriate routing algorithm suitable for the given network topology

C502.5 Manage the networks to ensure efficient, reliable, and high-quality communication.

C502.6 Assess the Transport layer protocols and the features of Application layer.

Unit – I Introduction to Networking Concepts

Network hardware, Network software, Reference Models, Example Networks: Internet, Wireless

LANs: 802.11x.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable and fiber optics.

Wireless Transmission: Electromagnetic Spectrum, Radio Transmission, Microwave Transmission and Infrared Transmission.

Data link layer: Design issues, Error detection and correction.

Unit – II Data Link Layer & Medium Access Control Sublayer

Elementary data link protocols: A Simplex protocol, A simplex stop and wait protocol for an

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocol: SONET

Medium Access Control Sublayer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, Collision free protocols, Ethernet; Data link layer switching.

Unit – III Network Layer -I

Network Layer Design Issues, Network Layer in the Internet: The IPv4 Protocol, IP Addresses, IPv6.

Routing algorithms: Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast, Multicast.

Unit – IV Network Layer –II

Congestion Control Algorithms, Quality of Service, Internetworking, BGP.

Unit – V Transport Layer &Application Layer

Transport Layer: Transport Services, Elements of Transport protocols, The Internet Transport protocols: TCP and UDP protocols.

Application Layer: The Domain Name System, Electronic Mail, The WORLD WIDE WEB, Streaming Audio and Video.

TEXT BOOK:

1. Andrew S Tanenbaum, David. j. Wetherall, Computer Networks, 5th Edition, Pearson Education/PHI

REFERENCE BOOKS:

1. S. Keshav, An Engineering Approach to Computer Networks,2nd Edition, Pearson
2. Behrouz A. Forouzan, Data Communications and Networking, Third Edition TMH.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS503PC	**DevOps**	3	0	0	3

Pre-Requisite: Software Engineering

Course Description: This course contains an advanced Software development model - DevOps. Work with Project Management using Git server and Docker. Integrating the system with Jenkins and finally testing using Selenium.

Course Outcomes: After completion of this course, the student will be able to

C503.1 Explore the various components of the DevOps environment.

C503.2 Identify Software development models and architectures of DevOps

C503.3 Work with Source code management.

C503.4 Choose a project management tool.

C503.5 Use the Jenkins integration tool to build the application.

C503.6 Choose appropriate testing tools deployment model for the project

Unit – I Introduction to DevOps

Introducing DevOps, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery. Release management, Scrum, Kanban and delivery pipeline, Identifying bottlenecks.

Unit – II Software development models and DevOps

DevOps Lifecycle for Business Agility, DevOps and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario,

Handling database migrations, Micro services and the data tier.

Unit – III Introduction to project management

The need for source code control, The history of source code management, Roles and code, source code management system and migrations, shared authentication. Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, Git Lab.

Unit – IV Integrating the system

Build systems, Jenkins build server, managing build dependencies, Jenkins plugins and file system layout, The host server, Build slaves, Triggers. Job chaining and build pipelines, build servers and infrastructure as code, building by dependency order, Build phases, Alternative build servers, Collating quality measures.

Unit – V Testing Tools and Deployment

Various types of testing, Automation of testing Pros and cons. Karate testing - Introduction, Karate testing features, Spring Boot Testing Pitfalls, Tips and Tricks.

Deployment of the system: Deployment systems, Virtualization stacks, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStack and Docker.

TEXT BOOK

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.
2. Benjamin Bischoff, Writing API Tests with Karate: Enhance your API testing for improved security and performance, Kindle Edition.

REFERENCE BOOKS

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect Perspective. Addison Wesley.
3. Testing Spring Boot Applications Demystified, Philip Riecks.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS511PE	**Graph Theory**	3	0	0	3

Pre-Requisite: Discrete Mathematics

Course Description: This course deals with some basic concepts and properties in graph theory and also covers the concepts of graph connectivity and colouring of graphs.

Course Outcomes: After completion of this course, the student will be able to

C511.1 Perform various operations in different digraphs.

C511.2 Apply the algorithms to find the shortest paths in connected graphs

C511.3 Analyze the classification of Trees based on properties and derive spanning trees.

C511.4 Describe the different types of graphs.

C511.5 Formulate and prove theorems about trees and graphs.

C511.6 Solve problems on vertex colourings.

Unit – I Introduction

Introduction: Definitions, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Union, Sum, Cartesian Product, Composition.

Unit – II Connected graphs and shortest paths

Walks, trails, paths, cycles, connected graphs, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Menger's theorem, Dijkstra's algorithm, Floyd Algorithm.

Unit – III Trees and Graphs

Definition, Characterization, and Simple Properties, minimum spanning trees, Counting the Number of Spanning Trees, Kruskal's Algorithm, Prim's Algorithm, Cayley's Formula, The Connector Problem. Special classes of graphs - Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Chinese Postman problem.

Unit – IV Independent sets coverings and matchings

Introduction: Vertex-Independent sets and Vertex coverings, Matching and factors, Matchings in bipartite graphs, Ramsey's Theorem, Perfect Matchings and the Tutte Matrix.

Unit – V Vertex Colorings

Basic definitions, Cliques and Chromatic number, Applications of Graph Coloring, Brooks Theorem, B-Colorings, Edge Colorings of graphs, Gupta-Vizing's Theorem.

A scheduling problem and equitable edge colouring.

TEXT BOOKS

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.
3. R. Balakrishnan and K. Ranganathan A Textbook of Graph Theory, Second edition.

REFERENCE BOOKS

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13.
2. Introduction to Graph Theory, Douglas B. West, Pearson.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS512PE	**Distributed Databases**	3	0	0	3

Pre-Requisite: Database Management Systems

Course Description: This course enriches the previous knowledge of database systems and exposes the need for distributed database technology to overcome the deficiencies of the centralized database systems.

Course Outcomes: After completion of this course, the student will be able to

C512.1 Analyze the architecture and design of distributed database systems.

C512.2 Explore the objectives and algorithms for distributed query processing.

C512.3 Apply the mechanisms for concurrency control and deadlock management.

C512.4 Evaluate the measures for distributed systems reliability and fault tolerance.

C512.5 Choose the appropriate parallel database system architecture for implementation

C512.6 Implement distributed object database management and data management systems.

Unit – I Distributed DBMS Architecture and Design

Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs, Complications and Design Issues.

Distributed DBMS Architecture: Architectural Models for Distributed DBMS, Autonomy, Distribution, Heterogeneity, Architectural Alternatives, Client/Server Systems, Peer-to-Peer Systems, Multi database System Architecture

Distributed Database Design: Top-Down Design Process, Distribution Design issues, Fragmentation, Allocation.

Unit – II Query Processing and Optimization

Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.

Distributed query Optimization: Query optimization, centralized query optimization, Join Ordering in Distributed Queries, distributed query optimization algorithms.

Unit – III Transaction Management and Concurrency Control

Transaction Management: Definition, properties of transaction, types of transactions.

Distributed concurrency control**:** serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

Unit – IV Reliability and Parallel Database Systems

Distributed DBMS Reliability: Reliability concepts and measures, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. Parallel Database Systems: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

Unit – V Distributed Object Database Management Systems and Data Management

Distributed Object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.

Data Management: Data Stream Management, Cloud Data Management

TEXT BOOKS

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

REFERENCE BOOKS

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The Complete Book”, Second Edition, Pearson International Edition.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS513PE	**Data Mining**	3	0	0	3

Pre-Requisite: Probability and Statistics

Course Description: This course covers the concepts such as discovering patterns, correlations, and anomalies, trends within large datasets to extract useful information and make informed decisions. This course also introduces the techniques, and algorithms used in data mining.

Course Outcomes: After completion of this course, the student will be able to

C513.1 Examine data mining tasks, KDD process, challenges and data types of data.

C513.2 Apply Data Preprocessing techniques to make data sets ready for mining.

C513.3 Identify the frequent patterns and association rules from transactional datasets.

C513.4 Apply pattern mining to the multilevel and multi-dimensional dataset.

C513.5 Classify the real world data into appropriate classes using various supervised learning techniques and measure its performance.

C513.6 Apply clustering and outlier detection techniques on given data sets and evaluate goodness measures.

Unit – I Data Mining

Introduction: Data mining, Kinds of data to be mined, Kinds of patterns to be mined, Technologies used, Applications of data mining, Major Issues in Data Mining.

Know Your Data: Data Objects and Attribute types, Basic statistical descriptions of data, Data visualization, Measuring data similarity and dissimilarity.

Unit – II Data Preprocessing

Data Preprocessing: Overview, Data cleaning- Missing values, Noisy data, Data cleaning as a process, Data integration - Entity identification problem, Redundancy and correlation analysis, Tuple duplication, Data value conflict detection and resolution.

Data Reduction & Transformation: Overview of data reduction strategies, Principal Component Analysis, Attribute subset selection, Parametric data reduction, Histograms, Clustering, Sampling, Data cube aggregation, Data transformation and Data discretization.

Unit – III Association Rule Mining

Mining Frequent Patterns: Basic concepts, Frequent itemset mining methods, Pattern evaluation methods.

Advanced Pattern Mining: Pattern mining in multilevel, Multidimensional space, Constraint- Based frequent pattern mining, Mining High-dimensional data and Colossal patterns, Pattern exploration and Application.

Unit – IV Classification

Classification and Prediction: Basic concepts, Decision tree induction, Bayesian classification, Rule based classification, Model evaluation and selection, Lazy Learner.

Unit – V Clustering and Application

Cluster analysis, Partitioning methods, Hierarchical methods, Density based methods, Grid based methods, Evaluation of clustering.

Outlier Detection: Outlier Analysis, Outlier detection methods, Statistical approaches, Proximity based approaches.

TEXT BOOK

1. Jiawei Han & Micheline Kamber, Data Mining – Concepts and Techniques, 3rd Edition Elsevier.

REFERENCE BOOKS

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.
2. Margaret H Dunham, Data Mining Introductory and Advanced topics, PEA.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS514PE	**Optimization Techniques**	3	0	0	3

Pre-Requisites: 1. Mathematics – I
2. Mathematics – II.

Course Description: This course introduces various optimization techniques like classical, linear programming, transportation problem, simplex algorithm, dynamic programming. Constrained and unconstrained optimization techniques for solving and optimizing electrical and electronic engineering circuits design problems in real world situations. This course also explains the concept of Dynamic programming and its applications to project implementation.

Course Outcomes: After completion of this course, the student will be able to

C514.1 Apply classical optimization techniques, linear programming, simplex algorithm

C514.2 Relate transportation and Assignment problem

C514.3 Illustrate Classical Optimization Techniques, Optimization with equality constraints.

C514.4 Use Multivariable Optimization with inequality constraints and Variable Nonlinear Unconstrained Optimization

C514.5 Analyze unconstrained optimization and constrained non-linear programming and Gradient methods

C514.6 Apply dynamic programming

UNIT – I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surface - classification of Optimization problems.

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT – II

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems. Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT - III

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints: Kuhn – Tucker conditions. Single Variable Nonlinear Unconstrained Optimization: Elimination methods: Uni Model function-its importance, Fibonacci method & Golden section method.

UNIT – IV

Multi variable nonlinear unconstrained optimization: Direct search methods – Univariant method, Pattern search methods – Powell's, Hooke - Jeeves, Rosenbrock's search methods.

