ACADEMIC REGULATIONS (BH25)

COURSE STRUCTURE

AND

DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

for

B.Tech. Four Year Degree Course

(Applicable for the batches admitted from 2025-26 onwards)

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

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Academic Regulations (BH25) for B.Tech. Regular Students with effect from Academic Year 2025-26

The B. Tech degree of Jawaharlal Nehru Technological University Hyderabad (JNTUH) shall be conferred on candidates admitted to the programme and fulfills 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 new regulations termed as BH25 for four Year (8 Semesters) Bachelor of Technology (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2025-26 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	66	Computer Science and Engineering (AI & ML)

2.0 Eligibility for Admission

2.1 Admissions to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified students at the entrance test conducted by Telangana Government (TG EAPCET) 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 instruction for the entire undergraduate programme in Engineering & Technology will be in **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 and a maximum period of **Eight** academic years starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech. Course. Each student has to secure a minimum of 160 credits out of 164 credits for successful 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.

3.2.1 Semester Scheme

Each undergraduate programme is of four academic years and there shall be two semesters in each academic year. There shall be a minimum of 15 weeks of instruction, excluding the mid- term and semester – end exams. Around 15 instruction hours, 30 instruction hours and 45 hours of learning need to be followed per one credit of theory course, practical course and project / field – based learning respectively. In each semester, there shall be 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS). The curriculum / course structure suggested by AICTE and JNTUH is followed as a reference document.

3.2.2 Credit Courses

All courses offered in each semester are to be registered by the student. Against each course in the course structure, the L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) pattern has been defined.

- One credit is allocated for one hour per week in a semester for lecture (L) or Tutorial (T) session.
- One credit is allocated for two hours per week in a semester for Laboratory / Practical (P) session.
- One credit is allocated for three hours per week in a semester for Project / Mini Project session.

For example, a theory course with three credit weightage requires three hours of classroom instruction per week, totaling approximately 45 hours of instruction over the entire semester.

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.

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	PC – Professional Core	Includes core courses related to the

	(CoC)		parent branch of Engineering.
5	Elective Courses (EℓC)	PE – Professional Electives	Includes elective courses related to the parent branch of Engineering.
6		OE – Open Electives	Elective courses which include inter-disciplinary courses or courses in an area outside the parent branch of Engineering.
7	Project Core	Project Work	B.Tech. Project Work
8	Other Core Courses (OCC)	Industry Training / Internship / Industry Oriented Mini- project / Skill Development Courses	Industry Training / Internship / Industry Oriented Mini- Project / Skill Development Courses
9		Seminar	Seminar based on core contents related to parent branch of Engineering.
10	Skill Development Courses (SDC)	-	Courses designed to help individuals gain, improve, or refine specific skills
11	Value Added Courses (VAC)	-	Courses to build professional values, traditional knowledge and sensitization of societal issues

4.0 Mandatory Induction Programme

An induction program of one week duration for the UG students entering the institution, right at the start shall be implemented. Normal classes commence only after the induction programme is conducted. Following activities could be part of the induction programme:

i) Physical Activity, ii) Creative Arts, iii) Imparting Universal Human Values, iv) Literary Activities, v) Lectures by Eminent People, vi) Visits to Local Areas and vii) Familiarization to department as well as entire institute and viii) Making students understand Innovative practices at the college premises etc.

5.0 Course Registration

5.1 A faculty advisor / mentor shall be assigned to a group of around 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choices / options of the courses, based on their competence, progress, pre-requisites and interest.

5.2 The academic section of the college invites 'registration forms' from students at the beginning of the semester.

5.3 A student can apply for registration, by consulting faculty advisor / mentor, which should be submitted to the college academic section through the Head of the Department. A copy

of it shall be retained with the Head of the Department.

5.4 A student shall register for all the courses offered in a semester as specified in the course structure.

5.5 Course options exercised through registration are final and **cannot** be changed; further, alternative choices also will not be considered. However, if the 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 alternative choice either for a new course (subject to offering of such a course), or for another existing course. Such alternative arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week**, but before the commencement of class- work of the semester.

5.6 The Head of the Department / Course Coordinator should review vacant slots in the Time table of each section once in every week or fortnight. The vacant slots in the time-table may be allocated to the subject teachers who could not take classes in proportion to the number of weeks completed from the commencement of the semester.

5.7 Two faculty members may be allocated for the tutorial session of Mathematics-1 course for better interaction / practice and to minimize the failures in the subject.

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

Students have the flexibility to choose from the list of professional electives offered by the Institute or opt to register for the equivalent Massive Open Online Courses (MOOCs) as listed from time to time by the College.

5.9 **Open Electives**: Students have to choose three Open Electives (OE - I, II & III) from three baskets of Open Electives given by other than the parent department. However, the student can opt for an Open Elective course offered by her parent department, if the student has not studied that course so far. Similarly, Open Elective courses being studied should not match with any courses of the forthcoming semesters.

5.10 **Provision for Early Registration of MOOCs:**

For a professional elective in a semester, students are allowed to register for an equivalent MOOCs course listed from time to time by the College one semester in advance. For example, a Professional Elective of III Year II Sem shall be allowed to register under MOOCs platform in III year I Sem.

The credits earned in one semester in advance can be submitted in the subsequent semester for the assessment.

The students, who have registered in advance in an equivalent MOOCs course and fail to secure any pass grade in the MOOCs course, can register for the regular course offered in the following semester of their course structure

5.11 **Conversion of Marks Secured in MOOCs into Grades**: Marks secured in the internal and external evaluations of a MOOCs course shall be scaled to 40 and 60 marks respectively. The sum of these two components shall be considered as the total marks out of 100. The corresponding grade shall then be determined as per the marks-to-grades conversion rules specified in Clause 10.3

5.12 MOOCs are allowed only for professional elective courses and for a few Minors & Honors courses

5.13 **Additional learning resources:**

Students are encouraged to acquire additional course - related knowledge by auditing learning resources from MOOCs platforms for each course offered in their course structure. These additional courses are not meant for earning credits but are intended to enhance knowledge. The College shall notify such courses from time to time through their portals for the benefit of students. They are categorized into three types: prerequisite, reinforcement, and aspirational. Prerequisite courses help students gain familiarity and provide sufficient background. Reinforcement courses aim to offer different perspectives on learning, while aspirational courses focus on next-level or advanced learning.

6.0 **Rules to offer Elective courses**

6.1 An elective course may be offered to the students, only if a minimum of 25% of class strength opts for it.

6.2 Same elective course for different sections may be offered by different faculty members. The selection of elective course by students will be based on first come first serve and / or CGPA criterion.

6.3 If the numbers of student's registrations are more than the strength of one section, then it is choice of the concerned Department to offer the same course for more than one section based on the resources available in the department.

7.0 **Attendance requirements**

7.1 A student shall be eligible to appear for the semester-end examinations, if the student acquires a minimum of 75% of aggregate attendance of all the courses for that semester.

7.2 Shortage of attendance in aggregate upto 10% (securing 65% and above but below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

7.3 A stipulated fee shall be payable for condoning of shortage of attendance as notified by the college.

7.4 **Two hours** of attendance for each theory course shall be considered, if the student appears for the mid-term examination of that course.

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

7.6 Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their semester-end examinations of that semester. They get detained and will not be promoted to the next semester. Their registration for that semester shall stand cancelled, including internal marks. They may seek re-registration for that semester in the next academic year.

7.7 A student fulfilling the attendance requirement in the present semester shall not be eligible for re-admission into the same semester

8.0 Criteria for Earning of Credits in a Course

8.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures 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 course.

8.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Field Based Research Project / Industry Oriented Mini Project / Internship, 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 Field-Based Research Project / 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 Field-Based Research Project / Industry Oriented Mini Project / Internship evaluations.

8.3 A student eligible to appear in the semester-end examination for any course, is absent from it or failed (there by failing to secure 'C' grade or above) may re-appear for that course in the supplementary examination as and when it is conducted. In such cases, internal marks

assessed in continuous internal evaluation (CIE) earlier for that course will be carried over, and added to the marks obtained in the SEE supplementary / make-up examination. If the student secures sufficient marks for passing, 'C' grade or above shall be awarded as specified in clause 10.3.

9.0 Distribution of Marks and Evaluation

9.1 The performance of a student in every course (including Value Added Courses and Skill Development Courses, Laboratory / Practical and Project Work) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination), irrespective of the credits allocated.

9.2 Continuous Internal Evaluation (CIE)

9.2.1 Theory Courses:

For theory courses, 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, totaling to 30 marks. Total duration of mid-term examination is two hours.

1. Mid Term Examination for 30 marks:
    a. Part-A: Objective / quiz paper for10 marks.
    b. Part-B: Descriptive paper for 20 marks.

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

The descriptive paper shall contain 6 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).

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. Questions will be drawn from the mid-term exam syllabus, ensuring uniform coverage of all topics.

The remaining 10 marks of Continuous Internal Evaluation are distributed as follows:

2. Five marks for the assignment. Student shall submit two assignments and the **average of 2 Assignments** each for 5 marks shall be taken. 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.
3. Five marks for the Viva-Voce / PPT / Poster Presentation / Case Study on a topic in

the concerned subject. This assessment shall be completed before II Mid-Term Examination. Respective Teachers schedule these sessions in their semester plan.

9.2.2 Engineering Drawing and Computer Aided Drafting Course:

For this course, 20 marks will be allocated for day-to-day assessments conducted during drawing practice sessions, and another 20 marks will be allocated for the mid-term examination. In the mid-term examination, students shall attempt any four out of six given questions. The first mid-term exam will be conducted in the conventional mode using a drawing board, while the second mid-term exam will be conducted using a CAD package

9.3 A **Computer-Based Test (CBT**) in each course is available for students who either:

1. Missed one of the two mid-term examinations due to unavoidable circumstances, or
2. Attended both mid-term examinations but wish to improve their internal marks.

The CBT will be conducted at the end of the semester and will carry a total of 30 marks. The marks obtained in the CBT will be considered equivalent to those obtained in one mid-term examination. Zero marks will be awarded to students who are absent for the mid-term examination. The average of the best two scores from the three exams (the two mid-term exams and the CBT), combined with other internal assessment components, will constitute the Continuous Internal Improvement (CII) marks for that specific course. CBT exams shall be conducted by the Exam Branch of the College.

9.4 Semester End Examination for theory courses

9.4.1 Theory Courses:

The semester end examinations (SEE), for theory courses, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks and ii) **Part - B** for 50 marks.

- Part-A is compulsory, consists of five short answer questions covering all units of syllabus; each question carries two marks.
- Part-B consists of five questions carrying 10 marks each. There shall be two questions asked in the question paper from each unit with either-or choice and the student should answer either of the two questions. The student shall answer one question from each of five units

9.4.2 Engineering Drawing and Computer Aided Drafting Course:

Question paper consists of five questions carrying 12 marks each. There shall be two questions asked in the question paper from each unit with either - or choice and the student should answer either of the two questions. The student shall answer one question from each of five units. **There shall be no section with short answer questions.**

9.4.3 Duration of SEE:

The duration of Semester End Examination of theory and drawing courses is 3 hours.

