

VELS





INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM, THIRUVANMIYUR - CHENNAI

UNDERGRADUATE DEGREE PROGRAMME

B.Tech. Electrical and Electronics Engineering

CURRICULUM & SYLLABUS

REGULATIONS 2026

Effective from the Academic Year 2026-2027

Department of Electrical and Electronics Engineering

School of Engineering

PALLAVARAM



VISION OF THE INSTITUTION
To make the Institute an epitome of excellence in higher education by effectively providing high quality education and rigorous training to students in multiple streams of choice with ample scope for all round development to make them excel in their profession for betterment of the society.

MISSION OF THE INSTITUTION	
M1	Effectively imparting knowledge and inculcating innovative thinking.
M2	Facilitating skill enhancement through add on courses and hands on training.
M3	Doing original, socially relevant, high-quality research.
M4	Instilling the spirit of integrity, equity, professional ethics and social harmony.



VISION OF THE DEPARTMENT

To be a center of excellence in Electrical and Electronics Engineering by providing quality education, encouraging meaningful research, and promoting innovation, while developing skilled engineers who contribute to sustainable technologies, smart energy solutions, and the progress of society and industry.

MISSION OF THE DEPARTMENT

M1	To develop strong technical competency through quality teaching, learning, and practical exposure
M2	To provide industry-oriented training to meet emerging professional demands.
M3	To enhance employability, innovation, entrepreneurship, and soft skills for global careers.
M4	To foster research, consultancy, and ethical contributions for societal development

After few years of completion of B.E Electrical and Electronics Engineering Programme, the graduates will

PROGRAMME EDUCATIONAL OUTCOMES (PEOs)	
PEO1	Apply strong technical competence in Electrical and Electronics Engineering to deliver efficient and sustainable solutions.
PEO2	Demonstrate research aptitude, lifelong learning, analytical skills, and multidisciplinary knowledge to meet evolving industrial needs.
PEO3	Develop entrepreneurial abilities and professional skills for personal and career growth.
PEO4	Exhibit leadership, ethical values, and environmental responsibility while contributing effectively to public and private sectors.

PROGRAMME OUTCOMES (POs)	
PO1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	**Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3	**Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and as required. (WK5)
PO4	**Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)
PO5	**Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
PO6	**The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	**Individual and Collaborative Team Work**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams
PO9	**Communication**: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	**Project Management and Finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for independent and life-long learning in the broadest context of technological change. (WK8)

KNOWLEDGE AND ATTRIBUTE PROFILE (WK)	
The Knowledge and Attitude Profile (WK) is intended to define the essential knowledge base and professional attitudes expected of program graduates. It ensures alignment with OBE principles and equips graduates with the capability to effectively analyze and address complex engineering problem.	
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
WK8	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
WK9	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)	
PSO1	Apply IoT and smart sensing techniques to develop intelligent power systems, smart grids, and advanced monitoring and control applications.
PSO2	Integrate modern tools to address real-world challenges in electric transportation and energy-efficient technologies.

COMETENICES AND PERFORMANCE INDICATORS

PO 1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.			
1.1	Demonstrate competence in mathematical modelling	1.1.1	Apply mathematical techniques such as Calculus, Linear Algebra, Probability theory and Random process, Fourier series, Fourier Transform, Laplace Transform, and Z-Transform to solve problems.
		1.1.2	Apply advanced mathematical techniques to model and solve Electrical and Electronics engineering problems.
1.2	Demonstrate competence in basic sciences	1.2.1	Apply laws of natural science to an engineering problem.
1.3	Demonstrate competence in engineering fundamentals	1.3.1	Apply fundamental engineering concepts to solve engineering problems
1.4	Demonstrate competence in specialized engineering knowledge to the program	1.4.1	Apply Electrical and Electronics engineering concepts to solve engineering problems.
PO 2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)			
2.1	Demonstrate an ability to identify and formulate complex engineering problem	2.1.1	Articulate problem statements and identify objectives
		2.1.2	Identify engineering systems, variables, and parameters to solve the problems
		2.1.3	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
2.2	Demonstrate an ability to formulate a solution plan and methodology for an engineering problem	2.2.1	Reframe complex problems into interconnected sub-problems
		2.2.2	Identify, assemble and evaluate information and resources.
		2.2.3	Identify existing processes/solution methods for solving the problem, including forming justified approximations and assumptions

		2.2.4	Compare and contrast alternative solution processes to select the best process.
2.3	Demonstrate an ability to formulate and interpret a model	2.3.1	Combine scientific principles and engineering concepts to formulate model/s (mathematical or otherwise) of a system or process that is appropriate interms of applicability and required accuracy.
		2.3.2	Identify assumptions (mathematical and physical) necessary to allow modeling of a system at the level of accuracy required.
2.4	Demonstrate an ability to execute a solution process and analyze results	2.4.1	Apply engineering mathematics and computations to solve mathematical models
		2.4.2	Produce and validate results through skillful use of contemporary engineering tools and models
		2.4.3	Identify sources of error in the solution process, and limitations of the solution.
		2.4.4	Extract desired understanding and conclusions consistent with objectives and limitations of the analysis
PO 3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and as required. (WK5)			
3.1	Demonstrate an ability to define a complex/ open-ended problem in engineering terms	3.1.1	Recognize that need analysis is key to good problem definition
		3.1.2	Elicit and document, engineering requirements from stakeholders
		3.1.3	Synthesize engineering requirements from a review of the state-of-the-art
		3.1.4	Extract engineering requirements from relevant engineering Codes and Standards such as IEEE, JEET-Springer, Elsevier etc.