Gradient methods: Gradient of function & its importance, Steepest descent method, Conjugate direction methods: Fletcher Reeves method &variable metric method.

UNIT – V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS

1. Singiresu S. Rao, Engineering Optimization Theory and Practice, John Viley &Sons.
2. Kalyanmoy Deb, Optimization for Engineering Design, PHI.

REFERENCE BOOKS

1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in Operations Research 3rd Edition, 2003.
2. H. A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3. Belegundu & Chandrupatla, Optimization Techniques, Pearson Asia.
4. M.C. Joshi, K. M. Moudgalya, Optimization Techniques Theory and Practice, Narosa Publications.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS521PE	**Computer Graphics**	3	0	0	3

Pre-Requisites: 1. Engineering Graphics
2. Programming for Problem Solving

Course Description: This course contains the fundamentals of drawing and filling primitives, exploring the attributes associated with output primitives, understanding both two-dimensional and three-dimensional geometric transformations, and delving into the concepts of two-dimensional and three-dimensional viewing.

Course Outcomes: After completion of this course, the student will be able to

C521.1 Explain application of computer graphics and apply different algorithms for drawing line, circle, polygon and polygon filling.

C521.2 Determine effects of Two-Dimensional geometric transformations on points, lines and planes.

C521.3 Explain window to view-port transformation

C521.4 Apply various clipping algorithms.

C521.5 Elaborate interpolation of line and space curves using Splines and Bezier curves.

C521.6 Determine the effects of Three-Dimensional geometric transformations on Three – Dimensional objects and explain the method of Three-Dimensional viewing and clipping

Unit – I Introduction, Output primitives, Polygon Filling

Introduction: Application areas of Computer Graphics, overview of graphics systems

Output primitives**:** Points and lines, line drawing algorithms (DDA and Bresenham's Algorithm) circle-generating algorithms and ellipse - generating algorithms

Filled Area primitives: Scan-line polygon fill algorithm, boundary-fill, flood-fill algorithm, Attributes of Output primitives- line attributes and curve attributes.

Unit – II Two-Dimensional Geometric Transformations

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transformations, transformations between coordinate systems.

Unit – III Two-Dimensional Viewing

The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, clipping operations, point clipping, Line clipping-Cohen Sutherland algorithms, Polygon clipping-Sutherland Hodgeman polygon clipping algorithm.

Unit – IV Three-Dimensional Object Representation

Polygon surfaces, quadric surfaces, spline representation, Bezier curve, B-Spline curves, Bezier and B-Spline surfaces.

Unit – V Three-Dimensional Geometric and Modelling Transformations

Translation, rotation, scaling, reflection and shear, composite transformations.

Three-dimensional viewing: Viewing pipeline, viewing coordinates, projections, view volume, General perspective- Projection Transformation, clipping.

TEXT BOOK

1. Donald Hearn and M. Pauline Baker, Computer Graphics C version, Pearson Education

REFERENCE BOOKS

1. David F Rogers, Tata Mc Graw hill, Procedural elements for Computer Graphics, 2nd edition.
2. Neuman and Sproul, Principles of Interactive Computer Graphics", TMH.
3. Shalini Govil, Pai, Principles of Computer Graphics, 2005, Springer.
4. Foley, VanDam, Feiner and Hughes, Computer Graphics Principles & Practice, second edition in C, Pearson Education.
5. Steven Harrington, Computer Graphics, TMH.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS522PE	**Information Retrieval Systems**	3	0	0	3

Pre-Requisites: 1. Data structures

2. Database Management Systems

Course Description: This course aims to provide the concepts of information retrieval and their application to locate relevant information in a large corpus of documents.

Course Outcomes: After completion of this course, the student will be able to

C522.1 Understand Information Retrieval Systems' (IRS) principles, capabilities, and functionalities.

C522.2 Choose appropriate data structure, file structure and indexing mechanism for efficient retrieval.

C522.3 Differentiate among various classes of automatic indexing methods and clustering techniques.

C522.4 Select suitable search technique based on the context.

C522.5 Apply visualization techniques for efficient presentation of information.

C522.6 Make use of the algorithms for different media data.

Unit – I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

Unit – II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N- Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

Unit – III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

Unit – IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

Unit – V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval (MIR): Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

TEXT BOOK

1. Gerald J. Kowalski, Mark T. Maybury. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition.

REFERENCE BOOKS

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
3. Robert Korfhage, Information Storage & Retrieval – John Wiley & Sons.
4. Yates and Neto, Modern Information Retrieval, Pearson Education.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS523PE	**Data Analytics**	3	0	0	3

Pre-Requisites: 1. Database Management Systems
2. Probability and Statistics

Course Description: This course explores the fundamental concepts of analytics, its principles and methods using statistical analysis. It contains supervised and unsupervised models with estimation to discover interesting patterns and analyze its impact in business decisions. This also covers the various search methods and visualization techniques to carry out standard data visualization and formal inference procedures.

Course Outcomes: After completion of this course, the student will be able to

C523.1 Fetch data from various sources and make it ready for analysis.

C523.2 Visualize the data and interpret the insights that exist in the data.

C523.3 Make use of various tools and technologies for data analysis.

C523.4 Apply regression techniques to data and evaluate performance.

C523.5 Build supervised and unsupervised learning models for objective segmentation.

C523.6 Build models for time series and evaluate its performance.

Unit – I Data Management

Design Data Architecture and manage the data for analysis, Databases &Types of Data and Variables, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality, Missing Values, Redundant data, Inconsistent Data, Noisy, Outliers, Data Processing.

Unit – II Data Visualization

Need for Visualization, Types of Visualization, Univariate Data Visualization- Univariate Statistics, Common Univariate Probability Distributions, Descriptive Bivariate Analysis- Two Quantitative Attributes, Two Ordinal Attributes, Descriptive Multivariate Analysis-Multivariate Frequencies, Multivariate Data Visualization, Infographics and Word Clouds.

Unit – III Data Analysis

Introduction to Analysis and Analytics, Tools and Environment, Application of Modeling in Business, Data Modeling Techniques, Missing Imputations, Need for Business Modeling.

Unit – IV Data Modelling

Introduction, Correlations and Relationships, Linear Regression, Blue property assumptions, Least Square Estimation, Non-linear regression, Logistic Regression, Advantages and Disadvantages of Regression Models, Analytics applications to various Business Domains.

Unit – V Objective Segmentation

Regression Vs Segmentation – Supervised Learning – Classification, Tree Building- Overfitting, Pruning and Complexity, Multiple Decision Trees, Unsupervised Learning-Clustering, Time Series Methods-Arima, Measures of Forecast Accuracy, ETL approach, Extract features from generated model and analyze, Data Analytics Application for Text.

TEXT BOOKS

1. Student's Handbook for Associate Analytics – II, III.
2. João Mendes Moreira, André C. P. L. F. de Carvalho, Tomáš Horváth, "A General Introduction to Data Analytics, Wiley.
3. Anil Maheswaran, McGrawHill - Data Analytics.

REFERENCE BOOKS

1. Julie Steele and Noah Iliinsky, "Beautiful Visualization, Looking at Data Through the Eyes of Experts", Oreilly.
2. Jure Leskovec, Anand Rajaraman, Jeff Ullman, "Mining of Massive Datasets", Stanford Univ, 2019.
3. M. Zaki and W. Meira, "Data Mining and Analysis: Fundamental Concepts and Algorithms".
4. Steinbach and Kumar, "Introduction to Data Mining", Tan, Addision Wesley, 2006.
5. Han, Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS524PE	**High Performance Computing**	3	0	0	3

Pre-Requisites: 1. Computer Organization & Architecture

2. Operating Systems

Course Description: This course introduces the basics of High - Performance Computing and the usage of different synchronization primitives and techniques to achieve high performance. This course elucidates the limitations of architectures, operating systems, and programming languages.

Course Outcomes: After completion of this course, the student will be able to

C524.1 Learn the basics of High-Performance Computing

C524.2 Know how to use different synchronization primitives and techniques to achieve high performance

C524.3 Implementation of Stack, Queues, Binary Search Trees.

C524.4 Discuss different Treaps, Skiplists and Hash tables.

C524.5 Understand the limitations of architectures, operating systems, and programming languages

C524.6 Construct various efficient parallel programs with CUDA.

UNIT – I

High-Performance Computing Basics; Introduction to Multi-threading, Synchronization Techniques: Coarse - Grained Synchronization, Fine-Grained Synchronization, Optimistic Synchronization, Lazy Synchronization, and Non-Blocking Synchronization.

UNIT – II

Synchronization Primitives: Locks and Barriers; Locks: Peterson Lock, Bakery Lock, Test-And- Set lock, Test-Test-And-Set lock, Exponential Backoff lock, Queue lock, and Hierarchical lock;

Barriers: Sense-Barrier and Combining Tree Barrier.

UNIT - III

Concurrent Implementation of Stacks, Queues, Binary Search Trees. ABA Problem.

UNIT – IV

Concurrent implementation of Treaps, Skiplists and Hash tables.

UNIT – V

Parameters for Measuring Performance, Identifying Performance Bottlenecks, Restructuring Applications for Memory Hierarchies. Heterogeneous Computing, Partitioning Applications for Heterogeneous Resources.

TEXT BOOK

1. Maurice Herlihy and Nir Shavit, "The Art of Multiprocessor Programming" Morgan Kaufmman Publishers.

REFERENCE BOOKS

1. "Petascale Computing: Algorithms and Applications", David A. Bader (Ed.), Chapman & Hall/CRC Computational Science Series.
2. M.J. Quinn, McGraw-Hill, "Parallel Programming in C with MPI and OpenMP".
3. Brian Goetz, Tim Peierls, Joshua Block, Joseph Bowbeer, David Holmes and Doug Lea, Addison Wesley, "Java Concurrency in Practice".
4. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012.
5. https://www.openmp.org/
6. https://www.openacc.org/
7. https://www.nvidia.com/en-in/data-center/resources/
8. https://gpuopen.com/

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS504PC	**DevOps Lab**	0	0	2	1

Course Description: This Course helps to develop a sustainable base for applications and ensure high scalability and also aims to shorten the software development lifecycle to provide continuous delivery with high-quality.

Course Outcomes: After completion of this course, the student will be able to

C504.1 Practice Source code management using GIT

C504.2 Build the environment for software application development using Jenkins.

C504.3 Apply different project management, integration and development tools

C504.4 Use Selenium tool for automated testing of application

LIST OF PROGRAMS

CYCLE 1:

1. Write code for a simple user registration form for an event using micro services frameworks.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.

CYCLE 2:

1. Integrate Kubernetes and Docker
2. Automate the process of running containerized applications for exercise 7 using Kubernetes.
3. Install and Explore Karate and Spring boot testing for automated testing.
4. Write a simple program in JavaScript and perform testing using Karate testing.
5. Develop test cases for the above containerized application using Spring boot testing.