9.5 Semester End Examination for Practical Courses

For practical courses there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and semester-end examination for 60 marks. The breakup of the continuous internal evaluation for 40 marks is as follows:

1. 10 marks for a write-up on day-to-day experiments in the laboratory (in terms of aim, components / procedure, expected outcome).
2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. 10 marks for the internal practical examination conducted by the laboratory teacher concerned.
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 submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination for practical courses shall be conducted with an external examiner and the laboratory course 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 for practical courses held for 3 hours, rubrics of evaluation for 60 marks are as given 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.

For any change of experiment, 5 marks will be deducted from the total of 60 marks. If second time change of experiment is requested, another five marks will be deducted from the 60 marks. No third change will be permitted.

9.6 Field-based Research Project:

There shall be a Field – based Research Project in the intervening summer between II-II and III- I Semesters. Students will register for their project immediately after II Year II Semester examinations and pursue it during summer vacation. The Field-based Research

Project shall be submitted in a report form and presented before the committee in III year I semester. It shall be evaluated for 100 external marks. The evaluation committee shall consist of an External Examiner, Head of the Department, Supervisor of the Project and a Senior Faculty Member of the department. There shall be no internal marks for Field-based Research Project. Student shall have to earn 40% marks, i.e 40 marks out of 100 marks. 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 committee as per schedule, or (iii) secures less than 40% marks in this course.

9.7 Internship / Industry Oriented Mini Project:

There shall be an Internship / Industry Oriented Mini Project in collaboration with an industry from their specialization. Students shall register for their project immediately after III Year II Semester Examinations and pursue it during summer vacation. Internship should be carried out at an organization (or) Industry. The Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in IV Year I Semester before the semester end 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 / Internship, and a Senior Faculty Member of the Department.

9.7.1 For evaluating industry - oriented mini-projects, it is preferable to appoint an external examiner from the industry, ideally from one of the organizations / industries with which the institute has established / proposing to establish collaborations.

9.8 UG Project Work:

9.8.1 The UG project work shall be initiated at the beginning of the IV Year II Semester and the duration of the project work is one semester. The student must present in consultation with her supervisor, the title, objective and plan of action of her Project work to the departmental committee for approval within two weeks from the commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start her project work.

9.8.2 Student has to submit project work report at the end of IV Year II Semester. The project work shall be evaluated for 100 marks. Out of which 40 marks and 60 marks are allocated for CIE and External Evaluation respectively.

9.8.3 For internal evaluation, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 40 marks.

The distribution of marks is as follows:

- Objective(s)of the work done - 05 Marks
- Methodology adopted - 15 Marks
- Results and Discussions - 15 Marks
- Conclusions and Outcomes - 05 Marks

Total - 40 Marks

9.8.4 The External Evaluation shall be conducted by the external examiner for a total of 60 marks. It shall comprise the presentation of the work, communication skills, and viva-voce, with a Weightage of 20 marks, 15 marks, and 25 marks respectively.

The topics for main Project shall be different from the topic of Industry Oriented Mini Project / Internship / SDC. 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.

9.8.5 For conducting viva-voce exam of project work, controller of examinations / chief superintendent selects an external examiner from the list of experts in the relevant branch submitted by the BoS chairman of the concerned department.

9.8.6 A student, who has failed, may re-appear once for the above evaluation, when it is scheduled again; if student fails in such 'one re-appearance' evaluation also, she has to appear for the same in the next subsequent year, as and when it is scheduled.

9.9 Skill Development Courses:

Four Skill Development Courses are included in the Curriculum in II-I, II-II, III-I and III-II semesters. Each Skill Development Course carries one credit. The evaluation pattern will be same as that of a laboratory course including the internal and external assessments.

The objective of Skill Courses is to develop the cognitive skills as well as the psycho-motor skills.

9.10 Value Added Courses:

The evaluation of Value Added Courses shall be similar to that of theory courses. However, the scheduling of these mid-term exams and semester-end examinations may not be combined with main-stream examinations. One hour /45 mins proctored mid-term examination shall be conducted in the regular class by the same subject teacher. It should not impact the conduct of other classes on that day. The scheduling of the semester-end examinations shall also be intimated by the Exam Branch time to time.

10.0 Grading Procedure

10.1 Absolute grading system is followed for awarding the grades to each course.

10.2 Grades will be awarded to indicate the performance of students in each Theory, Laboratory, Industry - Oriented Mini Project / Internship / Skill development course and Project Work. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in clause 8 above, a letter grade shall be given as explained in the following clause.

10.3 To measure the performance of a student, a10-point grading system is followed. The mapping between the percentage of marks secured and the corresponding letter grade is as follows:

Range of % of Marks Secured in a Course	Letter Grade	Grade Points (GP)
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**

10.4 A student shall be declared successful or 'passed' in a semester, if she secures **'C'** grade or above in every course (ie GP $\geq$ 5)

10.5 A student who has obtained an '**F'** grade in any course shall be deemed to have '**failed'** and is required to re-appear for a supplementary exam as and when conducted. In such cases, internal marks in those courses will remain the same as those obtained earlier.

10.6 To a student who has not appeared for an examination in any course, '**Ab'** grade will be allocated in that course, and she is deemed to have '**Failed'**. Such student will be required to re-appear for supplementary / make-up exam as and when conducted. The internal marks in those courses will remain the same as those obtained earlier.

10.7 The students earn a Grade Point (GP) in each course, on the basis of letter grade secured in that course. Every student who pass a course will receive grade point **GP** $\geq$**5** ('C 'grade or above).

10.8 The 'Credit Points' (C) are computed by multiplying the grade point with credits for a given course.

Credit Points (C) = Grade Point (GP) x Credits

10.9 The Semester Grade Point Average (SGPA) is calculated only when all the courses offered in a semester are cleared by a student. It is calculated by dividing the sum of credit points (ΣC_i) secured from all courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA for each semester is thus computed as

$$\text{SGPA} = \{\sum_{i=1}^{N} C_i \ G_i\} / \{\sum_{i=1}^{N} C_i \ \}$$

where 'i' is the course indicator index (considering all courses in a semester), 'N' is the no. of courses registered for the semester (as listed under the course structure of the branch), C_i is the no. of credits allotted to the i^{th}course, and G_i represents the grade points corresponding to the letter grade awarded for that i^{th}course.

10.10 If a student earns more than 160 credits, only the courses corresponding to the best 160credits shall be considered for the computation of CGPA of B.Tech. Degree.

10.11 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 for the courses corresponds to best 160 credits out of **all** registered courses in **all** semesters, and the total number of credits corresponds to those selected courses. CGPA is rounded off to **two** decimal places. CGPA is thus computed at the end of each semester, from the I year II semester onwards, as per the formula

$$\text{CGPA} = \{\sum_{j=1}^{M} C_j \ G_j\} / \{\sum_{j=1}^{M} C_j \ \}$$

where '**M'** is the total no. of courses corresponding to the best 160 credits from the courses registered in all eight semesters, 'j' is the course indicator index (takes into account all courses from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} course, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th}course.

Illustration of the Calculation of SGPA:

Course	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	3	O	10	3 x 10 = 30
Course 3	3	C	5	3 x 5 = 15

Course 4	3	B	6	3 x 6 = 18
Course 5	3	A	8	3 x 8 = 24
Course 6	2	A+	9	2 x 9 = 18
Course 7	1	C	5	1 x 5 = 5
Course 8	1	O	10	1 x10 = 10
	20			152

SGPA=152/20=7.6

The CGPA of the entire B.Tech. programme shall be calculated considering the best 160 credits earned by the student.

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

10.13 SGPA of a semester will be mentioned in the semester Memorandum of Grades if all courses of that semester are cleared in first attempt. Otherwise, the SGPA shall be mentioned only on the Memorandum of Grades in which sitting she passed her last exam in that semester.

11.0 Declaration of Results and issue of Grade Memo

11.1 While declaring the results, the web-version should display the marks earned by the student with the internal and external marks break-up. However, in the memorandum of grades, the marks need not be shown.

11.2 After the completion of each semester, a certificate of memorandum of grades shall be issued to all the registered students, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, course title, no. of credits), letter grade and credits earned.

12.0 With holding of Results

12.1 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.

13.0 Supplementary Examinations:

13.1 At the end of each semester, along with regular semester examinations, supplementary examinations shall be conducted for the students who have back-log subjects.

13.2 Advanced supplementary examinations in IV Year II Semester courses maybe conducted for those who failed in any course offered in IV Year II Semester. It may enable the

students to receive their B.Tech. Provisional certificate at an early date. Advanced supply examinations may be scheduled within one month period after the declaration of the final semester results.

There shall be no supplementary examination in the successive semester. The students who could not secure any pass grade in advance supplementary examinations have to wait for regular series examination of next batch to write their back-log examination.

14.0 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 and fulfillment of attendance requirement.
2	First year second semester to Second year first semester	i) Regular course of study of first year second semester and fulfillment of attendance requirement ii) Must have secured at least 25% of the total 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 and fulfillment of attendance requirement.
4	Second year second semester to Third year first semester	i) Regular course of study of second year second semester and fulfillment of attendance requirement. ii) Must have secured at least 25% of the total 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 and fulfillment of attendance requirement.
6	Third year second semester to Fourth year first semester	Regular course of study of third year second Semester and fulfillment of attendance requirement.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester and fulfillment of attendance requirement.

15.0 Re-admission after Detention

i) A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of credits.

ii) A student detained due to shortage of attendance shall be admitted in the same semester in the successive academic years.

iii) When a student is readmitted in the following academic years, the academic regulations under which the student seeks re-admission shall only be applicable to this student, not the academic regulations in which she got admitted in her first year of study.

16.0 Credit Exemption

A student (i) shall register for all courses covering 164 credits as specified and listed in the Course structure and (ii) earn 160 or more credits to successfully complete the undergraduate programme.

- Best 160 credits shall be considered for CGPA computation. The student can avail exemption of courses totaling up to 4 credits other than Professional core courses, Laboratory Courses, Seminars, Project Work and Field Based Research Project / Industry Oriented Mini Project / Internship, for optional drop out from these 164 credits registered;
- The semester grade point average (SGPA) of each semester shall be mentioned at the bottom of the grade card, when all the subjects in that semester have been passed by the student.
- Credits earned by the student in either a Minor or Honors program cannot be counted towards the required 160 credits for the award of the B.Tech. degree**.**

17.0 Award of degree

17.1 A student, who registers for all the courses specified in the course structure and secures the required number of 160 credits 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 branch of Engineering selected at the time of admission**.**

17.2 A student who qualifies for award of the degree as listed in item 17.1 shall be placed in the following classes

17.3 A student with final CGPA (at the end of the under graduate programme) $\geq$ 7.5, and fulfilling the following conditions - shall be placed in 'First Class with Distinction':

i) Should have passed all the courses in 'First Appearance'.