		3.1.5	Explore and synthesize engineering requirements considering health, safety risks, environmental, cultural and societal issues
		3.1.6	Determine design objectives, functional requirements and arrive at specifications
3.2	Demonstrate an ability to generate a diverse set of alternative design solutions	3.2.1	Apply formal idea generation tools to develop multiple engineering design solutions
		3.2.2	Build models/prototypes to develop a diverse set of design solutions
		3.2.3	Identify suitable criteria for the evaluation of alternate design solutions
3.3	Demonstrate an ability to select an optimal design scheme for further development	3.3.1	Apply formal decision-making tools to select optimal engineering design solutions for further development
		3.3.2	Consult with domain experts and stakeholders to select candidate engineering design solution for further development
3.4	Demonstrate an ability to advance an engineering design to defined end state	3.4.1	Refine a conceptual design into a detailed design within the existing constraints (of the resources)
		3.4.2	Generate information through appropriate tests to improve or revise the design
PO 4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)			
4.1	Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1	Define a problem, its scope and importance for purposes of investigation
		4.1.2	Examine the relevant methods, tools and techniques of experiment design, system calibration, data acquisition, analysis and presentation
		4.1.3	Apply appropriate instrumentation and/or software tools to make measurements of physical quantities

		4.1.4	Establish a relationship between measured data and underlying physical principles.
4.2	Demonstrate an ability to design experiments to solve open-ended problems	4.2.1	Design and develop an experimental approach, specify appropriate equipment and procedures
		4.2.2	Understand the importance of the statistical design of experiments and choose an appropriate experimental design plan based on the study objectives
4.3	Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1	Use appropriate procedures, tools and techniques to conduct experiments and collect data
		4.3.2	Analyze data for trends and correlations, stating possible errors and limitations
		4.3.3	Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
		4.3.4	Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions
PO 5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)			
5.1	Demonstrate an ability to identify/ create modern engineering tools, techniques and resources	5.1.1	Identify modern engineering tools and techniques and resources for engineering activities.
		5.1.2	Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2	Demonstrate an ability to select and apply discipline-specific tools, techniques and resources	5.2.1	Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
		5.2.2	Demonstrate proficiency in using discipline-specific tools
	Demonstrate an ability	5.31	Discuss limitations and validate tools, techniques and resources

5.3	to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.2	Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
PO 6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)			
6.1	Demonstrate an ability to describe engineering roles in a broader context, e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1	Identify and describe various engineering roles; particularly as pertains to protection of the public and public interest at the global, regional and local level
6.2	Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
PO 7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)			
7.1	Demonstrate an ability to recognize ethical dilemmas	7.1.1	Identify situations of unethical professional conduct and propose ethical alternatives
7.2	Demonstrate an ability to apply the Code of Ethics	7.2.1	Identify tenets of the IEEE professional code of ethics.
		7.2.2	Examine and apply moral & ethical principles to known case studies
PO 8: Individual and Collaborative Team Work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.			
8.1	Demonstrate an ability to form a team and define a role for each member	8.1.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
		8.1.2	Implement the norms of practice (e.g., rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
8.2	Demonstrate effective individual and team operations--communication, problem-solving,	8.2.1	Demonstrate effective communication, problem-solving, conflict resolution and leadership skills
		8.2.2	Treat other team members respectfully
		8.2.3	Listen to other members
		8.2.4	Maintain composure in difficult situations

	conflict resolution and leadership skills		
8.3	Demonstrate success ina team-based project	8.3.1	Present results as a team, with smooth integration of contributions from all individual efforts
PO 9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.			
9.1	Demonstrate an ability to comprehend technical literature and document project work	9.1.1	Read, understand and interpret technical and non-technical information.
		9.1.2	Produce clear, well-constructed, and well-supported written engineering documents.
		9.1.3	Create flow in a document or presentation – a logical progression of ideas so that the main point is clear.
9.2	Demonstrate competence in listening, speaking, and presentation	9.2.1	Listen to and comprehend information, instructions, and viewpoints of others
		9.2.2	Deliver effective oral presentations to technical and non-technical audiences
9.3	Demonstrate the ability to integrate different modes of communication	9.3.1	Create engineering-standard figures, reports and drawings to complement writing and presentations
		9.3.2	Use a variety of media effectively to convey a message in a document or a presentation
PO 10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.			
10.1	Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	10.1.1	Describe various economic and financial costs/benefits of an engineering activity
		10.1.2	Analyze different forms of financial statements to evaluate the financial status of an engineering project
10.2	Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	10.2.1	Analyze and select the most appropriate proposal based on economic and financial considerations.