REFERENCE BOOKS

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
3. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.
4. Benjamin Bischoff, Writing API Tests with Karate: Enhance your API testing for improved security and performance, Kindle Edition.
5. Philip Riecks, Testing Spring Boot Applications Demystified.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
EN505HS	**Advanced English Communication Skills Lab**	0	0	2	1

Course Description: This Course focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Outcomes: After completion of this course, the student will be able to

C318.1 Build sound vocabulary and its proper use contextually

C318.2 Analyze the given text and respond appropriately and develop efficacious writing skills

C318.3 Develop effective speaking skills and maximize job prospects

C318.4 Plan and make different forms of presentation using various techniques

Exercise-I

Main Topics: Thinking Skills, Personality Development, self confidence and assertiveness,

Flipped Sessions: Personal Sensitivity & Professional Sensibility (Reading & Discussion)

Writing Input: Writing concisely – Writing Abstracts – Slogan Writing

Exercise-II

Main Topics: Group Discussion: Dynamics of group discussion, intervention, summarizing, inclusion, modulation of voice, body language, relevance, fluency and coherence.

Flipped Sessions: Importance of Professional Updating & Upgrading (Reading & Discussions)

Writing Input: Writing concisely – Writing Abstracts – Slogan Writing

Exercise-III

Main Topics: Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews.

Resume writing Cover Letter – structure and presentation, planning, defining the career objective, projecting one's strengths and skills.

Flipped Sessions: Mock Interviews (Video Sessions & Practice)

Exercise-IV

Main Topics: Corporate Culture – Grooming and etiquette, communication media, academic ethics and integrity

Flipped Sessions: Corporate Culture, Etiquette & Grooming (Video Sessions & Practice through Role-play)

Writing Input: Writing to Define – Writing an effective SOP.

Exercise-V

Main Topics: Mini Project – General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar. Elements & Structure of effective presentation. Presentation tools – Body language, Eye contact, Props & PPT.

Flipped Sessions: Effective Presentations (Video & Writing Sessions, Practice through Emulation)

Writing Input: Writing to record – Writing minutes of meeting.

Reference Books

1. Madhavi Apte , "A Course in English communication" , Prentice-Hall of India, 2007
2. Dr. Shalini Verma, "Body Language- Your Success Mantra" , S Chand, 2006
3. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson,2010
4. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", New York: Palgrave Macmillan, 2004

* Flipped Class-room: Students explore the concept first and then trainer explains it, students work on their own.

Web sources

1. https://www.goskills.com/Soft-Skills
2. https://www.trainerbubble.com
3. https://www.skillsconverged.com

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS506PC	**UI design- Flutter**	0	0	2	1

Course Description: This Course provides hands-on experience in creating visually appealing and responsive user interfaces using the Flutter framework. Participants learn to build cross-platform applications with a single codebase, utilizing Flutter & widget-based architecture to craft beautiful designs for both iOS and Android platforms. The lab emphasizes practical skills in UI development, enhancing proficiency in Flutter rich set of tools and components.

Course Outcomes: After completion of this course, the student will be able to

C506.1 Apply the basics of the Dart programming language, Flutter Widgets.

C506.2 Create responsive UI Widgets using navigator in Flutter Applications

C506.3 Implement a form with various input fields and animations, along with validation and error handling.

C506.4 Demonstrate Flutter Application using REST API and Flutter debugging tools.

LIST OF PROGRAMS

CYCLE 1:

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
   b) Implement navigation with named routes.
5. a) Design stateful and stateless widgets.
   b) Implement state management using set State and Provider.
6. a) Create custom widgets for UI elements.
   b) Apply styling using themes and custom styles.

CYCLE 2:

7. a) Design a form with various input fields.
   b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.
    b) Use Flutter debugging tools to identify and fix issues.

REFERENCE BOOKS

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.
2. Eric Windmill, “Flutter in Action”.
3. Alessandro Biessek “Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2”.
4. Paul Deitel and Harvey Deitel, “Flutter Cookbook”
5. Prajyot Mainkar, “Google Flutter Mobile Development Quick Start Guide: Get up and running with iOS and Android development”.

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
CS507PC	**Computer Networks Lab**	0	0	2	1

Pre-Requisite: Programming for problem solving

Course Description: This lab introduces, implementation of various framing methods, error detection and correction mechanisms. Design and implementation of various routing protocols and congestion control. It helps in providing & monitoring security using tools like nmap, Wireshark and NS2.

Course Outcomes: After completion of this course, the student will be able to

C507.1 Implement various Framing methods, Error Control methods and Sliding window protocols.

C507.2 Analyze various protocols, operating system detection using appropriate monitoring tools.

C507.3 Evaluate various routing protocols and congestion control mechanisms.

C507.4 Evaluate the performance of routing protocols and IEEE 802.x standards using NS2 simulator

LIST OF PROGRAMS

CYCLE 1:

1. Implement the data link layer framing methods such as character count, character stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC- CCIP.
3. Develop a simple data link layer that performs the flow control using the sliding window
    i. protocol, and loss recovery using the Go-Back-N mechanism.
4. Wireshark
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics &Filters.
5. Nmap
    i. How to run Nmap scan
    ii. Operating System Detection using Nmap

CYCLE 2:

6. Implement Dijsktra's algorithm to compute the shortest path through a network
7. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
8. Implement distance vector routing algorithm for obtaining routing tables at each node.
9. Write a program for congestion control using Leaky bucket algorithm.
10. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

TEXT BOOK

1. Andrew S Tanenbaum, David. j. Wetherall, Computer Networks, 5th Edition. Pearson Education/PHI.

REFERENCE BOOKS

1. S. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Education.
2. Behrouz A. Forouzan, Data Communications and Networking – 3rd Edition, TMH.

WEB REFERENCES

1. https://nmap.org/
2. https://www.wireshark.org/
3. https://ns2simulator.com/ns2-download/

B.Tech. III Year I Semester

Course Code	Course Title	L	T	P	Credits
*MC 509	**Constitution of India**	3	0	0	0

Course Description: This course aims on the history of Indian Constitution, and to understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. It also addresses the role of socialism in India after the commencement of the Bolshevik Revolution and develops the spirit of nationalism.

Course Outcomes: After completion of this course, the student will be able to

C509.1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

C509.2 Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

C509.3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party (CSP) under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

C509.4 Discuss the passage of the Hindu Code Bill of 1956.

C509.5 Understand the Parliamentary form of Government in India.

C509.6 Discuss the role and importance of Local Administration.

Unit – I History and Philosophy of the Indian Constitution

History of Drafting Committee, Preamble and Salient Features of the Indian Constitution.

Unit – II Contours of Constitutional Rights & Duties

Fundamental Rights: Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy. Fundamental Duties.

Unit – III Organs of Governance

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Unit – IV Local Administration

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat.

Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

Unit – V Election Commission

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:

1. The Constitution of India, Government Publication, 1950 (Bare Act).

2. Mahendra Pal Singh, V.N.Shukla's Constitution of India, Eastern Book Company, 2017.

3. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

4. J.N. Pandey, Constitutional Law of India, Central Law Agency, 2018.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS601PC	**Machine Learning**	3	0	0	3

Course Description: This course introduces the basic concepts and techniques of Machine Learning with thorough understanding of the Supervised and Unsupervised learning techniques and its differences. The course elucidates the principles of evolutionary computing algorithms, ensembling techniques for increased prediction accuracy, and enlightens the principles of Reinforcement learning.

Course Outcomes: After completion of this course, the student will be able to

C601.1 Understand the basic concepts of Machine Learning Techniques.

C601.2 Evaluate various supervised, and unsupervised learning algorithms with ensemble techniques.

C601.3 Apply the neural network concepts with Perceptron and Back Propagation.

C601.4 Make use of Dimensionality Reduction concepts for model building.

C601.5 Apply evolutionary computing algorithms approach for search and optimization.

C601.6 Analyze the concepts of Reinforcement Learning for building autonomous systems.

Unit – I Introduction to Learning

Learning- Types of Machine Learning, Design a Learning System, Perspectives and Issues in Machine Learning, Concept Learning Task, Concept Learning as Search, Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Linear Discriminants, Perceptron, Linear Separability.

Unit – II Supervised and Unsupervised Learning

Linear Regression, Support Vector Machines, learning with Trees, Decision Trees, Constructing Decision Trees Classification and Regression Trees, Ensemble Learning, Boosting, Bagging, Different ways to Combine Classifiers, Basic Statistics, Gaussian Mixture Models, Nearest Neighbor Methods, Unsupervised Learning, K means Algorithms.

Unit – III Multi-Layer Perceptron– Going Forwards – Going Backwards

The Brain and the Neuron, Multilayer Perceptron– Going Forwards, Going Backwards: Back Propagation Error, Multilayer Perceptron in Practice, Examples of using the MLP, Overview, Deriving Back Propagation, Radial Basis Functions and Splines, Concepts, RBF Network, Interpolations and Basis Functions

Unit – IV Dimensionality Reduction and Evolutionary Learning

Curse of Dimensionality, Dimensionality Reduction, Linear Discriminant Analysis, Principal Component Analysis, Factor Analysis, Independent Component Analysis, Locally Linear Embedding, Isomap, Least Squares Optimization Evolutionary Learning, Genetic algorithms, Genetic Offspring: Genetic Operators, Using Genetic Algorithms.

Unit – V Reinforcement Learning

Reinforcement Learning, Overview, Getting Lost Example Markov Chain Monte Carlo Methods, Sampling, Proposal Distribution, Markov Chain Monte Carlo, Graphical Models, Bayesian Networks, Markov Random Fields, Hidden Markov Models, Tracking Methods.

TEXTBOOK

1. Stephen Marsland ― Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series.

REFERENCE BOOKS

1. Tom M Mitchell ― Machine Learning, First Edition, McGraw Hill Education, 2017.
2. Marco Gori, Alessandro Betti, Stefano Melacci, Machine Learning A Constraint-Based Approach, 2023.
3. Peter Flach ― Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.
4. Jason Bell ― Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014.
5. Ethem Alpaydin ― Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS602PC	**Formal Languages and Automata Theory**	3	0	0	3

Pre-Requisites: 1. Discrete Mathematics

2. Design and Analysis of Algorithms

Course Description: This course introduces a set of abstract machines, serve as models for computation - finite automata, pushdown automata and turing machines. This course also deals with undecidability and the relationship between these automata and formal languages.

Course Outcomes: After completion of this course, the student will be able to

C602.1 Design Finite Automata (FA) machines, minimization, achieve conversions among them.

C602.2 Construct Regular expressions and Test for regular languages

C602.3 Analyze Left Most Derivation (LMD), Right Most Derivation (RMD) and normal forms for context free grammars.

C602.4 Design Pushdown Automata for Languages, grammars and conversions.

C602.5 Design appropriate Turing Machine for a given problem.

C602.6 Distinguish between decidability and undecidability.

Unit – I Introduction to Finite Automata

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata (NFA): Formal Definition, an application, Text Search, NFA with ε-Transitions.

Deterministic Finite Automata (DFA): Definition of DFA, Process Strings, The language of DFA, Conversion of NFA with ε-transitions to NFA without ε-transitions. Conversion of NFA to DFA, Moore and Mealy machines, Equivalence of Automata and Minimization of Automata.

Unit – II Regular Expressions

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions and Regular Expression to Finite Automata. Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma, closure properties of Regular languages, Decision Properties of Regular Languages.

Unit – III Context-Free Grammars

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Applications of

Context-Free Grammars, Ambiguity in Grammars and Languages. Normal Forms for Context- Free

Grammars: Eliminating useless symbols, Eliminating Є-Productions, Unit productions. Chomsky Normal form and Greibach Normal form.