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 ≥ 7.5 shall be placed in 'First Class'.

17.4 Students with final CGPA (at the end of the under graduate programme) ≥ 6.5 but < 7.5 shall be placed in **'First Class'.**

17.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 5.5 but <6.5, shall be placed in '**Second Class'**.

17.6 All other students who qualify for the award of the degree (as per item 17.1), with final CGPA (at the end of the under graduate programme) ≥ 5.00 but < 5.5, shall be placed in '**Pass class**'.

17.7 Grace Marks

- Grace marks shall be given to those students who complete the course work of four-year B. Tech. degree, not secured pass grade in not more than three subjects and adding a specified grace marks enables the student to pass the subject(s) as well as gets eligibility to receive the provisional degree certificate.
- Grace marks for students admitted under the BH25 Academic Regulations should not exceed 0.15% of the total maximum marks in all eight semesters (excluding the marks allocated for value added courses and skill development courses).

18.0 Award of Gold Medals

18.1 Students fulfilling the conditions listed under item 17.3 alone will be eligible for award of 'Gold Medal'.

18.2 If more than one student secures the same highest CGPA, then the following tie resolution criteria, in the same order of preference shall be followed for selecting the Gold Medal winner, until the tie is resolved:

i) More number of times secured highest SGPAs,
ii) More number of O and A+ grades in that order and
iii) Highest SGPA in the order of first semester to eight semester.

19.0 Conversion of CGPA into equivalent Percentage of Marks

19.1 The following formula shall be used for the conversion of CGPA into equivalent marks, Whenever it is necessary

Percentage (%) of Marks = (Final CGPA – 0.5) x 10

20.0 Honours and Minor Degree Programs

Honours and Minor Degree programs will be available in all branches of B.Tech. Degree. Minor Degree programs will commence from II Year II Semester and continue till IV Year I semester and Honours Degree programs will commence from III Year I Semester and continue till IV Year II semester.

University shall under take the responsibility of assessing the infrastructure requirements during FFC visits. Only the University approved Minors and Honors shall be offered at the respective affiliated colleges.

21.0 Multiple Entry Multiple Exit Scheme (MEME)

21.1 Exit Option after Second Year:

Students enrolled in the 4-Year B.Tech. Program is permitted to exit the program after successful completion of the second year (B.Tech. II Year II Semester). The students who desire to exit after the II year shall formally inform the exit plan one semester in advance i.e., at the commencement of II Year II Semester itself. Such students need to fulfill the additional requirements as specified in Clause 21.2 described below.

Upon fulfilling the requirements like earning all the credits up to II Year II Semester and successfully completing the additional requirements, the students will be awarded a 2-Year Undergraduate (UG) Diploma in the concerned engineering branch.

21.2 Additional Requirements for Diploma Award

To qualify for the diploma under the exit option, students must also complete 2 additional credits through one of the following University-prescribed pathways:

Work-based Vocational Course:

Participation in a practical, hands-on vocational training program relevant to the engineering field, typically conducted during the summer term.

Internship /Apprenticeship:

Complete a minimum 8-week internship or apprenticeship in their related field to gain practical industry exposure.

In addition, students must clear any associated course(s) and submit the internship / apprenticeship report as per the University's schedule and guidelines.

21.3 Re-entry into the B.Tech. Programme

Students who have exited the B.Tech. Programme with a 2-Year UG Diploma may apply for reentry into the Third Year (Fifth Semester) of the B.Tech. Program. Re-entry is subject to the following conditions:

- The student must surrender the awarded UG Diploma Certificate.
- Students who wish to rejoin in III Year must join the same B.Tech. Program from which the student exited. Before rejoining, students should check for continuation of the same branch at the college. If the specific branch is closed, should consult the University for the Possible Alternative solutions.
- Re-registered students will be governed by the academic regulations in effect at the time of re-entry, regardless of the original regulations under which they were admitted.
- If a student opts to continue her studies without a gap after being awarded the diploma, they must register for the third-year courses before the commencement of classwork.

21.4 Break in Study and Maximum Duration

Students are allowed to take a break of up to four years after completion of II Year II Semester with prior University permission through the Principal of the college.

Re-entry after such a break is subject to the condition that the student completes all academic requirements within twice the duration of the program (i.e., within 8 years for a 4-year B.Tech. Programme).

22.0 Transitory Regulations for the students re-admitted in BH25 Regulations:

22.1 Transitory regulations are applicable to the students detained due to shortage of attendance as well as detained due to the shortage of credits and seek permission to re-join the B.Tech. Programme, where BH25 regulations are in force.

22.2 A student detained due to shortage of attendance and re-admitted in BH25 regulations: Such students shall be permitted to join the same semester, but in BH25 Regulations.

22.3 A student detained due to shortage of credits and re-admitted in BH25 regulations: Such students shall be promoted to the next semester in BH25 regulations, only after acquiring the required number of credits as per the corresponding regulations of her previous semester.

22.4 A student who has failed in any course in a specific regulation has to pass those courses in the same regulations.

22.5 If a student is readmitted to BH25 Regulations and has any course with 80% of syllabus common with her previous regulations, that particular course in BH25 Regulations will be substituted by an equivalent course of BH23 regulations by the University. All these details are summarized in a set of look-up Table; one set for each B. Tech. branch.

22.6 Lookup Table of equivalence courses

22.6.1 A lookup table will be provided for the benefit of students. This look up table will include all the courses to be registered by students who have been re-admitted under the BH25Academic Regulations from the BH23 Academic Regulations. Separate look up tables will be provided for the following categories of students:

1. Students re-admitted into the I Year II Semester of the BH-25 Regulations
2. Students re-admitted into the II Year I Semester of the BH-25 Regulations
3. Students re-admitted into the II Year II Semester of the BH-25 Regulations
4. Students re-admitted into the III Year I Semester of the BH-25 Regulations
5. Students re-admitted into the III Year II Semester of the BH-25 Regulations
6. Students re-admitted into the IV Year I Semester of the BH-25 Regulations
7. Students re-admitted into the IV Year II Semester of the BH-25 Regulations

Every B.Tech. Program shall have separate set of seven lookup tables.

22.6.2 Applicability of Lookup Table: The above look-up table shall be applicable for i) students who seek readmission from BH-23 regulations to BH-25 regulation and are going to be re-admitted in the same college. The Principals need to inform in the specified format, the list of such students and equivalences derived from the transitory regulations.

22.6.3 These look-Up Tables are not applicable for the students who seek transfer from i) other Universities, ii) one autonomous to another autonomous colleges and iii) non-autonomous to autonomous colleges under JNTUH. Such students should consult the University regarding equivalent courses, as was in previous practice.

22.7 The BH25 Academic Regulations are applicable to a student from the year of re-admission. However, the student is required to complete the study of B.Tech. Degree within the stipulated period of eight academic years from the year of first admission.

23.0 Student Transfers

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

23.2 The students seeking transfer from various other Universities / Institutions is having back-logs at the previous University / Institute, have to pass the courses offered at the college which are equivalent to the failed courses at the previous University / Institute.

23.3 The transferred students from other Universities / Institutions shall be given a chance to write CBTs for getting CIE component in the equivalent course(s) as per the clearance letter issued by the University.

24.0 Value Added Courses

24.1 Faculty members who have received a certificate in Innovation and Entrepreneurship / Entrepreneurship / Intellectual Property Rights from a reputed foundation / organization may be given preference to teach the "Innovation and Entrepreneurship" course.

24.2 To ensure quality delivery and standardization in teaching the **Indian Knowledge System (IKS)** and other value-added courses, the following guidelines must be adhered to:

i) faculty members must undergo a Faculty Development Program (FDP) organized by UGC – MMTTC (Malaviya Mission Teacher Training Centre), **or** any other recognized and competent institution / organization offering similar certified programs,

ii) the total instructional duration of the FDP should be around 32 hours or more,

iii) All sessions in the FDP must be conducted by certified and qualified resource persons with recognized expertise in the respective domains,

iv) A formal assessment component must be included as part of the FDP.

25.0 Mapping with the Sustainable Development Goals

All the courses specified in the course structure of every programme are mapped with the one or more sustainable development goals.

26.0 Scope

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

26.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council (AC) is final.

26.3 The AC may change or amend the academic regulations (if any from university), 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.

BVRIT HYDERABAD College of Engineering for Women
Bachupally, Hyderabad – 500090

ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME)

FROM THE AY 2026-27

Eligibility for the award of B.Tech. Degree (LES)

1. 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 123/124 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. Programme (LES) for the award of B.Tech. Degree.
3. The student can avail exemption of courses ***totaling upto 3/4credits*** other than Professional core courses, Laboratory Courses, Seminars, Project Work and Field Based Research Project / Industry Oriented Mini Project / Internship, for optional dropout.
4. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
5. The attendance requirements of B.Tech. (Regular) shall be applicable to B.Tech. (LES).
6. **Promotion rule**

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 and fulfillment of attendance requirement.
2	Second year second semester to Third year first semester	i) Regular course of study of second year second semester and fulfillment of attendance requirement. ii) Must have secured at least 25% of the total credits upto 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 and fulfillment of attendance requirement.
4	Third year second semester to Fourth year first semester	Regular course of study of third year second Semester and fulfillment of attendance requirement.
5	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester and fulfillment of attendance requirement.

7. All the other regulations as applicable to B.Tech. 4 – Year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
8. LES students are not permitted to exit the B.Tech. Program after completion of second year (B.Tech. II Year II Semester).

Academic Regulations for B.Tech - Acceleration of Course Work

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 final semester

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 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.

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.

B. Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE (BH25 Regulations)
Applicable from AY 2025-26 Batch

I Year I Semester

S. No.	Code	Course Title	L	T	P	Credits
1	**MA101BS**	Matrices and Calculus	3	1	0	4
2	**PH102BS**	Advanced Engineering Physics	3	0	0	3
3	**CS103ES**	Programming for Problem Solving	3	0	0	3
4	**ME104ES**	Engineering Drawing and Computer Aided Drafting	2	0	2	3
5	**EN105HS**	English for Skill Enhancement	3	0	0	3
6	**PH106BS**	Advanced Engineering Physics Lab	0	0	2	1
7	**CS107ES**	Programming for Problem Solving Lab	0	0	2	1
8	**EN108HS**	English Language and Communication Skills Lab	0	0	2	1
9	**EE109ES**	Introduction to Electrical Engineering	2	0	0	2
10	**EE110ES**	Electrical Engineering Lab	0	0	2	1
		Total Credits	**16**	**1**	**10**	**22**

I Year II Semester

S. No.	Code	Course Title	L	T	P	Credits
1	**MA201BS**	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	**CH202BS**	Engineering Chemistry	3	0	0	3
3	**EE203ES**	Network Analysis and Synthesis	3	0	0	3
4	**CS204ES**	Python Programming	3	0	0	3
5	**EC205ES**	Electronic Devices and Circuits	3	0	0	3
6	**CH206BS**	Engineering Chemistry Lab	0	0	2	1
7	**ME207ES**	Engineering Workshop	0	0	2	1
8	**EC208ES**	Electronic Devices and Circuits Lab	0	0	2	1
9	**CS209ES**	Applied Python Programming Lab	0	0	2	1
		Total Credits	**15**	**0**	**8**	**19**

II YEAR I SEMESTER

S. No.	Code	Course Title	L	T	P	Credits
1	**EC301PC**	Signals and Systems	3	0	0	3
2	**EC302PC**	Digital Logic Design	3	0	0	3
3	**EC303PC**	Control Systems	2	0	0	2
4	**CS304ES**	Data Structures	3	0	0	3
5	**MA305BS**	Numerical Methods and Complex Variables	3	0	0	3
6	**MS306HS**	Innovation and Entrepreneurship	2	0	0	2
7	**EC307PC**	Digital Logic Design Lab	0	0	2	1
8	**CS308ES**	Data Structures Lab	0	0	2	1
9	**EC309SD**	Linux and Shell Scripting	0	0	2	1
10	**MA310BS**	Computational Mathematics Lab	0	0	2	1
11	**VA300ES**	Environmental Science	1	0	0	1
		Total	**17**	**0**	**08**	**21**

II YEAR II SEMESTER

S. No.	Code	Course Title	L	T	P	Credits
1	**EC401PC**	Probability Theory and Stochastic Processes	3	0	0	3
2	**EC402PC**	Electromagnetic Fields and Transmission Lines	3	0	0	3
3	**EC403PC**	Analog and Digital Communications	3	0	0	3
4	**EC404PC**	Electronic Circuit Analysis	3	0	0	3
5	**EC405PC**	Linear and Digital IC Applications	3	0	0	3
6	**EC406PC**	Modelling and Simulation Lab	0	0	2	1
7	**EC407PC**	Analog and Digital Communications Lab	0	0	2	1
8	**EC408PC**	Electronic Circuit Analysis Lab	0	0	2	1
9	**EC409PC**	Linear and Digital IC Applications Lab	0	0	2	1
10	**EC410SD**	Web and Mobile Applications	0	0	2	1
		Total Credits	**15**	**0**	**10**	**20**

III YEAR I SEMESTER

S. No.	Code	Course Title	L	T	P	Credits
1	**EC501PC**	Digital Signal Processing	3	0	0	3
2	**EC502PC**	RISC and Microcontroller architectures	3	0	0	3
3	**EC503PC**	CMOS VLSI Design	3	0	0	3
4		Professional Elective-I	3	0	0	3
5		Open Elective-I	2	0	0	2
6	**EC504PC**	RISC and Microcontroller Interfacing Lab	0	0	2	1
7	**EC505PC**	CMOS VLSI Design Lab	0	0	2	1
8	**EC506PC**	Digital Signal Processing Lab	0	0	2	1
9	**EC507PC**	Field-based Research Project	0	0	4	2
10	**EC508SD**	FPGA based System Design	0	0	2	1
11	**VA500HS**	Indian Knowledge System	1	0	0	1
		Total Credits	**15**	**0**	**12**	**21**

III YEAR II SEMESTER

S. No.	Code	Course Title	L	T	P	Credits
1	**EC601PC**	Antenna Design and Wave Propagation	3	0	0	3
2	**EC602PC**	IoT Architectures and Protocols	3	0	0	3
3	**MS603HS**	Business Economics and Financial Analysis	3	0	0	3
4		Professional Elective-II	3	0	0	3
5		Open Elective – II	2	0	0	2
6	**EC604PC**	Advanced Communications Lab	0	0	2	1
7	**EC605PC**	IoT Architectures and Protocols Lab	0	0	2	1
8	**EC606PC**	VLSI Design Verification Lab	0	0	2	1
9	**EN607HS**	English for Employability Skills Lab	0	0	2	1
10	**EC608SD**	4G & 5G Practical Lab/Robotic Lab/Drone Lab	0	0	2	1
11	**VA600HS/ VA601HS**	Gender Sensitization*/ Human Values and Professional Ethics*	1	0	0	0.5+0.5
		Total Credits	**15**	**0**	**10**	**20**

***Note: For the courses Gender Sensitization Lab and Human Values and Professional Ethics-** one hour of instruction will be conducted on alternate weeks. For example, if a one-hour class for Gender Sensitization Lab is conducted this week, then a one-hour class for Human Values and Professional Ethics will be conducted in the following week.

IV YEAR I SEMESTER

S. No.	Code	Course Title	L	T	P	Credits
1	**EC701PC**	Microwave and Optical Communications	3	0	0	3
2	**EC702PC**	Embedded System Design	3	0	0	3
3	**MS703HS**	Fundamentals of Management for Engineers	3	0	0	3
4		Professional Elective-III	3	0	0	3
5		Professional Elective – IV	3	0	0	3
6		Open Elective – III	2	0	0	2
7	**EC704PC**	Microwave and Optical Communications Lab	0	0	2	1
8	**EC705PC**	Embedded System Design Lab	0	0	2	1
9	**EC706PC**	Industry Oriented Mini Project/ Internship	0	0	4	2
		Total Credits	**17**	**0**	**08**	**21**

IV YEAR II SEMESTER

S. No.	Code	Course Title	L	T	P	Credits
1.		Professional Elective – V	3	0	0	3
2.		Professional Elective – VI	3	0	0	3
3.	**EC801PC**	Project Work	0	0	42	14
		Total Credits	**06**	**0**	**42**	**20**

***Note:** Students who wish to exit after II Year II Semester has to register for this optional course and acquire the credits allotted by doing 6 weeks Work-based Vocational Course/ Internship or Apprenticeship. Please refer R25 Academic Regulations for more information.

Professional Electives

PE-I	**EC511PE**	AI & ML Applications in Electronics
	EC512PE	CMOS Fabrication and Technology
	EC513PE	Data Communications and Computer Networks
	EC514PE	Wireless Sensor Networks
PE-II	**EC611PE**	System Verilog for Verification
	EC612PE	Computer Organization and Operating Systems
	EC613PE	Wireless Communication Networks
	EC614PE	Image and Video Processing
PE-III	**EC711PE**	Design for Testability
	EC712PE	Electronic Packaging
	EC713PE	5G Communications
	EC714PE	Biomedical Signal and Image Processing
PE-IV	**EC721PE**	Low Power VLSI Design
	EC722PE	Artificial Neural Networks and Deep Learning
	EC723PE	Satellite Communications
	EC724PE	Unmanned Aerial Vehicles and Satellite Imaging
PE-V	**EC811PE**	System on Chip Architectures
	EC812PE	Analog and Mixed Signal IC Design
	EC813PE	AI for Signal and Image Processing
	EC814PE	Radar Systems
PE-VI	**EC821PE**	VLSI Physical Design
	EC822PE	Quantum Technologies
	EC823PE	DSP Processors and Architectures
	EC824PE	Information Theory and Coding

Open Elective - I

EC500OE	Principles of Communication
EC501OE	Fundamentals of IoT

Open Elective - II

EC600OE	Fundamentals of Image Processing
EC601OE	Embedded System Design

Open Elective - III

EC700OE	Introduction to Unmanned Aerial Vehicles
EC701OE	FPGA based System Design

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
MA101BS	Matrices and Calculus (Common to all)	3	1	0	4

Pre – Requisite Intermediate Mathematics

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 Eigen vectors, Reduction of Quadratic form to canonical forms. Mean value theorems, Generalized Mean value theorems and Curve tracing. Partial Differentiation, Total Derivatives, Jacobian of functions, Maxima and minima of functions of two variables and three variables, 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 students will be able to

C101.1: Apply matrix techniques to solve system of linear equations.
C101.2: Apply the concept of Eigenvalues and Eigenvectors to reduce the Quadratic form to canonical form.
C101.3: Examine the Mean value theorems for a single variable function.
C101.4: Trace the curve by applying properties of geometry.
C101.5: Analyze the given function of several variables for maxima and minima.
C101.6: Evaluate the multiple integrals to find areas and volumes for the given regions.

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

Limit and Continuous of functions and its properties. 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 (All the theorems without proof).
Curve Tracing: Curve tracing in cartesian coordinates.

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 for double integrals (Cartesian to polar). Evaluation of Triple Integrals – Change of variables for Triple Integrals (Cartesian to Spherical & cylindrical polar 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 Editon, 2016, Narosa Publications.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, 2006, John Wiley & Sons.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Reprint, 2002, Pearson.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Reprint, 2008, Laxmi Publications.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, 3rd Edition, 2014, S Chand and Company Limited, New Delhi.
5. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, 2019, Wellesley-Cambridge Press.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
PH102BS	Advanced Engineering Physics (Common to ECE, EEE and CSE(AI&ML))	3	0	0	3

Pre-Requisites 10+2 Physics

Course Description: This course covers advanced engineering physics concepts, including crystallography, nanomaterials, and materials characterization. It explores quantum mechanics, quantum computing, and energy band theory, along with magnetic, dielectric, laser, and fibre optics in engineering applications. It connects core physics with modern technologies for research and innovation in advanced materials and quantum systems.

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

C102.1: Understand the crystal structures and characterize materials using XRD and SEM techniques.

C102.2: Apply quantum mechanics principles to explain particle behaviour and energy band formation in solids.

C102.3: Utilize quantum computing concepts to demonstrate the operation of quantum gates and basic quantum algorithms.

C102.4: Classify magnetic and dielectric materials and explain their properties, synthesis and applications.

C102.5: Apply laser concepts to practical devices like barcode scanners and LIDAR systems.

C102.6: Make use of the principles of fibre optics to analyze applications in communication.

Unit – I Crystallography & Materials Characterization

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance; defects in crystals (Qualitative): point defects, line defects, surface defects and volume defects. concept of nanomaterials: surface to volume ratio, X -ray diffraction: block diagram, working principle, calculation of average crystallite
size using Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

Unit – II Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, formation of energy bands, origin of bandgap, classification of solids, concept of discrete energy levels and quantum confinement in nanomaterials.

Unit – III Quantum Computing

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their

properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates, challenges and advantages of
quantum computing over classical computation, quantum algorithms: Deutsch-Jozsa, Shor, Grover.

Unit – IV Magnetic and Dielectric Materials

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, Weiss domain theory of ferromagnetism, hysteresis, soft and hard magnetic materials, synthesis of ferrimagnetic materials using co-precipitation method, applications: magnetic hyperthermia for cancer treatment, magnets for EV.

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM) and load cell.

Unit – V Laser and Fibre Optics

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO_2 laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, application: optical fibre for communication system.