10.3	Demonstrate an ability to plan/manage an engineering activity within time and budget constraints	10.3.1	Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
		10.3.2	Use project management tools to schedule an engineering project, so it is completed on time and on budget.
PO 12: Life-Long Learning: Recognize the need for, and have the preparation and ability for independent and life-long learning in the broadest context of technological change. (WK8)			
11.1	Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	11.1.1	Describe the rationale for the requirement for continuing professional development
		11.1.2	Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap
11.2	Demonstrate an ability to identify changing trends in engineering knowledge and practice	11.2.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current
		11.2.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field.
11.3	Demonstrate an ability to identify and access sources for new information	11.3.1	Source and comprehend technical literature and other credible sources of information
		11.3.2	Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.
PSO 1: Apply IoT and smart sensing techniques to develop intelligent power systems, smart grids, and advanced monitoring and control applications.			
12.1	Demonstrate an ability to investigate the problems in the field of electrical and electronics engineering	12.1.1	Apply fundamentals of electrical concepts to solve electrical and electronics engineering problems
		12.1.2	Able to find solutions for proper functioning of circuits, systems and products.
12.2	Demonstrate an ability to analyze, design and evaluate problems in various systems	12.2.1	Able to locate and investigate the problem
		12.2.2	Select and use the suitable tools

		12.2.3	Able to eliminate the problem with optimum efforts for proper functioning of circuits, systems and products
PSO 2: Integrate modern tools to address real-world challenges in electric transportation and energy-efficient technologies.			
13.1	Demonstrate an ability to develop solutions for electrical and electronics engineering problems in industrial practices	13.1.1	Describe the reason for choosing solutions based on engineering principles
13.2	Demonstrate an understanding of the impact of electrical and electronics engineering on social, environmental and in economic contexts	13.2.1	Design solutions for engineering problems by considering it's effect and society and environment
		13.2.2	Recognize the economic impact of the various process and methods in designing solutions

VELS INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(Deemed to be University Estd. u/s 3 of the UGC ACT, 1956)

SCHOOL OF ENGINEERING UG REGULATIONS - 2026

Effective from the academic year 2026-2027 and applicable to the students to be admitted in **School of Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS),** Chennai.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

- "**Programme**" refers to the Degree Programme that is B.Tech.
- "**Discipline**" refers to specialization or branch of B.Tech. Degree Programme, like Electronics and Communication Engineering, Computer Science and Engineering etc.
- "**Course**" refers to theory or laboratory subject like Engineering Physics, Computer Programming etc.
- **"Registrar"** refers to the authority of the Institution who is responsible for all academic activities of the Departments for implementation of relevant rules and regulations.
- **"Controller of Examinations"** refers to the authority of the Institution who is responsible for all activities related to examinations.
- **"Institution"** refers to VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES (VISTAS**),** CHENNAI.

2. ADMISSION

2.1 First semester of the B.Tech. Degree Programme:

Passed 10+2 examination with Physics/ Mathematics/ Chemistry/ Computer Science/ Electronics/ Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/ Entrepreneurship as per table 8.4 Agriculture stream (for Agriculture Engineering) Obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in

the above subjects taken together.

OR

Passed D.Voc. Stream in the same or allied sector.

Admission to the B.Tech. programmes shall be offered to candidates who satisfy the eligibility criteria prescribed by AICTE and have qualified in the **VISTAS Scholastic Aptitude Test (VSAT)** conducted by the University.

The selection of candidates shall be based on their performance in VSAT and/or academic performance in the qualifying examination, as prescribed by the University from time to time.

Candidates shall have passed the Higher Secondary Examination (10+2 pattern) or its equivalent with Physics, Chemistry, and Mathematics as compulsory subjects and shall satisfy the minimum eligibility requirements stipulated by VISTAS and the statutory authorities.

2.2 Lateral entry to second year

Passed Minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology.

OR

Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject.

OR

Passed B.Voc/3-year D.Voc. Stream in the same or allied sector.

2.3 Lateral entry to third year

Candidates with a UG Diploma in Engineering are eligible for lateral entry admission directly into the third year of the relevant undergraduate engineering programme.

2.4 Lateral entry to final year

Candidates with a B.Voc. degree in the relevant discipline are eligible for lateral entry admission directly into the final year of the corresponding undergraduate programme.

3. PROGRAMMES OFFERED

A candidate may be offered a programme in any one of the branches of study approved by the Institution.

4. STRUCTURE OF THE PROGRAMMES

4.1 Curriculum and Syllabi

Every Programme will have curriculum with syllabi consisting of theory and practicals such as:

COURSE CATEGORY	DESCRIPTION AND SPECIFIC DETAILS
Basic Science Course (BSC)	Mathematics, Physics, Chemistry, Biology, etc.
Program Core Courses (PCC)	Allows students to pursue a secondary interest (e.g., Cyber Security, Management, or even Performing Arts).
Professional Elective Course (PEC)	core courses relevant to the chosen specialization/branch.
Multi-disciplinary Core Courses (MDC)	Courses on sciences, humanities, or social sciences.
Multi-disciplinary Elective Courses (MDE)	Courses from other branches which a student can choose from the list specified in the curriculum of the students B. Tech. Programmes.
Skill Enhancement Courses (SEC)	Courses on hands-on technical skills, **employability skills**, soft skills, and life skills.
Ability Enhancement Courses (AEC)	Courses on language proficiency and communication skills.
Value-Added Courses (VAC)	Courses on **Indian Knowledge Systems (IKS)**, Environmental education and constitutional values
Summer Internship (SI)	Mandatory practical exposure in industry
Project Report and Dissertation (PRD)	Course on Mini project, Phase I and II

4.2 Course Components

Each course includes one or more of the following components,

- **Lecture:** Structured classroom teaching focused on theoretical concepts and subject knowledge delivery.
- **Tutorial:** Interactive learning session intended for discussion, problem-solving, clarification, and guided practice.
- **Practical:** Hands-on learning activity designed to apply theoretical knowledge through experiments, demonstrations, or fieldwork.