Unit – IV Push Down Automata

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDAs and CFGs, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata and Non- Deterministic Pushdown Automata, Conversion of CFG to PDA, PDA to CFG. Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications, closure properties of CFL's, decision Properties of CFL's.

Unit – V Turing Machines

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, the language of a Turing machine, types of Turing machine. Turing machines and halting. Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages. Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

TEXT BOOKS

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education.
2. Mishra and Chandra Shekaran, Theory of Computer Science – Automata languages and computation, 2nd edition, PHI.
3. K.V.N Sunitha, N. Kalyani, Formal Languages and Automata Theory, Pearson.

REFERENCE BOOKS

1. John C Martin, Introduction to Languages and The Theory of Computation, TMH.
2. Daniel I.A. Cohen, John Wiley, Introduction to Computer Theory.
3. P. K. Srimani, Nasir S. F. B, A Textbook on Automata Theory, Cambridge University Press.
4. Michael Sipser, Introduction to the Theory of Computation, 3rd edition, Cengage Learning.
5. Kamala Krithivasan, Rama R, Introduction to Formal Languages Automata Theory and Computation Pearson.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS603PC	**Artificial Intelligence**	3	0	0	3

Pre-Requisites: 1. Programming for problem solving
2. Data Structures

Course Description: This course explains the theory and development of computer systems capable of performing tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns.

Course Outcomes: After completion of this course, the student will be able to

C603.1 Understand search strategies and intelligent agents

C603.2 Understand different adversarial search techniques

C603.3 Interpret search algorithms for any AI problem

C603.4 Apply propositional logic, predicate logic for knowledge representation

C603.5 Apply AI techniques to solve problems of game playing, and machine learning

C603.6 Design Bayesian networks to model complex relationships and understand the semantics encoded in these graphical structures.

Unit – I Introduction to Artificial Intelligence

Introduction to AI: Intelligent Agents, problem-Solving Agents, searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

Unit – II Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real - Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic,

Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

Unit – III Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

Unit – IV Knowledge Representation

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Unit – V Uncertain knowledge and Learning Uncertainty

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain

Reasoning: Dempster-Shafer theory

TEXT BOOK

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Third Edition, Pearson Education.

REFERENCE BOOKS

1. E. Rich and K. Knight Artificial Intelligence, 3rd Edn, (TMH)
2. Patrick Henry Winston, Artificial Intelligence, 3rd Edn., Pearson Education.
3. Shivani Goel, Artificial Intelligence, Pearson Education.
4. Patterson, Artificial Intelligence and Expert systems, Pearson Education

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS611PE	**Full Stack Development**	3	0	0	3

Pre-Requisite: NODE JS/REACT JS/ DJANGO

Course Description: This course contains full-stack components such as Node.js, MongoDB, Express, React, and Angular JS to develop web page.

Course Outcomes: After completion of this course, the student will be able to

C611.1 Understand the Full-stack components for developing web applications.

C611.2 Apply packages of NodeJS to work with Data, Files, HTTP Requests and Responses.

C611.3 Use MongoDB database for storing and processing huge data.

C611.4 Explore MongoDB database connection with NodeJS application.

C611.5 Design faster and more effective single-page applications using Express and Angular.

C611.6 Create interactive user interfaces with react components.

Unit – I Introduction to Full Stack Development

Basic Web Development Framework- User, Browser, Webserver, Backend Services Full Stack Components - Node.js, MongoDB, Express, React, Angular.

Unit – II Node.js

NodeJS: Understanding Node.js, Working with Node Packages, creating a Node.js Application, Understanding the Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks, Working with JSON.

Accessing the File System from Node.js: Opening, Closing, Writing, Reading Files, Processing Query strings and Form parameters, Understanding Request, Response, and Server Objects, Implementing HTTP service in Node.js

Unit – III MongoDB

Understanding NoSQL and MongoDB, Building the MongoDB Environment, MongoDB CRUD operations, Accessing and Manipulating MongoDB Collections Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js, and objects Used in the MongoDB Node.js Driver.

Unit – IV Express and Angular

Getting Started with Express: Configuring Routes, Using Requests and Response Objects.

Angular: importance of Angular, Understanding Angular, creating a Basic Angular Application, Angular Components, Expressions, Data Binding, Built-in Directives, Custom Directives, Implementing Angular Services in Web Applications.

Unit – V React

Need of React, Simple React Structure, The Virtual DOM, React Components, Introducing React Components, Creating Components in React, Data and Data Flow in React. Rendering and Life Cycle, Methods in React, working with forms in React, integrating third-party libraries, Routing in React.

TEXT BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, Node.js, MongoDB and Angular Web Development, 2nd Edition, Addison-Wesley, 2019.
2. Mark Tielens Thomas, React in Action, 1st Edition, Manning Publications.

REFERENCE BOOKS

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, Apress, 2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, 1st edition, Apress, 2018.
3. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, 2nd edition, Addison-Wesley Professional, 2018.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS612PE	**Scripting Languages**	3	0	0	3

Pre-Requisite: Programming for Problem Solving

Course Description: This course contains script programming paradigm and introduces languages namely Ruby, Perl, TCL and Tk components.

Course Outcomes: After completion of this course, the student will be able to

C612.1 Differentiate among typical scripting languages, typical system and application programming languages.

C612.2 Apply the basic concepts of Perl. Design programs in Advanced Perl and Interfacing Different Operating Systems Security Issues.

C612.3 Develop Ruby web applications along with SOAP and web services. Incorporate a Ruby interpreter with Embed Ruby.

C612.4 Design the scripts using TCL and Tk along with Perl.

C612.5 Implement the appropriate utilities to manage the Linux environment.

C612.6 Implement shell scripts to automate the administrative process

Unit – I Introduction to Scripting PERL, Advanced PERL

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages.

PERL- Names and Values, Variables, Scalar Expressions, Control Structures, Arrays and Lists, Hashes, Strings, Patterns and Regular Expressions, Subroutines. Advanced PERL - Finer points of looping, Pack and unpack, filesystem, eval, Data Structures, Packages, Modules, Objects, Interfacing to the operating system, Creating Internet-aware applications, Dirty Hands Internet Programming, Security Issues.

Unit – II Introduction to Ruby, Extending Ruby

The structure and Execution of Ruby Programs- Lexical Structure, Syntactic Structure, File Structure, Program Encoding, Program Execution. Ruby and web: Writing CGI scripts, Cookies,

Choice of Webservers, SOAP and Web services

Ruby Tk – Simple Tk Application, Widgets, Binding events, Canvas, Scrolling

Extending Ruby: Ruby Objects in C, the Jukebox Extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

Unit – III TCL and Tk

TCL TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, Input/Output, Procedures, Strings, Patterns, Files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, Trapping errors, Event driven programs, Making applications Internet- aware, Nuts and Bolts Internet Programming, Security Issues-Running Untrusted Code, C Interface.

Tk Tk-Visual Toolkits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl Tk

Unit – IV Linux Shell Scripts

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities. Sed-Scripts, Operation, Addresses, Commands, awk-Execution, Fields and Records, Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications

Unit – V Shell Programming

Shell programming with Bourne again shell(bash)- Introduction, Shell responsibilities, Pipes and Redirection, Running a Shell Script, The Shell as a Programming Language, Shell Meta Characters, File Name Substitution, Shell Variables, Command substitution, Shell commands, The environment, Quoting, Test Command, Control Structures, Arithmetic in Shell, Shell Script examples, Interrupt Processing, Functions, Debugging Shell Scripts.

TEXT BOOKS

1. David Barron, The World of Scripting Languages, Wiley Publications.
2. David Flanagan and Yukihiro Matsumoto, Ruby Programming language, O'Reilly.
3. Dabve Thomas, "Programming Ruby" The Pramatic Progammers guide, 2nd edition.
4. Sumitabha Das, Unix Concepts and Applications, 4th Edition, TMH.
5. T. Chan, Unix System Programming using C++, PHI

REFERENCE BOOKS

1. James Lee and Bent Ware, Addison Wesley, Open Source Web Development with LAMP Using Linux Apache, MySQL, Perl and PHP, Pearson Education.
2. Ellie Quigley, PERL by Example, Pearson Education.
3. Larry Wall, T. Christiansen and J. Orwant, Programming Perl, O'Reilly, SPD.
4. Ousterhout, Tcl and the Tk Tool kit, Pearson Education.
5. J. P. Flynt, Perl Power, Cengage Learning.
6. Neil Matthew, Richard Stones, Wrox, Beginning Linux Programming, 4th Edition.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS613PE	**Internet of Things**	3	0	0	3

Pre-Requisite: Computer Networks

Course Description: The course introduces Physical Design of IoT, Logical Design of IoT, M2M, IoT System Management with NETCONF-YANG, Arduino board. The course elucidates IoT Systems – Logical design using Python programme, IoT Physical Devices and Endpoints using Raspberry Pi board, and IoT and Case studies on Agriculture, Environment.

Course Outcomes: After completion of this course, the student will be able to

C613.1 Understand basic components in various IoT architectures

C613.2 Analyze different system management skills to address the challenges in implementation

C613.3 Apply Arduino programming skills for integration with the board.

C613.4 Make use of Python concepts to create solutions for diverse applications.

C613.5 Interface different components using Raspberry Pi board.

C613.6 Develop suitable solutions for the problems occurred in Industry.

Unit – I Introduction, Physical Design of IoT, Logical Design of IoT

Introduction: Definition and Characteristics of IoT, Sensing, Actuation

Physical Design of IoT: Things in IoT, IoT protocols

Logical Design of IoT: IoT Functional blocks, IoT communication Models, IoT communication APIs

Unit – II IoT and M2M, IoT System Management with NETCONF-YANG

IoT and M2M - Introduction, M2M, Difference between IoT and M2M

IoT System Management with NETCONF-YANG - Need for IoT system Management, Simple Network management protocol, and Network operator requirements.

Unit – III Arduino, IoT Systems – Logical design using Python

Arduino: Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes

Unit – IV IoT Physical Devices and Endpoints

Basic building blocks of an IoT Device, Raspberry Pi, About the Board, Linux on Raspberry Pi

Raspberry Pi Interfaces-Serial, SPI, I2C

Programming Raspberry PI with Python- Controlling LED with Raspberry Pi, Interfacing LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi

Unit – V Case studies

Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture, Health & Lifestyle.

TEXT BOOK

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things: A Hands-on Approach.
2. Pethuru Raj and Anupama C. Raman , The Internet of Things: Enabling Technologies, Platforms, and Use Cases (CRC Press)
3. Terokarvinen, kemo, karvinen and villey valtokari, Make sensors, 1st edition, maker media, 2014

REFERENCE BOOKS

1. Waltenegus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks: Theory and Practice.
2. Charles Bell, Beginning Sensor networks with Arduino and Raspberry Pi, Apress, 2013

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS614PE	**Software Testing Methodologies**	3	0	0	3

Pre-Requisite: Software Engineering

Course Description: This Course provides a comprehensive overview of various software testing methodologies, techniques and best practices to ensure the delivery of high-quality software products. This course also deals with the principles and processes involved in testing software applications from unit testing to system testing.