TEXT BOOKS:

1. Walter Borchardt-Ott, Crystallography: An Introduction, 3rd Edition, 2011, Springer.
2. Charles Kittel, Introduction to Solid State Physics, 8th Edition, 2004, John Wiley & Sons, Inc.
3. Thomas G. Wong, Introduction to Classical and Quantum Computing, 2022, Rooted Grove.
4. B. K. Pandey, S. Chaturvedi, M. Venkanna, Advanced Engineering Physics, 2025, Cengage.

REFERENCE BOOKS:

1. Jozef Gruska, Quantum Computing, 1999, McGraw Hill.
2. Michael A. Nielsen & Isaac L. Chuang, Quantum Computation and Quantum Information, 2010, Cambridge University Press.
3. John M. Senior, Optical Fiber Communications Principles and Practice, 3rd Edition, 2014, Pearson Education Limited

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CS103ES	Programming for Problem Solving (Common to all)	3	0	0	3

Course Description: This course contains C programming concepts. Discuss control structures, arrays, pointers. Implementing modular programming, file I/O operations.

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

C103.1 Understand the elements of the C programming language.

C103.2 Implement control structures using the C programming language.

C103.3 Develop reusable code using the concept of modular programming.

C103.4 Illustrate fundamentals, basic operations on arrays and strings with suitable examples.

C103.5 Demonstrate the purpose and usage of user defined data types like structures, unions.

C103.6 Explore File handling functions using c.

Unit – I

Overview of C:C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Operators, Type conversions, Arithmetic Expressions, Formatting Numbers in Program Output.

Selection Structures: Control Structures, Conditions, Conditional operator, if Statement, if Statements with Compound Statements, Nested if Statements and Multiple Alternative Decisions, Switch statement. Case study on Decision Steps in Algorithms.

Unit – II

Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Case study on Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments. Storage classes, Macros.

Unit – III

Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments. Dynamic memory allocation.

Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.

Unit – IV

Strings: String Basics, String Library Functions: Assignment and Substrings.

Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers. **Recursion:** The Nature of Recursion, Tracing a Recursive Function, Recursive

Mathematical Functions, Recursive Functions with Array and String Parameters.

Unit – V

Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types.

Text and Binary Files: File Operations

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, 2nd Edition, Prentice Hall.
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, Low Price Edition, Pearson Education.
5. Programming in C, Stephen G. Kochan, 4th Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, 4th Edition, McGraw Hill.
7. Byron Gottfried, Schaum's Outline of Programming with C, 2nd Edition, McGraw Hill.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
ME104ES	Engineering Drawing and Computer Aided Drafting (Common to ECE, EEE, CSE(AI&ML))	2	0	2	3

Course Description: To acquire computer-aided drafting skill set and to build the ability to visualize various objects through traditional drawing practice in order to communicate concepts and ideas in the design of engineering products.

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

C104.1: Construct different types of non-circular curves and scales used in engineering applications.

C104.2: Demonstrate the principles of orthographic projections for points and lines.

C104.3: Apply the projections of planes by conventional mode and the projection of solids with CAD.

C104.4: Interpret the interior features of the objects by means of sectional planes.

C104.5: Develop the surfaces to fabricate the objects.

C104.6: Analyze orthographic and isometric projections using CAD.

Unit – I Introduction to Engineering Graphics (Conventional)

Principles of Engineering Graphics and their Significance, Geometrical Constructions.

Scales: Plain & Diagonal,

Conic Sections: Conic Sections including the Rectangular Hyperbola – General method only.

Cycloidal Curves: Cycloid, Epicycloids, and Hypocycloid

Unit – II Orthographic Projections (Conventional)

Principles of orthographic projections – conventions. Projections of points in all positions.

Projection of straight lines: Projections of straight lines parallel to both reference planes, perpendicular to onereference plane, and parallel to the other reference plane, inclined to one reference plane, and parallel to the other reference plane. Projections of a Straight Line Inclined to both the reference planes.

Unit – III Projections of Planes& Solids

Projections of Planes (Conventional): Projections of Plane geometric figures. Surface parallel to one and perpendicular to the other reference plane. Surface perpendicular to both reference planes. Surface inclined to one reference plane and perpendicular to the other reference plane.

Projections of Regular Solids (Conventional and Computer-Aided): Projections of right regular solids (Prism, Pyramid, Cylinder and Cone) in simple position and axis inclined to one reference plane. Computer-aided projections of solids.

Unit – IV Sections of Solids & Development of Surfaces

Sections of Solids (Conventional and Computer-Aided): Sectional views and the true shape of sections of solids. Solid positions considered: Axis perpendicular to HP and parallel to VP;

Axis perpendicular to VP and parallel to HP. Sectional planes: Horizontal, vertical, and inclined sectional planes. Computer-aided projections of sectional views.
Development of Surfaces of Right Regular Solids (Conventional) : Prism, Pyramid, Cylinder and Cone.

Unit – V Isometric Projections (Conventional and Computer-Aided)
Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Conversion of Isometric views to Orthographic views. Conversion of Orthographic views to Isometric views (for simple planes, solids, and compound solids)

TEXT BOOKS:

1. Bhatt, N. D., V. M. Panchal, and Pramod R. Ingle, Engineering Drawing, 53rd Edition, 2016, Charotar Publishing House Pvt. Limited.
2. Agrawal, Basant, and C. M. Agrawal, Engineering Drawing, 3rd Edition, 2020, Tata McGraw Hill Education (India).
3. Venugopal, K., Sreekanjana, G, Engineering Drawing, 2nd Edition, 2011, New Age International.
4. Jeyapoovan, T., Engineering drawing & Graphics Using AutoCAD, 3rd Edition, 2010, Vikas Publishing House

REFERENCE BOOKS

1. Bethune,James D., Engineering Graphics with Auto CAD, 2nd Edition, 2020, Pearson Education, Inc..
2. Parthasarathy, N. S and Vela Murali, Engineering drawing, 1st Edition, 2015, Oxford University Press.
3. Balaveera Reddy, K., Computer Aided Engineering Drawing, 2nd Edition, 2015, CBS Pvt.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
EN105HS	**English for Skill Enhancement (Common to CSE, ECE, EEE)**	3	0	0	3

Pre - Requisite Intermediate English

Course Description: English for Skill Enhancement aligns with the objectives of the National Education Policy (NEP) 2020 by fostering linguistic competence, communication skills, and value-based learning. The course emphasizes the use of English for academic, professional, and social communication through the development of Listening, Speaking, Reading, and Writing (LSRW) skills. It builds on learners' existing knowledge of grammar, vocabulary, and comprehension to promote clarity and precision in expression. The course aims to prepare students for lifelong learning and effective communication in diverse contexts.

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

C105.1: Choose appropriate vocabulary in their oral and written communication.
C105.2: Demonstrate their understanding of the rules of functional grammar and sentence structures.
C105.3: Develop comprehension skills from known and unknown passages.
C105.4: Compose paragraphs, essays, précis and draft letters.
C105.5: Write abstracts and reports in various contexts.
C105.6: Develop key competencies to hone the humane traits.

Unit – I Theme: Perspectives

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions – Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

Unit – II Theme: Digital Transformation

Lesson on 'Emerging Technologies' from the prescribed textbook titled English for the Young in the Digital World published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

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

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing – Types, Structures and Features of a Paragraph – Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph –Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence

- Essay Writing - Writing
Introduction and Conclusion.

Unit – III Theme: Attitude and Gratitude

Poems on 'Leisure' by William Henry Davies and 'Be Thankful' – Unknown Author from the prescribed textbook titled English for the Young in the Digital World published by Orient BlackSwan Pvt. Ltd.

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

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

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

Unit – IV Theme: Entrepreneurship

Lesson on 'Why a Start-Up Needs to Find its Customers First' by Pranav Jain from the prescribed textbook titled English for the Young in the Digital World published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

Unit – V Theme: Integrity and Professionalism

Lesson on 'Professional Ethics' from the prescribed textbook titled English for the Young in the Digital World published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech - Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

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

TEXT BOOKS:

1. Board of Editors, English for the Young in the Digital World, 2025, Orient Black Swan Pvt. Ltd.

REFERENCE BOOKS:

1. Swan, Michael, Practical English Usage, 2016, Oxford University Press, Oxford.
2. Karal, Rajeevan, English Grammar Just for You, 2023, Oxford University Press, New Delhi.
3. Cengage India, Empowering with Language: Communicative English for Undergraduates, 2024, Cengage Learning India Pvt. Ltd., New Delhi.
4. Sanjay Kumar & Pushp Lata, Communication Skills – A Workbook, 2022, Oxford University Press, New Delhi
5. Wood,F.T, Remedial English Grammar, 2007, Macmillan.
6. Vishwamohan, Aysha, English for Technical Communication for Engineering Students, 2013, Mc Graw-Hill Education India Pvt. Ltd.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
PH106BS	Advanced Engineering Physics Lab (Common to ECE, EEE and CSE(AI&ML))	0	0	2	1
Pre-Requisites	10+2 Physics				

Course Description: This lab course offers hands-on training in advanced physics experiments on nanomaterials, semiconductors, magnetism, and optics. Students synthesize nanomaterials, study semiconductor and magnetic properties, and explore laser and fibre optic characteristics. It enhances experimental, analytical, and problem-solving skills essential for research, materials characterization, and modern technological applications.

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

C106.1: Synthesize and analyze nanomaterials using chemical methods.

C106.2: Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.

C106.3: Characterize semiconductors using Hall effect and energy gap measurement techniques.

C106.4: Demonstrate working knowledge of photoelectric effect, laser systems and optical fiber parameters through experimental study.

LIST OF EXPERIMENTS

1. Synthesis of nano material using co-precipitation method.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concertation of a given semiconductor.
4. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
5. Study of B-H curve of a ferro magnetic material.
6. Determination of the work function of metal and Planck's constant using the photoelectric effect.
7. Determination of dielectric constant of a given material.
8. Determination of Curie's temperature of a given ferroelectric material.
9. A) Determination of wavelength of a laser using diffraction grating.
   B) Study of V-I & L-I characteristics of a given laser diode.
10. A) Determination of numerical aperture of a given optical fibre.
    B) Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.

REFERENCE BOOKS:

1. S. Balasubramanian & M.N. Srinivasan, A Text book of Practical Physics, 2017, S Chand.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
CS107ES	Programming for Problem Solving Lab (Common to all)	0	0	2	1

Course Description: This Course introduces applying various C programming concepts. Develop reusable code using modular programming. Explore various predefined functions on strings. Handling file operations.

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

C107.1: Build programs using control structures to solve simple mathematical problems.

C107.2: Handle arrays and strings with pointers for efficient memory usage and faster operations.

C107.3: Utilize modular programming techniques to improve program readability and maintainability.

C107.4: Implement programs involving file handling operations for effective data processing.