- **Self-Learning:** Independent learning undertaken by students through reading, online resources, assignments, projects, and self-paced study activities.

4.3 Personality and Character Development

All students will undergo structured professional development courses designed to enhance communication, aptitude, soft skills, leadership, and professional competencies of students from the 3rd to 6th semester, with one course offered in each semester. The courses shall focus on improving confidence, interpersonal skills, teamwork, problem-solving ability, and career readiness.

All students shall enroll, on admission, in any one of the personality and character development programmes (NCC/NSS/NSO/YRC) and undergo training for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first-aid.

National Service Scheme (NSS) will have social service activities in and around the Institution.

National Sports Organization (NSO) will have sports, Games, Drills and Physical exercises.

While the training activities will normally be during weekends, the camp will normally be during vacation period.

4.4 Credit Distribution

Each course is assigned certain number of credits based on the following:

Learning Component	Credit Calculation Basis
Lecture (L)	1 hour of teaching per week = 1 Credit
Tutorial (T)	1 hour of Interactive learning session per week = **1 Credit**
Practical/Lab (P)	2 hours of lab work per week = **1 Credit**

4.5 Pre-requisite for courses

- A prerequisite course is a course that must be successfully completed before a student is permitted to enroll in a designated higher-level course.
- The Course Coordinator and the Department shall verify and approve the fulfillment of prerequisite requirements after the declaration of the End Semester Examination results of the preceding semester.
- A student may be considered eligible for enrollment in the desired course if any one of the following conditions is satisfied:
    - The student has maintained a minimum attendance of 75% in the prerequisite course.
    - The student has secured at least 50% marks in the Continuous Internal Assessment (CIA) examinations of the prerequisite course.
    - The student has successfully completed an online certification in the same or a related subject through NPTEL or any recognized MOOC platform.
- Students who do not satisfy any of the above criteria, or who were unable to meet the requirements due to valid medical reasons supported by appropriate documentation, shall be required to undergo and successfully complete a 30-hour bridge/crash course conducted by the Department before being permitted to register for the desired course.

4.6 Industrial Training / Internship

The students may undergo Industrial training for a period as specified in the Curriculum during summer / winter vacation. In this case the training has to be undergone continuously for the entire period.

The students may undergo Internship at Research organization / University (after due approval from the Department) for the period prescribed in the curriculum during summer / winter vacation, in lieu of Industrial training.

4.7 Industrial Visit

Every student is required to go for at least one Industrial Visit every year starting from the second year of the programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

4.8 Medium of Instruction

The medium of instruction is English for all courses, examinations, seminar presentations

and project / thesis / dissertation reports.

4.9 Massive Open Online Courses (MOOCs)

- Students opting for an online course shall be required to register for the MOOCs through SWAYAM-NPTEL with the guidance of SPOC/Mentors.
- Credit transfer policy will be applicable to –
  - All UG and PG programmes offered by the Institution.
  - All PCC/PEC/BSC/MDC/MDE/VAC courses offered by the corresponding program.
- Students should have successfully completed the course and received the Marksheet from SWAYAM to opt for credit transfer. They shall apply to the office of the COE through the HOD and SPOC.
- VISTAS shall award the credit of the equivalent core and elective course in the curriculum as credit for the courses completed via SWAYAM/ NPTEL platforms.
- VISTAS shall give the equivalent grade to the students for the credits earned through online learning courses through SWAYAM platform

SWAYAM Range of Marks	SWAYAM/ NPTEL Type of Certificate	Proposed Equivalent Grade Points (VISTAS)	Proposed Letter Grade (VISTAS)	Proposed Description (VISTAS)
90-100	Elite + Gold	10	O	Outstanding
75-89	Elite + Silver	9	A+	Excellent
60-74	Elite	8	A	Very Good
40-59	Successfully Completed	7	B+	Good

- Credits earned through MOOCs will be incorporated in the mark sheet /final mark sheet issued to the student by the Controller of Examination
- Students who have qualified in the examination conducted by the SWAYAM and opting for Credit Transfer shall be exempted from appearing in Continuous and Semester End examinations for the equivalent course.
- VISTAS also permit students to undergo the same courses and appear for Continuous and Semester End Examinations at VISTAS if they desire to do so for a better performance.

4.10 Honors and Minor Degree

- **Honours Degree**

  An Honours Programme enables a student to acquire advanced knowledge and specialization in an emerging, multidisciplinary, or industry-relevant area within the same discipline/department. To earn an Honours credential, the student shall study and successfully complete **additional courses carrying 18–20 extra credits** beyond the credit requirements of the regular degree programme, as specified in the curriculum.