Course Outcomes: After completion of this course, the student will be able to

C614.1 Understand the software testing foundations and bugs

C614.2 Apply suitable testing techniques for representation of flow graphs

C614.3 Apply data flow and interface testing techniques for identifying nice and ugly domains

C614.4 Choose appropriate path expression, KV charts for logic based testing strategies

C614.5 Examine the state graphs for state testing and the testability tips

C614.6 Explore graph matrices, matrix properties and node reduction algorithms.

Unit – I Software Testing fundamentals

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of Bugs. Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit – II Testing types- Transaction flow testing and Domain testing

Transaction Flow Testing: transaction flows, transaction flow testing techniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: Domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domains and testability

Unit – III Path testing and Logic based Testing

Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

Unit – IV State testing and Transition Testing

State, State Graphs and Transition testing: State graphs, good & bad state graphs, state testing, Testability tips.

Unit – V Applications of Graph matrices

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

TEXT BOOKS

1. BarisBeizer, Dreamtech, Software Testing techniques, second edition.

2. SPD(Oreille), Software Testing Techniques.

REFERENCE BOOKS

1. Brian Marick, The craft of software testing, Pearson Education.

2. Dr. K. V. K. K. Prasad, Software Testing Tools, Dreamtech.

3. Edward Kit, Software Testing in the Real World, Pearson.

4. Perry, Effective methods of Software Testing, John Wiley.

5. Meyers, Art of Software Testing, John Wiley.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS604PC	**Machine Learning Lab**	0	0	2	1

Pre-Requisite: Python Programming Laboratory

Course Description: This Course implements fundamental statistical concepts using Python libraries. Various classification and regression models are built, which helps to gain practical experience in machine learning model selection and evaluation.

Course Outcomes: After completion of this course, the student will be able to

C604.1 Implement statistical concepts required for data analysis

C604.2 Analyze data, model, model complexity, and predict the trends.

C604.3 Correlate various machine learning algorithms along with their strengths and weaknesses.

C604.4 Build predictive models from data and analyze the model performance.

LIST OF EXPERIMENTS:

CYCLE 1:

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode, and Measure of Dispersion: Variance and Standard Deviation.
2. Write a program to perform Arithmetic Array Operations (Addition, Subtraction, Multiplication, Division, Exponentiation, and Modulus) using Libraries such as Statistics, Math, Numpy and Scipy.
3. Implement and demonstrate the following by importing the dataset from load_ dataset.
   a. Pandas library function for data analysis & manipulation
   b. Matplotlib library functions for data visualization
4. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis for a given dataset.

```
['Sunny', 'Warm', 'Normal', 'Strong', 'Warm', 'Same', 'Yes']
['Sunny', 'Warm', 'High', 'Strong', 'Warm', 'Same', 'Yes']
['Rainy', 'Cold', 'High', 'Strong', 'Warm', 'Change', 'No']
['Sunny', 'Warm', 'High', 'Strong', 'Cool', 'Change', 'Yes']
```

CYCLE 2:

5. a. Write a Python program to find out the correlation between Salary (dependent variable) and Experience (independent variable) using Simple Linear Regression.
   b. Using scikit-learn, perform House Price Prediction with Multiple Linear Regression (minihomeprices.csv)

6. Write a program to Predict Humidity using Decision Tree Algorithm. (daily_weather.csv)

7. Write a program to implement k-Nearest Neighbour classification algorithm using iris dataset.

8. Write a program to predict rainfall using Logistic Regression. (weatherAUS.csv)

9. Write a program to implement K-Means algorithm for clustering Mallcustomers (Mallcustomers.csv)

10. Build a Multi-Layer Perceptron (MLP) neural network model for Regression using Keras (minihomeprices.csv / housing.csv)

TEXT BOOK

1. Tom M Mitchell ― Machine Learning, First Edition, McGraw Hill Education, 2017.

REFERENCE BOOK

1. Stephen Marshland, Taylor & Francis, Machine Learning: An Algorithmic Perspective, Second Edition.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS605PC	**Artificial Intelligence Laboratory**	0	0	2	1

Course Description: This Course introduces hands-on experience in implementing, experimenting with, and understanding various AI techniques and algorithms.

Course Outcomes: After the completion of this course, the student will be able to

C605.1 Demonstrate a deep understanding of fundamental search algorithms.

C605.2 Apply algorithmic techniques to implement games.

C605.3 Exhibit proficiency in solving complex problems through heuristic search algorithms

C605.4 Apply evaluation skills, to assess and select appropriate optimization techniques.

LIST OF PROGRAMS

CYCLE 1:

1. Create a program to implement linear regression.
2. Implement a decision tree classifier for a basic classification problem.
3. Implement the Breadth-First Traversal algorithm on a given graph.
4. Write a program for Depth-First Traversal in a graph.
5. Develop a two-player Tic-Tac-Toe game. Allow users to make moves on a 3x3 grid, and implement the logic to determine the winner or declare a draw.
6. Implement the search algorithm to solve the 8-Puzzle problem.

CYCLE 2:

7. Solve the classic Water-Jug Problem using a search algorithm. Given two jugs with different capacities, determine the sequence of actions needed to measure a specific quantity of water
8. Design a program to solve the Travelling Salesman Problem using a suitable algorithm.
9. Write a program to solve the Tower of Hanoi problem.
10. Solve the Monkey Banana Problem using a search or planning algorithm.
11. Implement the Alpha-Beta Pruning algorithm for optimizing the search in a minimax game tree.
12. Solve the 8-Queens Problem using a search algorithm. Implement a program to find a placement of eight queens on a chessboard such that no two queens attack each other

TEXT BOOK

1. Stuart Russell and Peter Norvig, Artificial Intelligence a Modern Approach, Third Edition, Pearson Education.

REFERENCE BOOKS

1. E. Rich and K. Knight (TMH), Artificial Intelligence, 3rd Edn.
2. Patrick Henny Winston, Artificial Intelligence, 3rd Edn., Pearson Education.
3. Shivani Goel, Artificial Intelligence, Pearson Education.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS621PE	**Full Stack Development Lab**	0	0	2	1

Course Description: This Course introduces front and backend tools, to create web-based applications, and understands effective database access and also fast, efficient, interactive, and scalable web applications using a run-time environment provided by the full-stack components.

Course Outcomes: After completion of this course, the student will be able to

C621.1 Design flexible and responsive Web applications using Node JS

C621.2 Perform CRUD operations with MongoDB on a huge amount of data.

C621.3 Use various full-stack modules to handle HTTP requests and responses.

C621.4 Develop real time applications using react and Angular components.

LIST OF PROGRAMS

CYCLE 1:

1. Create an application to setup node JS environment and display “Hello World”.
2. Create a Node JS application for user login system.
3. Write a Node JS program to perform read, write, and other operations on a file.
4. Create a food delivery website where users can order food from a particular restaurant listed on the website for handling http requests and responses using NodeJS.
5. Implement a program with basic commands on databases and collections using MongoDB.
6. Implement CRUD operations on the given dataset using MongoDB.
7. Perform Count, Limit, Sort, and Skip operations on the given collections using MongoDB.

CYCLE 2:

8. Develop an angular JS form to apply CSS and Events.
9. Develop a Job Registration form and validate it using angular JS.
10. Write an angular JS application to access JSON file data of an employee from a server using $http service.
11. Develop a web application to manage student information using Express and Angular JS Write a program to create a simple calculator Application using React JS.
12. Write a program to create a voting application using React JS

13. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days using react application.
14. Build a music store application using react components and provide routing among the web pages.

TEXT BOOKS

1. Brad Dayley, Brendan Dayley, Caleb Dayley, Node.js, MongoDB and Angular Web Development, 2nd Edition, Addison-Wesley, 2019.
2. Mark Tielens Thomas., React in Action, 1st Edition, Manning Publications.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS622PE	**Scripting Languages Lab**	0	0	2	1

Course Description: This course contains the programs using Ruby, Perl, TCL scripting languages to solve the problems from different domains.

Course Outcomes: After completion of this course, the student will be able to

C622.1 Script using the features of Perl Script

C622.2 Solve the problems writing the appropriate Ruby Script

C622.3 Apply the constructs of TCL using Tk to write the scripts.

C622.4 Make use of the features of Shell scripts.

CYCLE 1:

1. a) Perl script that determines the largest number among three given numbers.
   b) Perl script that utilize subroutines to print multiplication tables from 1-10.
2. Implement the following list of manipulating functions using Perl program.
   a) Shift b) Unshift c) Push
3. a) Develop a Perl script that replaces one word with another in a given string.
   b) Create a Perl script to check the validity of both IP addresses and email addresses.
4. Develop a Perl script that prints the contents of a file in reverse order, utilizing command line arguments.
5. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
6. Develop a Ruby script that prompts the user for their first and last names, then prints them in reverse order with a space between them.
7. Create a Ruby script that prompts the user to input a filename and then prints out the file extension.
8. Craft a Ruby program to obtain the total marks from a hash containing subject names and their respective marks for a student.

CYCLE 2:

9. Compare and contrast different approaches to calculating factorials in TCL.
10. Compose a TCL script demonstrating comprehension by calculating the product of numbers ranging from 1 to 10.

11. Construct a TCL script illustrating application skills by sorting a list using a custom – Defined comparison function.

12. Define TCL script to (i) create a list (ii) append elements to the list (iii) Traverse the list (iv) Concatenate the list.
13. AWK script to find the number of characters, words and lines in a file.
14. AWK script to count the number of lines in a file that do not Contain vowels.
15. Shell script that receives any number of file names as arguments, Check if every argument supplied is a file or directory & report accordingly. Whenever the arguments are supplied as a file the number of lines on it is also reported.
16. Using shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.

TEXT BOOKS

1. David Barron, The World of Scripting Languages, Wiley Publications.
2. David Flanagan and Yukihiro Matsumoto, Ruby Programming language by O'Reilly
3. Dabve Thomas, "Programming Ruby" The Pramatic Programmers guide, Second Edition.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS623PE	**Internet of Things Lab**	**0**	**0**	**2**	**1**

Course Description: This Course introduces the programming using Arduino, Raspberry Pi, Node MCU for the data collected from different sensors.

Course Outcomes: After completion of this course, the student will be able to

C623.1 Inference the impact and challenges posed by IoT networks leading to new architectural models.
C623.2 Compare and contrast the deployment of smart objects and the technologies to connect them to the network.
C623.3 Appraise the role of IoT protocols for efficient network communication
C623.4 Elaborate Python programming with various interfacing devices using Raspberry PI
C623.5 Illustrate different sensor technologies for sensing real-world entities and identify the applications of IoT in Industry.
C623.6 Construct a restful web API.

CYCLE 1:

1. Installing OS on Raspberry Pi

   a) Installation using PiImager

   b) Installation using image file
   Downloading an Image
   Writing the image to an SD card
   using Linux
   using Windows
   Booting up Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html

2. Accessing GPIO pins using Python
   a). Installing GPIO Zero library.
   First, update your repositories list:
   sudo apt update
   Then install the package for Python 3:
   sudo apt install python3-gpiozero

b). Blinking an LED connected to one of the GPIO pin

c). Adjusting the brightness of an LED Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wave length

3. Displaying the RSS news feed headlines on a LCD display connected to a device using Raspberry pi. (Additional Program)

CYCLE 2:

4. Using Raspberry Pi
   a) Calculate the distance using a distance sensor.
   b) Basic LED functionality.

5. Using Arduino
   a) Calculate the distance using a distance sensor.
   b) Basic LED functionality.
   c) Calculate temperature using a temperature sensor.