LIST OF PROGRAMS

CYCLE 1:

Simple numeric problems:

1. Write a program for finding the max and min from the three numbers.
2. Write the program for the simple, compound interest.
3. 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
   5 x 3 = 15
4. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

5. 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).
6. Write a program that finds if a given number, is a prime number.
7. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
8. 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.
9. Write a C Program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
10. Write a C program to find the roots of the Quadratic equation.

Arrays, Pointers and Functions:

11. Write a C program to find the minimum, maximum and average in an array of integers.
12. Write a C program that uses functions to perform the following:
    a. Addition of Two Matrices.

b. Multiplication of Two Matrices.

13. Write a program for reading elements using a pointer into an array and display the values using the array.
14. Write a program for display values reverse order from an array using a pointer.

CYCLE 2:

Recursion:

15. Write C programs that use both recursive and non-recursive functions.
    a. To find the factorial of a given integer.
    b. To GCD (greatest common divisor) of two given integers.
    c. To generate Fibonacci series.

Arrays (Contd.)

    d. Write a C program that uses recursive and non-recursive functions to search for a Key value in a given list of integers using linear search method.
    e. Write a C program that uses recursive and non-recursive function sorts the given array of integers using selection sort in descending order.

Strings:

16. Write a C program that uses functions to perform the following operations:
17. To insert a sub-string into a given main string from a given position.
18. To delete n Characters from a given position in a given string.
19. 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.).
20. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
21. Write a C program to count the lines, words and characters in a given text.

Files:

22. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
23. 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).

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, 2nd Edition, Prentice Hall.
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, Low Price Edition, Pearson Education.
5. Programming in C, Stephen G. Kochan, 4th Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, 4th Edition, McGraw Hill.
7. Byron Gottfried, Schaum's Outline of Programming with C, 2nd Edition, McGraw Hill.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
EN108HS	English Language and Communication Skills Lab (Common to CSE, ECE, EEE)	0	0	2	1

Pre - Requisite Intermediate English

Course Description: The English Language and Communication Skills (ELCS) Lab focuses on listening and speaking skills, particularly 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 students will be able to

C108.1: Listen and interpret important information from spoken text and speeches.

C108.2: Use neutralized accent for intelligibility

C108.3: Speak fluently with clarity and confidence in professional and social spaces.

C108.4: Write appropriately and creatively for the given prompt.

Listening kills

Objectives

1. To enable students, develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds

Speaking Skills

Objectives

1. To improve their pronunciation and neutralize accent
2. To enable students express themselves fluently and appropriately
3. To practice speaking in social and professional contexts

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab which focusses on listening skills**

b. **Interactive Communication Skills (ICS) Lab which focusses on speaking skills**

The following course content is prescribed for the **English Language and Communication Skills Lab**

Exercise-I

CALL Lab:

Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active

Listening Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) - *Testing Exercises*

ICS Lab:

- **Diagnostic Test – Activity titled 'Express Your View'**

Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others

Practice: Any Ice-Breaking Activity and creating LinkedIn Profile

Exercise – II

CALL Lab:

Instruction: Listening vs. Hearing - Barriers to Listening

Practice: Listening for General Information - Multiple Choice Questions - Listening

Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: Features of Good Conversation – Strategies for Effective Communication-Chat Etiquette

Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations – Making Requests and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise – III

CALL Lab:

Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)

Practice: Differences between British and American Pronunciation –Listening Comprehension *Exercises*

ICS Lab:

Instruction: Picture Description

Practice: Looking at a Picture and Describing Objects, Situations, Places, People and Events (A wide range of Materials / Handouts are to be made available in the lab.)

Exercise – IV

CALL Lab:

Instruction: Techniques for Effective Listening

Practice: Listening for Specific Details - Listening - Gap Fill Exercises - Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity

Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V

Instruction: Identifying the literal and implied meaning

Practice: Listening for Evaluation - Write the Summary –Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: Understanding Non-Verbal Communication

Practice: Silent Speech - Dumb Charades Activity

- **Post-Assessment Test on 'Express Your View'**

REFERENCE BOOKS:

1. Shobha, KN & Rayen, J. Lourdes, Communicative English – A workbook, 2019, Cambridge University Press.
2. Board of Editors, ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities, 2016, Orient BlackSwan Pvt. Ltd.
3. Mishra, Veerendra et al., English Language Skills: A Practical Approach, 2020, Cambridge University Press.
4. Cengage, English Language Communication Skills – Lab Manual cum Workbook, 2022, Cengage Learning India Pvt. Ltd.
5. Ur, Penny and Wright, Andrew, Five Minute Activities – A Resource Book for Language Teachers, 2022 Cambridge University Press.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
EE109ES	**Introduction to Electrical Engineering**	**2**	**0**	**0**	**2**

Course Description: Introduction to Electrical Engineering covers the fundamental concepts and applications of electrical engineering essential for all disciplines. The course includes DC and AC circuit analysis, construction and operation of common electrical machines, and key components in electrical installations. It emphasizes understanding the principles of electricity that form the basis for modern engineering and daily life.

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

C109.1: Analyze DC electric circuits with basic electrical components.
C109.2: Analyze single phase and Three phase AC circuits.
C109.3: Explain the construction and working principle of DC machine.
C109.4: Evaluate the performance of transformers.
C109.5: Explain the construction and working principle of AC machines.
C109.6: Explain 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, Nodal Analysis; Superposition, Thevenin and Norton Theorems. (Only Problems with independent sources).

Unit – II A.C. Circuits

Representation of sinusoidal waveforms, peak, rms, and average values (only for sinusoidal waveforms), 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).

Unit – III DC Machine and Transformers

DC Machine: Construction and working principle of dc motor and dc generator, performance characteristics of dc shunt motor.

Transformers: Construction and working principle of Transformer, Ideal and practical transformer, losses in transformers, regulation and efficiency (elementary treatment only). Working principle of Auto-transformer (elementary treatment only).

Unit – IV Three Phase Balanced Circuits and AC Electrical Machines

Introduction to Three phase balanced circuits (Star and Delta), Generation of rotating magnetic field, Construction and working principle of a three-phase induction motor, construction and working principle of a Single-phase induction motor.

Unit – V Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing. Elementary calculations for energy consumption, Applications of Batteries as Energy storage devices. Basic definition and applications of DC-DC converter and inverter.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 4th Edition, 2019, Tata McGraw Hill.
2. MS Naidu and S Kamakshaiah, Basic Electrical Engineering, 2nd Edition, 2008, Tata McGraw Hill.

REFERENCE BOOKS:

1. P. Ramana Pillai, M. Suryakalavathi, G.T. Chandrasheker, Basic Electrical Engineering, 2nd Edition, 2019, S. Chand.
2. D. C. Kulshreshtha, Basic Electrical Engineering, 2009, McGraw Hill.
3. M. S. Sukhija, T. K. Nagsarkar, Basic Electrical and Electronics Engineering, 1st Edition, 2012, Oxford.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, Basic Electrical Engineering, 2nd Edition, 2021, McGraw Hill.
5. L. S. Bobrow, Fundamentals of Electrical Engineering, 2011, Oxford University Press.

B.Tech. I Year I Semester

Course Code	Course Title	L	T	P	Credits
EE110ES	**Electrical Engineering Lab**	**0**	**0**	**2**	**1**

Course Description: This 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 modelled 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 students will be able to

C110.1: Verify electrical laws and theorems using circuit experiments.

C110.2: Analyze impedance in RL, RC, and RLC circuits.

C110.3: Measure voltage, current, power in Three-Phase Circuits and Single-Phase Transformers.

C110.4: Evaluate performance of DC Motors.

The following experiments are required to be conducted compulsorily:

1. Verification of KVL and KCL.
2. Verification of Thevenin's theorem.
3. Verification of Superposition theorem.
4. Calculations and Verification of Impedance and Current of RLC series Circuits.
5. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer.
6. Performance Characteristics of a DC Shunt Motor.
7. Measurement of Active Power in a balanced Three-phase circuit.
8. Measurement of Energy in a Single-Phase Circuit Using a 1-ϕ Energy Meter.

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

1. Verification of Norton's theorem.
2. Calculation and verification of impedance and current of series RL and RC Circuits.
3. Analysis and simulation of Single-Phase RLC circuit with sinusoidal input.
4. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
5. Measurement of reactive Power in a balanced three-phase circuit.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 4th Edition, 2019, Tata McGraw Hill.
2. MS Naidu and S Kamakshaiah, Basic Electrical Engineering, 2nd Edition, 2008, Tata McGraw Hill.

REFERENCE BOOKS:

1. P. Ramana Pillai, M. Suryakalavathi, G.T. Chandrasheker, Basic Electrical Engineering, 2nd Edition, 2019, S. Chand.
2. D. C. Kulshreshtha, Basic Electrical Engineering, 2009, McGraw Hill.
3. M. S. Sukhija, T. K. Nagsarkar, Basic Electrical and Electronics Engineering, 1st Edition, 2012, Oxford.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, Basic Electrical Engineering, 2nd Edition, 2021, McGraw Hill.
5. L. S. Bobrow, Fundamentals of Electrical Engineering, 2011, Oxford University Press.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
MA201BS	Ordinary Differential Equations and Vector Calculus (Common to all)	3	0	0	3

Pre - Requisite Intermediate Mathematics

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

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

C201.1: Apply first-order and first-degree differential equations in solving real-time and Engineering problems.

C201.2: Solve higher-order linear differential equations with constant coefficients using appropriate techniques.

C201.3: Utilize Laplace transforms and inverse Laplace transforms to solve initial value problems in engineering applications.

C201.4: Analyze the vector fields with respect to the vector differentiation.

C201.5: Solve the line, surface and volume integrals.

C201.6: Analyze the relation between the vector integral theorems.

Unit – I First Order and First-Degree Ordinary Differential Equations

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 – Applications to Electrical Circuits: LR Circuit.

Unit – II ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Higher order linear differential equations with constant coefficients: non-Homogeneous terms of the type e^{ax}, sinax, cosax, polynomials in x, $(x)$and $xV(x)$- Method of variation of parameters. Applications to Electrical Circuits: LCR Circuits

Unit – III LAPLACE TRANSFORMS

Laplace Transforms: Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' 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 – Scalar potential functions – Solenoidal and Irrotational vectors.

Unit – V VECTOR INTEGRATION

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

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 Editon, 2016, Narosa Publications.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, 2006, John Wiley & Sons.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Reprint, 2002, Pearson.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Reprint, 2008, Laxmi Publications.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, 3rd Edition, 2014, S Chand and Company Limited, New Delhi.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
CH202BS	Engineering Chemistry (Common to ECE, EEE, CSE(AI&ML))	3	0	0	3

Pre - Requisite Intermediate 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, analyse chemical reactions, and apply chemical concepts in engineering practice.

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

C202.1: Understand the basic properties of waters and their applications in both domestic and industrial purpose.

C202.2: Acquire the fundamental knowledge of electrochemistry and relate the electrochemical reactions for corrosion and its control.