- **Minor Degree**

  A Minor Degree enables a student to gain interdisciplinary knowledge and specialization in a discipline other than the parent department. To earn a Minor Degree, the student shall study and successfully complete **additional courses carrying 18–20 extra credits** beyond the credit requirements of the regular degree programme, as specified in the curriculum of the respective department.

- Students who satisfy the eligibility criteria prescribed by the University may opt to pursue either an **Honours Programme** or a **Minor Degree** in addition to their regular degree programme. The award of an Honours Programme or Minor Degree shall be subject to the successful completion of the prescribed additional courses and the attainment of the required **18–20 extra credits.** The detailed regulations, eligibility requirements, credit requirements, and award criteria shall be governed by the guidelines issued by the University from time to time.
- The Department shall offer Honours or Minor programmes irrespective of the number of students enrolled.
- If a student discontinues Honours:
  - The completed additional courses may be considered in place of Professional Electives.
  - Courses with higher grades will be considered for CGPA calculation.
  - The other completed courses will appear in the grade sheet but will not be accounted for CGPA calculation.
  - Failed courses or courses with shortage of attendance will not appear in the grade sheet or CGPA calculation.
- If a student discontinues Minor:
  - The completed additional courses may be considered in place

of Open Electives.

- Courses with higher grades will be considered for CGPA calculation.
- The other completed courses will appear in the grade sheet but will not be accounted for CGPA calculation.
- Failed courses or courses with shortage of attendance will not appear in the grade sheet or CGPA calculation.

- Students must register for honors or minor degrees separately for these additional courses and pay the prescribed tuition and examination fees.

4.11 Semester Abroad and Twinning Programmes

Students may undergo a Semester Abroad / Twinning Programme at approved foreign universities or Institutions having academic collaboration with the Institution. The maximum duration permitted for a Semester Abroad Programme shall be six months, while the maximum duration permitted for a Twinning Programme shall be one year. A maximum of 30% of the total credits prescribed for the degree programme may be earned through the Semester Abroad / Twinning Programme.

Courses and credits completed at the host institution shall be approved by the Department and may be transferred to the respective programme as per the norms of the Institution. Students shall comply with the academic and disciplinary regulations of both the parent institution and the host institution during the programme period.

4.12 Dual Degree

The programme shall be offered only through institutions having a valid academic collaboration or Memorandum of Understanding (MoU) with the parent institution.

Students opting for a Dual Degree Programme shall fulfill the eligibility criteria and academic requirements prescribed by both participating institutions. The duration, course structure, credit transfer, and degree requirements shall be governed by the regulations approved by the respective institutions. Students shall comply with the

academic, disciplinary, and administrative rules of both institutions throughout the period of study.

The award of the dual degree shall be subject to the successful completion of all prescribed credits, project requirements, and assessment criteria of both programmes.

4.13 Joint Degree

The Institution may offer Joint Degree Programmes in collaboration with recognized national or international institutions having a valid academic collaboration agreement or Memorandum of Understanding (MoU).

The curriculum, duration of study, credit requirements, and evaluation pattern for the Joint Degree Programme shall be jointly approved by the participating institutions in accordance with the applicable regulatory norms. Students admitted to the Joint Degree Programme shall comply with the academic, administrative, and disciplinary regulations of all participating institutions. Credits earned at the partner institution shall be transferred and considered for the award of the Joint Degree as per the approved credit transfer policy of the Institution.

The Joint Degree shall be awarded upon successful completion of all prescribed academic requirements, including coursework, project work, internship, and examinations, as specified in the programme regulations.

4.14 Two Academic Programmes

A student may be permitted to pursue two academic programmes simultaneously, subject to the regulations and approval of the Institution where one of the two programmes may be pursued in online, open and distance learning, or hybrid mode, as permitted by the applicable regulatory norms.

The student shall satisfy the eligibility, attendance, academic, and examination requirements prescribed for both programmes independently. Credits earned in one programme shall not be transferred to the other programme unless specifically approved by the Institution.

The award of degrees shall be based on the successful completion of all requirements prescribed for the respective programmes.

4.15 Transfer of credits from other Institution

Students may be permitted to transfer credits earned from recognized Indian or Foreign Higher Educational Institutions, subject to the norms, conditions, and credit limits prescribed by the UGC.

- Twinning Programme: Credits earned from the Foreign Higher Educational Institution shall not exceed 30% of the total credits of the

programme.

- Joint Degree Programme: Students must earn at least 30% of the total credits from each of the Indian and Foreign Higher Educational Institutions.
- Dual Degree Programme: Students must earn at least 30% of the total credits from the Indian Institution.

4.16 Advanced and Differential Learners

Students securing a CGPA above 8.0 shall be identified as Advanced Learners and may be permitted to register for a maximum of three additional courses per semester along with flexible attendance provisions from the second year onwards.

Students requiring additional academic support shall be identified as Differential Learners and may be provided with bridge courses, remedial classes, mentoring, and other academic assistance measures

5. DURATION OF THE PROGRAMME

5.1 A student is expected to complete the B.Tech. Programme in 8 semesters (four academic years) but in any case, not more than 14 Semesters.