6. Using Arduino

Using the light sensors, monitor the surrounding light intensity &automatically turn ON/OFF the high intensity LED's by taking some pre-defined threshold light intensity value. (Additional Program)

CYCLE 3:

7. Using Node MCU
   a) Calculate the distance using a distance sensor.
   b) Basic LED functionality.
   c) Calculate temperature using a temperature sensor.

8. Collecting Sensor Data
   a) DHT Sensor interface
      - Connect the terminals of DHT GPIO pins of Raspberry Pi.
      - Import the DHT library using import Adafruit_DHT Read sensor data and display it on screen

9. Collecting Sensor Data in cloud
   a) DHT Sensor interface
      - Connect the terminals of DHT GPIO pins of Raspberry Pi.
      - Import the DHT library using import Adafruit_DHT Read sensor data and display it on screen and cloud (Thing Speak). (Additional Program)

REFERENCE BOOKS

1. Arshdeep Bahga and Vijay Madisetti, Internet of Things - A Hands-on Approach, Universities Press, 2015.

2. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
CS624PE	**Software Testing Methodologies Lab**	0	0	2	1

Course Description: This Course provides knowledge of software testing methods. This Course aims develop skills in automation of software testing and software test automation management using the latest tools.

Course Outcomes: After completion of this course, the student will be able to

C624.1 Design and develop the best test strategies in accordance with the development model.

C624.2 Design and develop GUI, Bitmap and database checkpoints.

C624.3 Develop database checkpoints for different checks

C624.4 Perform batch testing with and without parameter passing

CYCLE 1:

1. Recording in context sensitive mode and analog mode.
2. GUI checkpoint for single property.
3. GUI checkpoint for single object/window.
4. GUI checkpoint for multiple objects.
5. a. Bitmap checkpoint for object/window.
   b. Bitmap checkpoint for screen area.
6. Database checkpoint for Default check.
7. Database checkpoint for custom check.

CYCLE 2:

8. Database checkpoint for runtime record check.
   a. Data driven test for dynamic test data submission.
   b. Data driven test through flat files.
   c. Data driven test through front grids.
   d. Data driven test through excel test.
9. Batch testing without parameter passing.
10. Batch testing with parameter passing.
11. Data driven batch.
12. Silent mode test execution without any interruption.
13. Test case for calculator in windows application.

14. Use Protractor tool for end-to-end testing of an Angular application.

TEXT BOOKS

1. Baris Beizer, Software Testing techniques, 2nd Edition, Dreamtech.
2. SPD(Oreille), Software Testing Techniques.

REFERENCE BOOKS

1. Brian Marick, The craft of software testing, Pearson Education.
2. Dr. K.V.K.K.Prasad, Software Testing Tools, Dreamtech.
3. Edward Kit, Software Testing in the Real World, Pearson.
4. Perry, John Wiley, Effective methods of Software Testing.
5. Meyers, John Wiley, Art of Software Testing.

B.Tech. III Year II Semester

Course Code	Course Title	L	T	P	Credits
*MC 607	**Intellectual Property Rights**	3	0	0	0

Course Description: This Course aims to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

Course Outcomes: After completion of this course, the student will be able to

C607.1 Understand the fundamental aspects of Intellectual Property Rights who are going to play a major role in development and management of innovative projects in industries.

C607.2 Examine Trademarks, Acquisition of Trade Mark Rights and its registration processes.

C607.3 Evaluate various aspects relating to copyrights and its procedure for registration processes.

C607.4 Evaluate with the Trade Secret Law, protection for submission, Unfair Competition.

C607.5 Evaluate on the International Developments in Intellectual Property Rights.

C607.6 Interpret about current trends in IPR and the steps taken by the Government of India in fostering IPR.

Unit – I Introduction to Intellectual property

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Unit – II Trade Marks

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

Unit – III Law of copy rights

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Unit – IV Trade Secrets

Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

Unit – V New development of intellectual property

New developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS

1. Deborah. E. Bouchoux, Intellectual property right, Cengage learning.
2. prabuddha ganguli, Intellectual property right – Unleashing the knowledge economy, Tata McGraw Hill Publishing company ltd.

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS701PC	**Cryptography and Network Security**	3	0	0	3

Course Description: This course contains concepts and techniques related to cryptography and network security.

Course Outcomes: After completion of this course, the student will be able to

C701.1 Illustrate the concepts and principles of security Attacks, Services and Mechanisms.

C701.2 Evaluate applications of Cryptographic algorithms in real time scenarios.

C701.3 Demonstrate Message authentication, Hash function.

C701.4 Assess different key management techniques and web security considerations

C701.5 Apply different methods of wireless network security

C701.6 Analyze email security techniques

Unit – I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

Unit – II

Symmetric key Ciphers: Block Cipher principles, DES, Blowfish, RC4, RC5, IDEA, AES, Block cipher operations.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

Unit – III

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA-512),

Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Unit – IV

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).

Unit – V

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

TEXT BOOKS

1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition
2. Atul Kahate, Mc Graw Hill, Cryptography and Network Security, 3rd Edition

REFERENCE BOOKS

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security: Wiley India, 1st Edition.
2. Forouzan Mukhopadhyay, Mc Graw Hill, Cryptography and Network Security: 3rd Edition
3. Bruce Schneier, Applied Cryptography: Protocols, Algorithms, and Source Code in C.
4. WM. Arthur Conklin, Greg White, Principles of Computer Security, TMH
5. Neal Krawetz, Introduction to Network Security, CENGAGE Learning
6. Bernard Menezes, Network Security and Cryptography, CENGAGE Learning

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS702PC	**Compiler Design**	3	0	0	3

Pre-Requisite: Formal Languages and Automata Theory

Course Description: This Course covers the fundamental principles, tools, and techniques necessary for building a compiler and understanding its role in programming language processing.

Course Outcomes: After completion of this course, the student will be able to

C702.1 Identify the phases in design of a compiler and acquiring the skill of lex tool.

C702.2 Implement top-down parsers and bottom-up parsers.

C702.3 Differentiate synthesized and inherited attributes.

C702.4 Construct intermediate code based on abstract tree and symbol table data.

C702.5 Illustrate the different code generators for flow graphs

C702.6 Examine the performance of code optimization techniques

Unit – I

Introduction: The structure of a compiler, the science of building a compiler, programming language basics, Compiler-Construction Tools.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Design of Lexical-Analyzer Generator Lex.

Unit – II

Syntax Analysis: Introduction, Context-Free Grammars, writing a Grammar, Top-Down Parsing, Bottom-Up Parsing.

Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators, Parser Generators YACC.

Unit – III

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L- Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

Unit – IV

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Code Generation: Issues in the Design of a Code Generator, The Target Language, addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Unit – V

Machine-Independent Optimization: The Principal Sources of Optimization, Introduction to Data- Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

TEXT BOOK

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman. Compilers: Principles, Techniques and Tools, Second Edition

REFERENCE BOOKS

1. John R. Levine, Tony Mason, Doug Brown - Lex & Yacc O'reilly

2. Louden, Thomson, Compiler Construction.

3. Dr K V N Sunitha, Compiler Construction, Pearson.

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
SM703MS	**Organizational Behavior**	3	0	0	3

Course Description: This Course introduces the conceptual framework and the theories underlying Organizational Behavior.

Course Outcomes: After completion of this course, the student will be able to

C703.1 Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.

C703.2 Assess the potential effects of organizational level factors (such as structure, culture and change) on organizational behavior.

C703.3 Critically evaluate the potential effects of important developments in the external environment (such as globalization and advances in technology) on organizational behavior.

C703.4 Analyze organizational behavioral issues in the context of organizational behavior theories, models and concepts.

C703.5 Analyze Group Behavioral influence in an organization

C703.6 Analyze working with different people from different cultural and diverse background in the workplace.

Unit – I Introduction to Organizational Behaviour

Organizational Behavior (OB): Definition, Nature and Scope –Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour.

Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization - Social perception – Attribution Theories – Locus of control –Attribution Errors –Impression Management.

Unit – II Cognitive Processes-II

Personality and Attitudes - Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organizational commitment- Motivational needs and processes- Work Motivation Approaches Theories of Motivation- Motivation across cultures - Positive organizational behavior: Optimism – Emotional intelligence – Self-Efficacy.

Unit – III Dynamics of OB-I

Communication – types - interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision making techniques – creativity and group decision making.

Dynamics of OB –II: Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict - strategies to cope with stress and conflict.

Unit – IV Dynamics of OB –III

Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups –dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

Unit – V Leading High performance

Job design and Goal setting for High performance- Quality of Work Life- Socio technical Design and High performance work practices - Behavioral performance management: reinforcement and punishment as principles of Learning –Process of Behavioral modification - Leadership theories - Styles, Activities and skills of Great leaders.

TEXT BOOKS

1. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009

2. Robbins, P. Stephen, Timothy A. Judge: Organizational Behaviour, 12/e, PHI/Pearson, New Delhi, 2009.

3. Nelson: Organizational Behaviour, 3/e, Thomson, 2008.

REFERENCE BOOKS

1. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.

2. Hitt: Organizational Behaviour, Wiley, 2008

3. Aswathappa: Organisational Behaviour, Himalaya, 2009

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS711PE	**Quantum Computing**	3	0	0	3

Course Description: This course explores Quantum information theory, Algorithms, Cryptography, Noise, Error Correction, and Tools.

Course Outcomes: After completion of this course, the student will be able to

C711.1 Understand the basics of quantum information theory.

C711.2 Implement Quantum algorithms

C711.3 Apply the various Quantum Cryptographic Techniques

C711.4 Analyze different Quantum Noise operators

C711.5 Illustrate Quantum Error Correction Methods

C711.6 Identify the tools of Quantum Information Theory

Unit – I

Introduction: Qubits and Quantum States, Matrices and Operators, Quantum Measurement Theory, Entanglement, Quantum Gates and Circuits.

Unit – II

Quantum Algorithms: Matrix Representation of Serial and Parallel Operations, Quantum Interference, Quantum Parallelism and Function Evaluation, Deutsch-Jozsa Algorithm, Shor's Algorithm, Quantum Searching and Grover's Algorithm.

Unit – III

Quantum Cryptography: A Brief Overview of RSA Encryption, Basic Quantum Cryptography, An Example Attack: The Controlled NOT Attack, The B92 Protocol, The E91 Protocol -Ekert.

Unit – IV

Quantum Noise and Error Correction: Single-Qubit Errors, Quantum Operations and Krauss Operators, The Depolarization Channel, The Bit Flip and Phase Flip Channels, Amplitude Damping, Quantum Error Correction.

Unit – V

Tools of Quantum Information Theory: The No-Cloning Theorem, Trace Distance, Fidelity, Entanglement of Formation and Concurrence, Information Content and Entropy.

TEXT BOOK

1. David McMahon-Quantum Computing Explained-Wiley-Interscience, IEEE Computer Society ,2008.

REFERENCE BOOKS

1. M. A. Nielsen & Chuang, Quantum Computation and Quantum Information, Cambridge University Press ,2013.
2. Eleanor G. Rieffel and Wolfgang H. Polak, Quantum Computing, A Gentle Introduction, MIT Press, 2014.