C202.3: Analyse the synthesis, working mechanisms, and significance of batteries and electronic materials, exploring their applications in various fields.

C202.4: Illustrate the concepts, properties of advanced engineering polymers, functional materials and their applications in various industries.

C202.5: Propose and interpret solutions for the challenges related to green and sustainable technologies.

C202.6: Comprehend and apply the working principles of spectroscopy in analyzing pollutants in dye industries and biomedical field.

Unit – I Water and Its Treatment

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break- point chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges 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 Electrochemistry and Corrosion

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion – Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the

corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

Unit – III Energy storage and Electronic Materials

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium-ion battery. Fuel Cells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

RFID and IONT materials: Synthesis, properties and applications in logistic information, intelligent packaging systems (Graphene oxide, carbon nanotubes (CNTs) and polyaniline).

Sensors: Introduction-Definition, Basic principle, and components, Classification of sensors, Examples – Piezoelectric - quartz, electrochemical- Gas sensor, and Biosensor -Amperometric Glucose monitor and their engineering applications.

Unit – IV Functional Materials and Green Chemistry

Conducting polymers: Definition and Classification with examples - Mechanism of conduction in trans-poly-acetylene and applications of conducting polymers.

Biodegradable polymers: Synthesis, Properties and applications of Polylactic acid

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol

Green Chemistry: Introduction, 12 principles with real life examples, validation of greenness.

E -waste: Hazards and toxicity, segregation and recycling (Hydrometallurgy, pyrometallurgy and direct recycling). Extraction of valuable metals from E-waste. Battery waste management and recycling, circular economy – case studies.

Unit – V Principles of Spectroscopy and Analysis

Basic Principles and selection rules of UV-Visible, IR spectroscopy, Raman spectroscopy

Interpretative spectroscopic applications: UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumour detection in medical applications.

TEXT BOOKS:

1. P.C. Jain and M. Jain, Engineering Chemistry, 16th Edition, 2010, Dhanpatrai Publishing Company.
2. Shashi Chawla, A textbook of Engineering Chemistry, 3rd Edition, 2011, Dhanpatrai and Company (P) Ltd. Delhi.
3. Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, 2nd Edition, 2015, Cambridge University Press, Delhi.
4. B. Rama Devi, P. Aparna, Prasanta Rath, Engineering Chemistry, 1st Edition, 2025, Cengage learning.

REFERENCE BOOKS:

1. Thirumala Chary Laxminarayana & Shashikala, Engineering Chemistry, 2020, Pearson Publications
2. Donald J. Leo, Engineering Analysis of Smart Material Systems, 2007, Wiley.

3. Singh, Paramvir, Avinash Kumar Agarwal, Anupma Thakur, and Ravindra Kumar Sinha, eds. Challenges and Opportunities in Green Hydrogen Production, 2024, Springer.
4. Chander Prakash, Sunpreet Singh, J. Paulo Davim, Functional and smart materials,2020, CRC Press.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EE203ES	Network Analysis and Synthesis	3	0	0	3
Prerequisites	Introduction to Electrical Engineering				

Course Description: Network analysis and synthesis is a professional engineering course that deals with the study and application of network concepts in communication engineering. This course gives significance of magnetically coupled circuits and graph theory in communication engineering. It also deals with transient and steady state analysis of RLC circuits, two port network parameters, design and analysis of filter circuits and network synthesis.

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

C203.1: Understand the concepts of network topology and coupled circuits
C203.2: Determine the steady state and transient analysis of first order and second order circuits.
C203.3: Determine the two port network parameters
C203.4: Design and analyze different types of filters
C203.5: Design and analyze different types of attenuators
C203.6: Synthesize various types of networks using network functions

Unit – I Network Topology & Coupled Circuits

Graph, tree, chord, Tie-set, cut-set, incident matrices, Problems on determination of incidence, tie-set and cut-set matrices.

Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance, Ideal Transformer, Impedance transformation and equivalent T for magnetically coupled circuits.

Unit – II Transient and Steady state analysis

Response of RL, RC and RLC series and parallel circuits for step and sinusoidal excitations. Damping factor, over damped, under damped, critically damped cases for RLC circuits. RC Circuits as integrator and differentiators. Series and parallel resonance, resonance curves, quality factor and bandwidth.

Unit – III Two port network parameters

Z, Y, ABCD, h and g parameters, inter relationship between the parameters, interconnection of two port networks. Characteristic impedance and image impedance of standard T and π Sections. Image transfer constant.

Unit – IV Filters and Attenuators

Classification of Filters, Filter Networks, Constant-K Filters-Low pass, high pass, Band pass, band-stop filters, M-derived Filters- T and π filters- Low pass, high pass Attenuators: Types – T, π, and lattice symmetrical Attenuators.

Unit – V Network Synthesis

Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non-ladder networks, Poles and Zeros of network functions, Hurwitz polynomials, Positive Real Functions, Synthesis of LC, RC and RL Functions by Foster and Cauer methods.

TEXT BOOKS:

1. Van Valkenburg, Network Analysis, 3rd Edition, 2016, Pearson.
2. JD Ryder, Networks, Lines and Fields, 2nd Edition, 1999, PHI.
3. Ravish R. Singh, Network Analysis and Synthesis, 2nd Edition, 2019, McGraw Hill

REFERENCE BOOKS:

1. J. Edminister and M. Nahvi, Electric Circuits, Schaum's Outline Series, 4th Edition, 1999, Mc Graw Hill Education.
2. A. Sudhakar and Shyammohan S Palli, Circuits and Networks: Analysis and Synthesis, 5th Edition, 2017, Tata McGraw- Hill Publications.
3. William Hayt and Jack E. Kimmerley, Engineering Circuit Analysis, 6th Edition, 2005, McGraw Hill Company.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
CS204ES	**Python Programming (Common to ECE & EEE)**	**3**	**0**	**0**	**3**

Course Description: This course introduces Python programming with fundamental concepts such as syntax, variables, operators, input/output, and control structures, and then progresses to data structures, including strings, lists, tuples, sets, and dictionaries for efficient data handling. Building on these foundations, it covers functions, modules, and packages, with practical applications on Raspberry Pi to enhance problem-solving skills. The course further addresses file handling, exception handling, and regular expressions are also introduced to create real-world applications.

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

C204.1: Understand Python programs using variables, operators, expressions, and control structures.

C204.2: Demonstrate the use of built-in data structures such as lists, tuples, sets, and dictionaries.

C204.3: Apply modular and reusable principles for designing Python programs.

C204.4: Analyze problems using file handling and Python libraries.

C204.5: Make use of custom exceptions to provide specific error information for different scenarios.

C204.6: Apply Python programming concepts and interface peripherals on a Raspberry Pi

Unit – I Introduction to Python and Basics of Programming

Introduction to Python: Features, Applications, Installation, IDEs, Python Syntax, Indentation, Comments, Variables, Data Types, Type Casting, Operators: Arithmetic, Relational, Logical, Assignment, Membership, Identity, Bitwise, Input/Output functions (input(), print()), Control Structures: if, if-else, if-elif-else, Nested Conditions, Looping: for, while, Nested Loops, break, continue, pass.

Unit – II Data Structures in Python

Strings: Creation, Indexing, Slicing, Methods, String Formatting

Lists: Creation, Indexing, Slicing, List Comprehension, Methods

Tuples: Properties, Indexing, Methods, Sets: Creation, Operations, Methods

Dictionaries: Creation, Access, Methods, Dictionary Comprehension, Iterating over data structures.

Unit – III Functions

Functions: Defining, Calling, Parameters, Return Values, Types of Arguments: Positional, Keyword, Default, Variable Length, Scope of Variables: Local and Global, Lambda Functions, Map, Filter, Reduce, Recursion in Python

Unit – IV Modules and File Handling

Modules: Importing, Creating User-defined Modules, Standard Modules (math, random, datetime), Packages in Python

Unit – V Exception Handling & Raspberry PI Programming

Exception Handling: try, except, else, finally, Built-in Exceptions, Raising Exceptions, Introduction to Regular Expressions (re module).

Introduction to Raspberry PI: Programming Raspberry PI with Python, Interfacing Raspberry Pi with basic peripherals.

TEXT BOOKS:

1. Reema Thareja, Python Programming – Using Problem Solving Approach, 1st Edition, Oxford University Press.
2. Eric Matthes, Python Crash Course, 2nd Edition, 2019, No Starch Press.
3. Mark Lutz, Learning Python, 4th Edition, O'Reilly.

REFERENCE BOOKS:

1. Gowrishankar S., Veena A, Introduction to Python Programming, 1st Edition, CRC Press.
2. David Beazley, Brian K. Jones, Python Cookbook, 3rd Edition, O'Reilly.
3. Luciano Ramalho, Fluent Python, 2nd Edition, O'Reilly.
4. AL Sweigart, Automate the Boring Stuff with Python, 2015, No Starch Press.
5. Arsheep Bahga, Vijay Madisetti, Internet of Things - A Hands-On Approach, 1st Edition, 2015, Orient Blackswan Private Limited.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EC205ES	Electronic Devices and Circuits	3	0	0	3

Course Description: This course provides in-depth knowledge on diodes, BJTs and FETs their switching characteristics, Applications, analysis of transistors. To understand of various types of feedback amplifier circuits and some special function ICs.

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

C205.1: Evaluate diode characteristics and applications in rectification, regulation, and waveform shaping circuits.

C205.2: Analyze the structure, operation, and characteristics of BJT configurations and determine h-parameters.

C205.3: Apply different transistor biasing techniques to establish stable operating points and ensure thermal stability.

C205.4: Examine small-signal transistor amplifiers using h-parameter and approximate models.

C205.5: Explain the operation and applications of Special purpose diodes.

C205.6: Differentiate characteristics and operation of JFET and MOSFET devices.

Unit – I Diodes

Diode Characteristics and Applications: PN junction diode – I-V characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers – Half-wave, Full- wave (Centre-tap and bridge), Capacitor filter for rectifiers, Clippers and clampers, Zener diode – I-V characteristics and voltage regulation.

Unit – II Bipolar Junction Transistor (BJT)

Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics, Determination of h-parameters from transistor characteristics.

Unit – III BJT Biasing

Need for biasing and stabilization, Load line and operating point, Biasing techniques: Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway.

Unit – IV Transistor Amplifiers

Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

Unit – V Special Purpose Diodes:

Principle of Operation of SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode.

Field Effect Transistors: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics.

TEXT BOOKS:

1. Millman, Jacob and Christos C. Halkias, Electronic Devices and Circuits, 1st Edition, 1991, Tata McGraw-Hill.
2. Boylestad, Robert L and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, 2013, Pearson.
3. Sedra, Adel S and Kenneth C. Smith., Microelectronic Circuits, 7th Edition, 2014, Oxford University Press.