5.2 To support lifelong learning, the curriculum follows multiple entry multiple exit pathways as described below,

Pathway/Stage	Qualification Awarded	Additional Requirement	Re-entry & Validity Terms
Exit after Year 1	**Undergraduate (UG) Certificate**	Completion of a minimum of 40 credits followed by an additional **4-credit skill-based exit module** during the summer.	Credits earned are stored in the **Academic Bank of Credits (ABC)** and are typically valid for **7 years**.
Exit after Year 2	**Undergraduate (UG) Diploma**	Completion of a minimum of 80 credits followed by an additional **4-credit skill-based exit module**.	Students can return to the ecosystem to progress to the next level within the valid period.

Exit after Year 3	**B.Voc. degree**	Completion of a minimum of 120 credits followed by an additional **4-credit skill-based exit module**.	Students can return to the ecosystem to progress to the next level within the valid period.
Re-entry	**N/A(Vertical Mobility)**	Redemption of accumulated credits stored against the student's **APAAR ID** in the ABC.	Re-entry after the 7-year validity period requires **re-validation** of prior learning outcomes through fresh assessment.

5.3 Each semester shall normally consist of 90 working days or 450 periods. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods / hours specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

5.4 The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5.1 irrespective of the period of break of study (vide clause 18.3) in order that he/she may be eligible for the award of the degree (vide clause 16).

5.5 In special and exceptional cases, a further extension of **one year** may be permitted with the approval of the **Executive Council (EC)**, subject to the recommendation of the Head of the Institution and compliance with the applicable regulations.

6. ATTENDANCE REQUIREMENTS

6.1 Students are expected to attend all classes regularly and maintain a minimum attendance of 75% in each course.

6.2 It is the responsibility of every student to monitor their attendance percentage in each course and ensure compliance with the attendance regulations prescribed by VISTAS. Any discrepancy in attendance records should be immediately brought to the notice of the concerned faculty member for necessary correction.

6.3 Attendance relaxation up to 10% may be considered for valid reasons such as medical emergencies, on-duty assignments, extracurricular or extramural activities, permitted academic assignments, job interviews, inter-university sports meets, competitions, and other unforeseen emergencies.

6.4 Students who do not maintain the minimum attendance requirement of 75% in any course will not be permitted to appear for the End Semester Examination for that course.

6.5 The registration for such course(s) will be treated as cancelled, and the student will be awarded an 'I' Grade ('I' indicates Incomplete / Registration cancelled due to shortage of attendance). This grade will remain in the grade sheet until the course is successfully completed.

6.6 Students who fail to maintain the minimum attendance requirement of 75% in one or two courses may be permitted to attend additional classes on payment of the prescribed fee, and shall be allowed to appear for the End Semester Examination upon securing full attendance and satisfactory performance in such classes, as recommended by the course instructor and approved by the Institution.

6.7 A candidate who secures overall attendance between 65% and 74% in that current semester due to medical reasons (prolonged hospitalization / accident / specific illness / Participation in Sports events) may be permitted to appear for the current semester examinations subject to the condition that the candidate shall submit the medical certificate attested by the Dean of the School.

6.8 The overall attendance below 65% shall not be condoned under any circumstances.

6.9 A student whose overall attendance is below 65%, or whose shortage of attendance has not been condoned, shall be detained from appearing for the End Semester Examination of that semester.

6.10 Such a student shall be required to re-register for and repeat the semester/course(s) in accordance with the regulations of the University and shall fulfill the prescribed attendance requirements afresh.

6.11 Students from the second year onwards securing a CGPA of 8.0 and above may be granted flexible attendance, subject to the approval of the Institution, to pursue approved academic, research, internship, innovation, or entrepreneurial activities.

7. CLASS ADVISER AND MENTORS

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department of the students will attach a certain number of students to a teacher of the Department who shall function as Class Adviser for those students throughout their period of study. Such Class Advisers shall advise the students and monitor the courses undergone by the students, check the attendance and progress of the students attached to him/her and counsel

them periodically. If necessary, the Class adviser may also discuss with or inform the parents about the progress of the students.

Every student will also be allotted a mentor from the faculty of the department to guide him/her personally. The mentors will work in close association with the Class advisor to understand the progress of the students and provide the needed guidance.

8. COURSE COMMITTEE

Each common theory course offered to more than one discipline or class of students shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator.

The nomination of the course coordinator shall be made by the Head of the Department
/ Dean depending upon whether all the teachers teaching the common course belong to a single department or to several departments.

The 'Course committee' shall meet in order to arrive at a common scheme of evaluation for the assessments and shall ensure a uniform evaluation.

9. CLASS COMMITTEE

9.1 A Class Committee (CCM) shall be constituted for every class/semester consisting of the HoD, Chairperson, faculty members, and student representatives.

9.2 Each department shall nominate a faculty member as the Class Committee Coordinator to monitor and organize the meetings.

9.3 The Chairperson shall be nominated by the HoD and CCM Coordinator on a rotational basis.

9.4 Student representatives shall be selected based on academic performance, discipline,
attendance, and participation in co-curricular/extracurricular activities, ensuring fair representation of all student categories.

9.5 Class Committee Meetings shall be conducted periodically, preferably before every assessment examination, as per the academic schedule.

9.6 The committee shall review syllabus coverage, teaching–learning processes, assessment methods, student performance, attendance, and discipline.