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS712PE	**Advanced Operating Systems**	3	0	0	3

Pre-Requisite: Operating Systems

Course Description: This course covers Distributed Systems' concepts, design, and challenges, including architectures, communication, synchronization, deadlocks, file systems, scheduling, resource management, distributed memory, load distribution, and algorithm implementation.

Course Outcomes: After completion of this course, the student will be able to

C712.1 Understand the various architectures of distributed systems

C712.2 Implement different distributed mutual exclusion algorithms

C712.3 Compare distributed deadlock detection and resolution strategies.

C712.4 Analyze Multiprocessor System Architectures.

C712.5 Apply Distributed File System Concepts

C712.6 Demonstrate various distributed scheduling and shared memory systems

Unit – I

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives.

Theoretical Foundations: Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

Unit – II

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token –Based Algorithms, Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Heuristic Algorithm.

Unit – III

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

Unit – IV

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures

Multi-Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating System Design Issues, Threads, Process Synchronization, Processor Scheduling.

Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues.

Unit – V

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues.

TEXT BOOK

1. Mukesh Singhal, Niranjan G. Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw-Hill Edition ,2001.

REFERENCE BOOK

1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems: Pearson Prentice Hall, Edition – 2, 2007.

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS713PE	**Cloud Computing**	3	0	0	3

Pre-Requisites: 1. Operating Systems
2. Computer Networks

Course Description: This course contains insight in cloud computing Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing.

Course Outcomes: After completion of this course, the student will be able to

C713.1 Understand Cloud Computing Fundamentals.

C713.2 Analyze cloud deployment models, cloud service models

C713.3 Acquire the knowledge on Technological Drivers for Cloud Computing

C713.4 Examine the process of Virtualization and Networking Issues in Cloud Computing

C713.5 Identify the security concerns and issues in cloud computing

C713.6 Elaborate the knowledge of advances in cloud computing.

Unit – I

Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and `Management

Unit – II

Cloud Deployment Models, Cloud Service Models

Technological Drivers for Cloud Computing - SOA and Cloud, Multicore Technology.

Web 2.0, Web 3.0, Pervasive Computing, Operating System, Application Environment

Unit – III

Virtualization, Programming Models for Cloud Computing- MapReduce, Cloud Haskell.

Software Development in Cloud. Case Study to Create Virtual Machine in Azure/AWS

Unit – IV

Networking for Cloud Computing - Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers.

Case Study about Services Provided by Azure and AWS

Unit – V Security in Cloud Computing and Advanced Concepts in Cloud Computing

TEXT BOOK

1. Chandrasekaran, K. Essentials of cloud computing. CRC Press, 2014.

REFERENCE BOOK

1. Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011.
2. Gautam Shroff, Enterprise Cloud Computing - Technology, Architecture, Applications, Cambridge University Press, 2010.
3. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010.

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS714PE	**Advanced Algorithms**	3	0	0	3

Pre-Requisites: 1. Data Structures
2. Design and Analysis of Algorithms

Course Description: This course builds upon the fundamental concepts of algorithm design and analysis introduced in earlier courses. This course also covers advanced algorithmic techniques, data structures, and their applications in solving complex computational problems efficiently.

Course Outcomes: After completion of this course, the student will be able to

C714.1 Solve the complex problem using dynamic programming

C714.2 Analyze complex problems using advanced data structures

C714.3 Apply real life problem using different algorithm design techniques

C714.4 Design different techniques to solve network related problems.

C714.5 Select proper pattern matching algorithm for given problem

C714.6 Compare NP hard and NP complete problems

Unit – I

Introduction: Role of Algorithms in computing, Growth of Functions, Recurrences, Probabilistic Analysis and Randomized Algorithms.

Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time.

Advanced Design and Analysis Techniques: Dynamic Programming-Matrix Chain Multiplication, longest common Subsequence and optimal binary Search trees.

Unit – II

Greedy Algorithm: Huffman Codes, Activity Selection Problem, Amortized Analysis.

Graph Algorithms: Elementary Graph Algorithms- Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

Unit – III

Multithreaded Algorithms: The basics of dynamic multithreading, Multithreaded matrix multiplication, Multithreaded merge sort

Matrix Operations- Solving system of linear Equations, Inverting matrices,

Unit – IV

String Matching: Naive String Matching, Rabin-Karp algorithm, String matching with finite Automata, Knuth Morris - Pratt algorithm.

Unit – V

NP-Completeness: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems.

Approximation Algorithms- Vertex cover Problem, Travelling Sales person problem.

TEXT BOOK

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Introduction to Algorithms Third Edition, PHI.

REFERENCE BOOKS

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design and Analysis Algorithms - Pearson
3. M.T. Goodrich and R. Tomassia, John Wiley and sons. Algorithm Design: Foundations, Analysis and Internet examples,
4. Allen Weiss, Data structures and Algorithm Analysis in C++, Second edition, Pearson education.

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS704PC	**Cryptography and Network Security Lab**	0	0	2	1

Course Description: This Course introduces Implementing various cryptographic techniques to encode and decode the given text and also develop solutions to different cryptographic algorithms.

Course Outcomes: After completion of this course, the student will be able to

C704.1 Compare various cryptographic techniques to encode and decode the given text.

C704.2 Develop solutions using symmetric key algorithms.

C704.3 Build solutions using public key cryptographic algorithms.

C704.4 Analyze various secure hash algorithms to generate hash key.

List of Programs:

Cycle 1:

1. Write a program that contains a string (char pointer) with a value 'Hello world'. The program should XOR and AND each character in this string with 0 and 127, and display the result.
2. Write a program to perform encryption and decryption using the following algorithms
   a. Ceaser cipher b. Hill Cipher
3. Write a program to implement

a. DES algorithm

b. AES algorithm.

c. Blowfish algorithm.

d. RC4 algorithm.

Cycle 2:

4. Encrypt the "Hello world" text using Blowfish. Create your key using the Java key tool.
5. Write a program to implement the RSA algorithm.
6. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
7. Calculate the message digest of a text using
   a. SHA-512 algorithm.
   b. MD5 algorithm.

TEXT BOOKS

1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition
2. Atul Kahate, Mc Graw Hill : Cryptography and Network Security, 3rd Edition

REFERENCE BOOKS

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network SecurityWiley India, 1st Edition.
2. Forouzan Mukhopadhyay, Mc Graw Hill, Cryptography and Network Security, 3rd Edition
3. Mark Stamp, Information Security, Principles, and Practice, Wiley India.
4. WM. Arthur Conklin, Greg White, Principles of Computer Security, TMH
5. Neal Krawetz : Introduction to Network Security: CENGAGE Learning
6. Bernard Menezes : Network Security and Cryptography, CENGAGE Learning

B.Tech. IV Year I Semester

Course Code	Course Title	L	T	P	Credits
CS705PC	**Compiler Design Lab**	0	0	2	1

Course Description: The Course aims to provide hands-on experience in building the essential components, viz., lexical analyzers, parsers, syntax trees, and type checkers of a compiler.

Course Outcomes: After completion of this course, the student will be able to

C705.1	Design lexical analyzers using manual coding and Lex tools.
C705.2	Develop syntax analyzers using YACC for parsing arithmetic expressions and recursive grammars.
C705.3	Construct abstract syntax trees and type-checking to ensure correctness in programming constructs.
C705.4	Implement memory allocation strategies and parsing techniques.

List of Programs:

Cycle 1:

1. Implementation of the symbol table.
2. Develop a lexical analyzer to recognize a few patterns in C (ex. Identifiers, constants, comments, operators etc.)
3. Implementation of lexical analyzer using lex tool.
4. Write a lex program to count the number of words and number of lines in a given file or program.
5. Generate YACC specification for a few syntactic categories.
    a. Program to recognize a valid arithmetic expression that uses operators +,-, *, and /.
    b. Program to recognize a valid variable that starts with a letter followed by any number of letters or digits.
    c. Implementation of calculator using Lex and YACC.
6. Convert the BNF rules into YACC form and write code to generate an abstract syntax tree.

Cycle 2:

7. Write a YACC program to implement a top-down parser for the given grammar.
8. Write a YACC program to evaluate algebraic expressions.
9. Implement type checking to evaluate a simple expression.
10. Implement any one storage allocation strategy (heap, stack, static)
11. Write a recursive descent parser for the grammar

a. E->E+T
   E->T
   T->T*F
   T->F
   F->(E)/id.

b. S->(L)
   S->a
   L->L, S
   L->S

12. Write a C program to calculate the first function for the grammar
   E->E+T
   E->T
   T->T*F
   T->F
   F->(E)/id

TEXT BOOK

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman Compilers: Principles, Techniques and Tools, Second Edition.

REFERENCE BOOKS

1. John R. Levine, Tony Mason, Doug Brown - Lex & YACC, O'Reilly
2. Louden, Kenneth C. Compiler construction: principles and practice, 1997, PWS Publishing Co.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS811PE	**Mobile Application Development**	3	0	0	3

Course Description: This course introduces students to programming technologies, design and development related to mobile applications. This course also covers device capabilities, industry standards, operating systems, and programming for mobile applications.

Course Outcomes: After completion of this course, the student will be able to

C811.1 Understand the fundamentals of Android operating systems

C811.2 Apply android user interface tools

C811.3 Develop intents and broadcasts on mobile platform

C811.4 Create notifications on mobile platform

C811.5 Make use of persistent storage on files

C811.6 Implement SQLite database concepts

Unit – I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, best practices in Android programming, Android tools Android

application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

Unit – II

Android User Interface: Measurements – Device and pixel density independent measuring units

Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components –Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

Unit – III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

Unit – IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

Unit – V

Database: Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, using content Providers (insert, delete, retrieve and update).

TEXT BOOK

1. Reto Meier, Professional Android 4 Application Development, Wiley India, (Wrox), 2012.

REFERENCE BOOKS

1. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013.
2. Wei-Meng Lee, Beginning Android 4 Application Development, Wiley India (Wrox), 2013.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS812PE	**Agile Methodology**	3	0	0	3

Pre-Requisite: Software Engineering

Course Description: This course contains Agile, DevOps related methods to reach a continuous delivery capability, implementation of automated system update and DevOps lifecycle.

Course Outcomes: After completion of this course, the student will be able to

C812.1 Understand basic concepts of agile methodology and Extreme programming

C812.2 Identify real customer involvement in collaboration

C812.3 Analyze Bug free Release and Version Control

C812.4 Illustrate Collective ownership and Documentation

C812.5 Discuss risk management and iteration planning

C812.6 Understanding incremental requirements, refactoring, incremental design and architecture.

Unit – I

Agile Development: Why Agile, Understanding Success, Beyond Deadlines, Importance of Organizational Success, Introduction to Agility, Agile Methods.

Understanding XP (Extreme Programming): XP life cycle, XP team, XP Concepts.

Adopting XP: Knowing whether XP is suitable, Implementing XP, assessing Agility,

Practicing XP: Thinking, Pair Programming, Energized work, Informative Workspace, Root cause Analysis, Retrospectives.

Unit – II

Collaborating: Trust, Sit together, Real customer involvement, Ubiquitous language, Stand-Up meetings, coding standards, Iteration demo, Reporting.

Unit – III

Releasing: Bug free Release, Version Control, Ten-Minute Build, continuous integration, Collective ownership and Documentation.

Unit – IV

Planning: Version, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, and Estimating.