REFERENCE BOOKS:

1. David A Bell, Electronic Devices and Circuits, 5th Edition, 2008, Oxford University Press.
2. Donald A Neamen, Electronic Circuit Analysis and Design, 2nd Edition, 2001, McGraw-Hill.
3. Salivahanan S and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, 2017, McGraw-Hill Education.
4. Razavi, Behzad, Fundamentals of Microelectronics, 2nd Edition, 2013, Wiley.
5. Taur Yuan, and Tak H. Ning, Fundamentals of Modern VLSI Devices, 2nd Edition, 2009, Cambridge University Press.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
CH206BS	**Engineering Chemistry Lab (Common to ECE, EEE, CSE(AI&ML))**	**0**	**0**	**2**	**1**
Pre - Requisite	Intermediate Chemistry				

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 students will be able to

C206.1: To develop practical skills through hands-on chemistry experiments relevant to engineering.

C206.2: To analyze parameters related to water and the rate of corrosion of mild steel.

C206.3: To understand the working principle in the determination of concentrations or absorbance using different instrumentation techniques.

C206.4: To apply the principle of polymerization procedures in the synthesis of polymers.

LIST OF EXPERIMENTS

1. **Water analysis:**
   - Estimation of Hardness of water by EDTA Complexometry method.
   - Determination of optimum dose of coagulants in water purification process.
2. **Conductometry:**
   - Estimation of the concentration of strong acid by Conductometry.
   - Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.
3. **Potentiometry:**
   - Estimation of concentration of Fe^{+2}ion by Potentiometry using $KMnO_4$.
   - Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone.
4. **Colorimetry:** Verification of Lambert-Beer's law using $KMnO_4$.
5. **Preparations:**
   - Preparation of Bakelite.
   - Preparation of starch-based biopolymers.
6. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
7. **Virtual lab experiments:**
   - Construction of Fuel cell and it's working.
   - Smart materials for Biomedical applications
   - Batteries for electrical vehicles.
   - Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. B. Ramadevi, P. Aparna, Laboratory Manual in Engineering Chemistry, Special Edition, 2022, S. Chand Publishing.
2. Vogel, Arthur I, A text book of practical organic chemistry, 5th edition, 1989, Pearson India.
3. S. S. Dhara, A Textbook on Experiments and Calculations in Engineering Chemistry, 9th Edition, 2015, S. Chand.
4. K. Mukkanti, Practical Engineering Chemistry, 1st Edition, 2009, BS Publications

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
ME207ES	**Engineering Workshop (Common to ECE, EEE, CSE(AI&ML))**	**0**	**0**	**2**	**1**

Course Description: Engineering workshop 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 students will be able to

C207.1: Identify and distinguish basic manufacturing processes such as carpentry, fitting, and welding.

C207.2: Develop household and engineering components using metallic sheets through tin smithy practices.

C207.3: Apply fundamental electrical engineering concepts in house wiring, including the installation of switches and tube lights.

C207.4: Construct sand moulds using single and split patterns with foundry tools for casting applications.

1. Trades for Exercises

At least two exercises should be performed from each trade.

Cycle 1:

1. Carpentry – T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint
2. Fitting – V-Fit, L-Fit, Square Fit
3. Tin Smithy – Rectangular Tray, Conical Funnel, Open Scoop.

Cycle 2:

4. Foundry – Preparation of Green Sand Mould using Single Piece and Split Pattern
5. House Wiring – Parallel & Series Connections, Two-way Switch, Tube Light Connection
6. Welding Practice- Arc Welding and Gas Welding.

2. Trades for Demonstration & Exposure

The following trades will be demonstrated to provide students with practical insights into industrial applications and tools:

- Plumbing, Machine Shop, Metal Cutting, Power Tools in Construction, Wood working, Blacksmithy.

TEXT BOOKS:

1. Juneja, B. L., Workshop Practice, 1st Edition, 2015, Cengage Learning India.
2. Reddy, K. Venkata, Workshop Practice Manual, 6th Edition, Reprint 2025, BS Publications.

REFERENCE BOOKS:

1. Kannaiah, P., and K. L. Narayana, Workshop Manual, 2nd Edition, 2009, Scitech Publications.
2. Venugopal, K., Workshop Manual, 2012, Anuradha Publications.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
EC208ES	**Electronic Devices and Circuits Lab**	**0**	**0**	**2**	**1**

Course Description: This laboratory course aims to provide hands-on experience and simulation-based learning of semiconductor devices and basic electronic circuits. Students will analyze the characteristics and applications of diodes, BJTs, and FETs, design rectifiers and amplifiers, and simulate modern electronic circuits using software tools.

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

C208.1: Evaluate the characteristics of PN Junction and Zener diodes and their applications.

C208.2: Analyze BJT amplifier configurations with various biasing schemes.

C208.3: Use simulation tools to verify the characteristics and applications of PN junction, Zener diode, and BJT.

C208.4: Examine the characteristics of JFET, MOSFET and CMOS inverter circuits using simulation tools.

List of Experiments

A. Hardware-Based Experiments (7):

1. Study the I–V characteristics of a PN junction diode in forward and reverse bias to determine cut-in voltage and dynamic resistance.
2. Examine the reverse bias characteristics of a Zener diode and demonstrate its application as a voltage regulator under varying conditions.
3. Design and analyze half-wave and full-wave rectifiers (centre-tap and bridge) with and without capacitor filters to evaluate ripple factor and output voltage.
4. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
5. Plot the input and output characteristics of a BJT in common emitter configuration to determine input/output resistance and current gain.
6. Design and test fixed bias and voltage divider bias circuits to establish a stable operating point for a BJT amplifier and study DC load line behavior.
7. Construct and analyze a Common Base (CB) configuration of a BJT to study input-output characteristics and determine current gain (α) and input/output resistance.

B. Software-Based Simulation Experiments (7):

1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate a common emitter amplifier with and without emitter bypass capacitor to analyze the effect on voltage gain and signal amplification.
4. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
5. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
6. Simulate the characteristics of a MOSFET and design a CMOS inverter to study digital switching behavior and low-power logic design.

7. Simulate the transfer and output characteristics of an enhancement-mode NMOS transistor to analyze threshold voltage, drain current, and switching behavior.

Hardware Requirements:

1. Regulated DC Power Supply (0–30V)
2. Function Generator
3. Digital Multimeter
4. Cathode Ray Oscilloscope (CRO) or DSO
5. Breadboards and Connecting Wires
6. Resistors, Capacitors, Diodes (1N4007, Zener Diodes)
7. BJTs (e.g., BC107, 2N2222), JFETs (e.g., J201), MOSFETs (e.g., IRF540N)
8. Trainer Kits (optional but preferred for ease)

Software Requirements (Any one of the listed tools or equivalent):

1. LTSpice (Free from Analog Devices)
2. NI Multisim (Academic License or Student Version)
3. Proteus Design Suite (Simulation and PCB Design)
4. TINA-TI (Free from Texas Instruments)
5. PSPICE for TI or OrCAD Lite
6. Windows PC or Laptop with minimum 4GB RAM and i3 processor or better.

TEXT BOOKS

1. Millman, Jacob and Christos C. Halkias, Electronic Devices and Circuits, 1st Edition, 1991, Tata McGraw-Hill.
2. Boylestad, Robert L and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, 2013, Pearson.

REFERENCE BOOKS

1. David A Bell, Electronic Devices and Circuits, 5th Edition, 2008, Oxford University Press.
2. Salivahanan S and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, 2017, McGraw-Hill Education.
3. Taur Yuan, and Tak H. Ning, Fundamentals of Modern VLSI Devices, 2nd Edition, 2009, Cambridge University Press.

B.Tech. I Year II Semester

Course Code	Course Title	L	T	P	Credits
CS209ES	Applied Python Programming Lab (Common to ECE & EEE)	0	0	2	1

Course Description: This Course Covers Installation procedure of python, packages and implementation of different control structures. This course also focuses on installation of OS on Raspberry Pi, importing packages and usage of GPIO pins for collecting sensor data.

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

C209.1: Build basic programs using fundamental programming constructs.
C209.2: Develop reusable code using standard library functions
C209.3: Use different packages for processing data from files and plotting graphs.
C209.4: Implement applications on hardware boards using Python.

List of Programs:

Cycle 1:

1. Downloading and Installing Python and Modules
   a. Python 3 on Linux
      Follow the instructions given in the URL https://docs.python- guide.org/starting/install3/linux/
   b. Python 3 on Windows
      Follow the instructions given in the URL https://docs.python.org/3/using/windows.html
      (Please remember that Windows installation of Python is harder!)
   c. pip3 on Windows and Linux
      Install the Python package installer by following the instructions given in the URL:https://www.activestate.com/resources/quick-reads/how-to-install-and-use- pip3/
   d. Installing numpy and scipy
      You can install any python3 package using the command pip3 install <packagename>
   e. Installing jupyterlab
      Install from pip using the command pip install jupyterlab
2. Introduction to Python3
   a. Printing your biodata on the screen
   b. Printing all the primes less than a given number
   c. Finding all the factors of a number and show whether it is a perfect number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself.
3. Defining and Using Functions
   a. Write a function to read data from a file and display it on the screen.
   b. Define a boolean function *is palindrome* (<input>).
   c. Write a function *collatz(x)* which does the following: if x is odd, $x = 3x + 1$; if x is even, then $x = x/2$. Return the number of steps it takes for $x = 1$.
   d. Write a function $N(m, s) = exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$ that computes the Normal distribution.
4. The package numpy

a. Creating a matrix of given order m x n containing random numbers in the range 1 to 99999.
b. Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed.
c. Write a program to solve a system of n linear equations in n variables using matrix inverse.

5. The package scipy and pyplot
   a. Finding if two sets of data have the same *mean* value.
   b. Plotting data read from a file.
   c. Fitting a function through a set a data points using *polyfit* function.
   d. Plotting a histogram of a given data set.
6. The strings package
   a. Read text from a file and print the number of lines, words and characters.
   b. Read text from a file and return a list of all *n* letter words beginning with a vowel.
   c. Finding a secret message hidden in a paragraph of text.
   d. Plot a histogram of words according to their length from text read from a file.

Cycle 2:

7. Installing OS on Raspberry Pi
   a. Installation using PiImager
   b. Installation using image file
      i. Downloading an Image.
      ii. Writing the image to an SD card
      iii. Using Linux.
      iv. Using Windows.
      v. Booting up.
8. Accessing GPIO pins using Python
   a. Installing GPIO Zero library.
      i. First, update your repositories list.
      ii. sudo apt update.
      iii. Then install the package for Python 3.
      iv. sudo apt install python3-gpiozero.
   b. Blinking an LED connected to one of the GPIO pin.
   c. Adjusting the brightness of an LED.
   d. Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
9. Collecting Sensor Data
   a. DHT Sensor interface.
   b. Connect the terminals of DHT GPIO pins of Raspberry Pi.
   c. Import the DHT library using import Adafruit_DHT.
   d. Read sensor data and display it on screen.

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