9.7 Student feedback regarding courses, faculty, infrastructure, placement training, and other academic/non-academic matters shall be discussed

for continuous improvement.

9.8 Remedial actions, corrective measures, and follow-up plans for academic and student-related issues shall be identified and implemented.

9.9 Minutes of the meeting, including discussions, decisions, and action taken reports, shall be properly documented and maintained in both soft and hard copies.

9.10 The Class Committee shall function as a quality enhancement mechanism to improve academic performance, student support, and the overall teaching–learning environment.

10. SYSTEM OF EXAMINATION

10.1 Performance in each course of study shall be evaluated based on (i) continuous assessment throughout the semester and (ii) End Semester Examinations at the end of the semester.

10.2 Each course, both theory and practical (including project work & Viva voce Examinations) shall be evaluated for a maximum of 100 marks.

10.3 For all theory and practical courses including project work, the continuous assessment will carry 40 marks while the End Semester examination will carry 60 marks.

10.4 Project work may be allotted to a single student or to a group of students not exceeding 4 per group.

10.5 For theory cum practical courses, the practical component will be evaluated during the continuous assessments. End Semester examination will be similar to theory courses for 60 marks.

10.6 The end semester examination (theory and practical) of 3 hours duration shall ordinarily be conducted between November and December during the odd semesters and between April and May during the even semesters.

10.7 The end semester examination for project work shall consist of evaluation of the final report submitted by the student or students of the project group (of not exceeding 4 students) by an external examiner followed by a viva-voce examination conducted separately for each student by a committee consisting of the external examiner, the guide of the project group and an internal examiner.

10.8 For the end semester examination in both theory and practical courses including project work the internal and external examiners shall be appointed by Controller of Examinations.

11. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

11.1 Theory Courses

The distribution of internal assessment marks for theory courses shall be as follows:

S.No	Description		Marks
1	Two Continuous Assessment (C.A) Class Tests	(2 x 10)	**20**
2	Model Examination	(1 x 15)	**15**
3	Assignments / Class Seminar	(1 x5)	**05**
Total			**40**

11.2 Practical Courses

Every practical exercise / experiment shall be evaluated based on the exercise / experiment prescribed as per the syllabi and the records of work done maintained. There shall be at least one test during the semester. The criteria for arriving at the continuous assessment marks (40 marks) shall be decided based on the recommendation of the course committee/department advisory committee and shall be announced at the beginning of every semester by the Head of the Department.

11.3 Project Work:

11.3.1 The allotment of guides for eligible UG students must be done before the semester starts. All students are required to do Projects in Reputed Industry / Laboratory to promote academic industrial interaction and to provide professional expertise in selected fields of interest. Under this program, projects are formulated and implemented jointly by specialists from the industries and faculty members of the institute.

11.3.2 The Dean shall constitute a review committee for each branch of study. There shall be three reviews (each 100 Marks) during the semester by the review committee. The student shall make presentation on the progress made by him / her before the committee. The total marks obtained in the three reviews shall be reduced for 3 0 marks and rounded to the nearest integer. (This also implies equal weightage to all the three assessments), 5 marks shall be given for Attendance (Clause 11.3), and 5 marks shall be given for Student's Assesment by Faculty.

11.3.3 The project report shall carry a maximum 20 marks (same mark shall be awarded for the report submitted to every student within the project group) while the viva-voce examination shall carry 40 marks. (Marks are

awarded to each student of the project group based on the individual performance in the viva-voce examination).

11.3.4 If a candidate fails to submit the project report on or before the specified deadline, he / she is deemed to have failed in the Project Work and shall re-register for the same in a subsequent semester.

11.3.5 Students who are entrepreneurs with registered startups may be permitted to undertake startup-based innovation activities in lieu of the final year project, subject to approval by the Institution.

11.4 Other Employability Enhancement Courses

11.4.1 The seminar is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar, marks can be equally apportioned. The three-member committee appointed by Head of the Institution will evaluate the seminar and at the end of the semester the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper (40%), presentation (40%) and response to the questions asked during presentation (20%).

11.4.2 The Industrial / Practical Training, Summer Project, Internship, shall carry 100 marks and shall be evaluated through internal assessment only. At the end of Industrial / Practical training / internship / Summer Project, the candidate shall submit a certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a Viva- Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Institution.

12. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATIONS

A candidate shall be permitted to appear for the End Semester Examinations of any semester commencing from I semester if he/she has satisfied the semester completion requirements (subject to Clause 6) and has registered for examination in all courses of the semester. Registration is mandatory for semester examinations as well as arrear examinations, failing which the candidate will not be permitted to move to the higher semester.

A candidate who has already appeared for any subject in a semester and passed the examination is not entitled to reappear in the same subject for improvement of grades / marks.

13. PASSING REQUIREMENTS

13.1 A candidate who secures not less than 40% of total marks prescribed for the end- semester Examination in both theory and practical courses (including Project work), shall be declared to have passed the Examination.

13.2 If a candidate fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course during the subsequent semester when examination is conducted in that course; he/she should continue to register and reappear for the examinations in the failed subjects till he / she secures a pass.

13.3 The continuous assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent attempts till the candidate secure a pass.