Unit – V

Developing: Incremental requirements, Customer tests, Test driven development, Refactoring, Incremental design and architecture, spike solutions, Performance optimization, Exploratory testing

TEXT BOOKS

1. James Shore and Shane Warden, The art of Agile Development, 11th Indian Reprint, O'Reilly, 2018.

REFERENCE BOOKS

1. Andrew Stellman and Jennifer Greene, Learning Agile, O'Reilly, 4th Indian Reprint, 2018.
2. Venkat Subramaniam and Andy Hunt, Practices of an Agile Developer, SPD, 5th Indian Reprint, 2015.
3. Jim Highsmith, Agile Project Management, Pearson Low Price Edition 2004.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS813PE	**Natural Language Processing**	3	0	0	3

Pre-Requisites: 1. Data structures

2. Compiler design

Course Description: This course introduces problems, solutions and relations to linguistics, statistics, various techniques of Natural Language Processing.

Course Outcomes: After completion of this course, the student will be able to

C813.1 Understand sensitivity to linguistic phenomena with formal grammars.

C813.2 Implement Data-Driven Approach to represent syntactic structures

C813.3 Analyze Meaning Representation for semantic parsing

C813.4 Implement various Language Modeling techniques

C813.5 Illustrate the ability to handle multilingual and cross-lingual issues in natural language processing

C813.6 Develop machine learning models to extract meanings from natural language

Unit – I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches, Features

Unit – II

Syntax I: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

Unit – III

Syntax II: Models for Ambiguity Resolution in Parsing, Multilingual Issues, Semantic Interpretation, System Paradigms

Semantic Parsing: Word Sense, Predicate-Argument Structure, Meaning Representation.

Unit – IV

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Multilingual and Cross Lingual Language Modeling

Unit – V

Machine Translation- Machine Translation Evaluation, Word Alignment -Co-occurrence, IBM Model 1, Word alignment as Machine Learning problem, Phrase-based Models- Models, Training, Decoding, Tree-based Models- Hierarchical Phrase-Based Models, Chart Decoding, Syntactic models

TEXT BOOK

1. Daniel M. Bikel and Imed Zitouni, Multilingual natural Language Processing Applications: From Theory to Practice, Pearson Publication.

REFERENCE BOOKS

1. Daniel Jurafsky &James H Martin - Speech and Natural Language Processing, Pearson Publications.
2. Tanvier Siddiqui, U.S. Tiwary: Natural Language Processing and Information Retrieval.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS814PE	**Software Process & Project Management**	3	0	0	3

Pre-Requisite: Software Engineering

Course Description: This course explores Software Processes, Project Management techniques, risk analysis and Quality assurance for successful software development along with case studies.

Course Outcomes: After completion of this course, the student will be able to

C814.1 Analyze the Software process maturity levels for Process Improvement and Process Assessment.

C814.2 Explore the Software Management Renaissance in Economics.

C814.3 Evaluate Life cycle phases and Artifacts in Project Management.

C814.4 Examine the role of workflows and checkpoints in process planning.

C814.5 Illustrate Project Organization, Project control and process instrumentation.

C814.6 Evaluate the Project management practices with Case Studies.

Unit – I

Software Process Maturity -Software Maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process, Process Reference Models, Capability Maturity Model (CMM, CMMI, PCMM, PSP, TSP).

Unit – II

Software Project Management Renaissance – Conventional Software Management, Evolution of Software Economics, Improving Software Economics, Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

Unit – III

Workflows and Checkpoints of process: Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments, Process Planning Work breakdown structures, planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

Unit – IV

Project Organizations: Line-of-business organizations, project organizations, evolution of organizations, process automation.

Project Control and process instrumentation - The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation

Unit – V

CCPDS-R Case Study: CCPDS-R Case Study and Future Software Project Management Practices, Modern Project Profiles, Next-Generation Software Economics, Modern Process Transitions.

TEXT BOOKS

1. Watts S. Humphrey, Managing the Software Process, Pearson Education
2. Walker Royce, Software Project Management, Pearson Education

REFERENCE BOOKS

1. Watts S. Humphrey, An Introduction to the Team Software Process, Pearson Education, 2000
2. James R. Persse, Process Improvement essentials, O'Reilly, 2006.
3. Bob Hughes & Mike Cotterell, Software Project Management, fourth edition, TMH, 2006.
4. Andrew Stellman &Jennifer Greene, Applied Software Project Management, O'Reilly, 2006.
5. Richard H. Thayer & Edward Yourdon, Software Engineering Project Management, 2nd edition, Wiley India, 2004.
6. Jim Highsmith, Agile Project Management, Pearson education, 2004.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS821PE	**Distributed Systems**	3	0	0	3

Pre-Requisites: 1. Operating Systems
2. Computer Networks
3. Cryptography and Network Security

Course Description: This course introduces architectural styles, client server and communication between processes. This course also covers Synchronization, fault tolerance and security in distributed systems.

Course Outcomes: After completion of this course, the student will be able to

C821.1 Understand classification and architectures of distributed systems.

C821.2 Demonstrate Threads and code migration.

C821.3 Build Remote procedure call and Message - oriented communication.

C821.4 Illustrate clock synchronization and Mutual exclusion.

C821.5 Make use of consistency models and replica management.

C821.6 Implement fault tolerance and security in distributed systems

Unit – I

Introduction: Networked systems to Distributed systems, Design goals, A simple classification of distributed systems.

Architectures: Architectural styles, Middleware and distributed systems, symmetrically distributed system architectures, Hybrid system architectures.

Unit – II

Processes: Threads, Virtualization, Clients, Servers, Code migration

Unit – III

Communication: Foundations, Remote procedure call, Message-oriented communication, Multicast communication.

Unit – IV

Coordination: Clock synchronization, Logical clocks, Mutual exclusion, Election algorithms, Gossip-based coordination, Distributed event matching, Location systems.

Consistency and Replication: Introduction, Data-centric consistency models, Client-centric consistency models, Replica management, Consistency protocols.

Unit – V

Fault Tolerance: Introduction to fault tolerance, Process resilience, Reliable client-server communication, Reliable group communication, Distributed commit, Recovery

Security: Authentication, Trust in distributed systems, Authorization, Monitoring.

TEXT BOOK

1. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems, 4th Edition.

REFERENCE BOOKS

1. George Coulouris, J Dollimore and Tim Kindberg, Distributed Systems, Concepts and Design, Pearson Education, Edition. 2009.
2. Sukumar Ghosh, Chapman Hall/CRC, Taylor & Fransis Group, Distributed Systems, An Algorithm Approach, 2007.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS822PE	**Deep Learning**	3	0	0	3

Pre-Requisites: 1. Matrices and Calculus
2. Ordinary Differential Equations and Vector Calculus
3. Python programming

Course Description: This course explores machine learning basics, neural network architectures like feed forward, convolutional, and recurrent networks, focusing on optimization and regularization techniques. This Course Covers hands-on applications in areas like computer vision and NLP using modern frameworks.

Course Outcomes: After completion of this course, the student will be able to

C822.1 Understand Machine Learning basics.

C822.2 Apply regularization and optimization techniques to enhance deep learning model performance.

C822.3 Design convolutional neural networks for structured data processing.

C822.4 Develop recurrent and recursive neural networks for sequential data.

C822.5 Utilize practical methodologies for model evaluation, debugging, and hyperparameter tuning.

C822.6 Implement deep learning solutions for applications in Computer Vision, Speech Recognition, and Natural Language Processing.

Unit – I

Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning

Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

Unit – II

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier

Optimization for Training Deep Models: Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

Unit – III

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features

Unit – IV

Sequence Modeling: Recurrent and Recursive Nets-Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long Term Dependencies, Explicit Memory

Unit – V

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

TEXT BOOKS

1. Yoshua Bengio and Aaron Courville, Deep Learning by Ian Goodfellow, MIT Press.

REFERENCE BOOKS

1. Hastie, R. Tibshirani, and J. Friedman, The Elements of Statistical Learning, Springer.

2. Koller, and N. Friedman, Probabilistic Graphical Models, MIT Press.

3. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.

4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.

5. Golub, G., H., and Van Loan, C., F., Matrix Computations, JHU Press, 2013.

6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS823PE	**Blockchain Technologies**	3	0	0	3

Pre-Requisites: 1. Computer Networks

2. Cloud Computing

Course Description: This course introduces blockchain technology, covering its fundamentals, cryptography, consensus mechanisms, and applications. It prepares students to design secure, decentralized systems and address real-world challenges.

Course Outcomes: After completion of this course, the student will be able to

C823.1 Understand the fundamentals of blockchain technology

C823.2 Explore knowledge on smart contracts

C823.3 Summarise the key concepts of private blockchain system

C823.4 Apply cryptographic techniques on consortium blockchain

C823.5 Examine security challenges in blockchain

C823.6 Analyze the various blockchain applications with case studies

Unit – I

Fundamentals of Blockchain: Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

Cryptocurrency – Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

Unit – II

Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

Unit – III

Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Need of Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda.

Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

Unit – IV

Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in

Unit – V

Applications of Blockchain: Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

TEXT BOOK

1. Asha A. George, Abhilash K A and Meena Karthikeyan, Chandramouli Subramanian, Blockchain Technology, Universities Press.

REFERENCE BOOKS

1. Michael Juntao Yuan, Building Blockchain Apps, Pearson, India.

2. Melanie Swan, Blockchain Blueprint for Economy, SPD O'reilly.

3. Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Blockchain for Business, Pearson.

4. https://www.universitiespress.com/resources?id=9789389211634#

B.Tech. IV Year II Semester

Course Code	Course Title	L	T	P	Credits
CS824PE	**Cyber Security and Forensics**	3	0	0	3

Pre-Requisite: Cryptography and Network Security

Course Description: This course covers the principles of cybersecurity, cyber laws, and forensic techniques to address cyber threats and vulnerabilities and also covers design and implementation of secure systems while investigating and mitigating cybercrimes.

Course Outcomes: After completion of this course, the student will be able to

CS824.1 Understand the basics of cybersecurity concepts.

CS824.2 Apply Cyber Security Regulations and Roles of International Law.

CS824.3 Determine the fundamental concepts of data privacy attacks and defences.

CS824.4 Apply forensic duplication techniques on Windows System

CS824.5 Identify key principles of Forensics Analysis and Validation

CS824.6 Apply knowledge of Network Forensics

Unit – I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Unit-II

Cyberspace the Law: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Unit-III

Privacy Issues: Basic Data Privacy Concepts- Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Unit – IV

Initial Response and forensic duplication: Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system –

Forensic Duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive.

Unit – V

Forensics Analysis and Validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

TEXT BOOKS

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill, 2006.

REFERENCE BOOKS

1. B. B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithms, Applications, and Perspectives, CRC Press.
2. James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials CRC Press.
3. Chwan-Hwa (john) Wu, J.David Irwin, Introduction to Cyber Security, CRC Press T&F Group.

SUSTAINABLE DEVELOPMENT GOALS

01 NO POVERTY

02 ZERO HUNGER

03 GOOD HEALTH AND WELL-BEING

04 QUALITY EDUCATION

05 GENDER EQUALITY

06 CLEAN WATER AND SANITATION

07 AFFORDABLE AND CLEAN ENERGY

08 DECENT WORK AND ECONOMIC GROWTH

09 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER

15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

17 PARTNERSHIPS FOR THE GOALS