14. AWARD OF LETTER GRADES

14.1 Grade Conversion Table

The performance of students in each course shall be indicated by Letter Grades and Grade Points based on the range of marks secured, as prescribed in the Grade Conversion Table approved by the Institution.

Range of	Grade Points	Letter Grade	Description
90 – 100	10	O	Outstanding
82 – 89	9	A+	Excellent
75 – 81	8	A	Very Good
67 – 74	7	B+	Good
60 – 66	6	B	Above Average
50 – 59	5	C	Average
40 – 49	4	D	Minimum for Pass
00 – 39	0	RA	Reappear
		AA	Absent

14.2 Calculation of GPA and CGPA

The Grade Point Average (GPA) for the semester GRADE POINT AVERAGE [GPA] is calculated as follows,

$$GPA = \frac{\sum(C \times GP)}{\sum(C)}$$

The Cumulative Grade Point Average (CGPA) is calculated as follows,

$$CGPA = \frac{\sum_{i=1}^{n} (C_i \times GP_i)}{\sum_{i=1} C}$$

where,

n - Number of subjects.

C - Credit for the academic courses successfully completed.

GP - Grade point for the academic courses successfully completed.

15. REVALUATION / PHOTOCOPY / REVIEW

15.1 A candidate can apply for revaluation of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Dean of the School. A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time. The Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Dean of the School. Revaluation is not permitted for practical courses, seminars, practical training and for project work.

15.2 A candidate can apply for photocopy of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of Department. The answer script is to be valued and justified by a faculty member, who handled the subject and recommend for revaluation with breakup of marks for each question. Based on the recommendation, the candidate can register for the revaluation through proper application to the Controller of Examinations. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

15.3 A candidate can apply for revaluation of answer scripts for not exceeding

5 subjects at a time.

15.4 Candidates not satisfied with Revaluation can apply for Review of his/ her examination answer paper in a theory course, within the prescribed date on payment of a prescribed fee through proper application to Controller of Examination through the Head of the Department. Candidates applying for Revaluation only are eligible to apply for Review.

16. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the award of the Degree if he/she has,

- Successfully gained the required number of total credits as specified in the Curriculum corresponding to his/her Programme within the stipulated time.
- No disciplinary action is pending against him/her.
- Successfully completed the field visit / industrial training, if any, as prescribed in the curriculum.
- The award of the degree must be approved by the Executive Council.

17. CLASSIFICATION OF THE DEGREE AWARDED

17.1 A candidate who qualifies for the award of the degree having passed the examination in all the courses in his / her first appearance within the specified minimum number of semesters securing a CGPA of not less than 7.5 shall be declared to have passed the examination in First class with Distinction. For the purpose the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.

17.2 A candidate who qualifies for the award of the degree having passed the examination in all the courses in his / her first appearance within the specified minimum number of semesters plus one year (two semesters), securing a CGPA of not less than 6.50 shall be

declared to have passed the examination in First class. Further, the authorized break of study will not be counted for the purpose of classification.

17.3 All other candidates who qualify for the award of the degree shall be declared to have passed the examination in Second Class.

17.4 Students who have been admitted from other Universities under Inter University Transfer are not eligible for Classification.

18. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

18.1 A candidate who qualifies for the award of the degree having passed the examination in all the courses in his / her first appearance within the specified minimum number of semesters securing a CGPA of not less than 7.5 shall be declared to have passed the examination in First class with Distinction. For the purpose the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.

18.2 A candidate who qualifies for the award of the degree having passed the examination in all the courses in his / her first appearance within the specified minimum number of semesters plus one year (two semesters), securing a CGPA of not less than 6.50 shall be declared to have passed the examination in First class. Further, the authorized break of study will not be counted for the purpose of classification.

18.3 All other candidates who qualify for the award of the degree shall be declared to have passed the examination in Second Class.

18.4 Students who have been admitted from other Universities under Inter University Transfer are not eligible for Classification.

19. PROVISION FOR AUTHORISED BREAK OF STUDY

19.1 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Dean of the School stating the reasons therefor and the probable date of rejoining the programme.

19.2 The candidate permitted to rejoin the Programme after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. If the Regulations is changed, then, those candidates may have to do additional courses as prescribed by the Dean, School of Engineering.

19.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide Clause

14). However, additional break of study granted will be counted for the purpose of classification.

19.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5.1 irrespective of the period of break of study (vide clause 18.3) in order that he/she may be eligible for the award of the degree.

19.5 If any student is detained for want of required attendance, the period spent in that semester shall not be considered as permitted 'Break of Study' (Clause 18.3) is not applicable for this case.

20. DISCIPLINE

Every student is required to observe disciplined and decorous behavior both inside and outside the Institution and not to indulge in any inappropriate or unethical activity. The Registrar shall constitute a disciplinary committee consisting of Dean, Two Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline and notify the Institution about the disciplinary action recommended for approval. In case of any serious in disciplinary action which leads to suspension or Dismissal, then a committee shall be constituted by the Institution. In this regard, the member will be nominated by Institution on getting information from the Head of School.

If a student indulges in malpractice in any of the end semester / internal examination he / she shall be liable for punitive action as prescribed by the Institution from time to time.

21. REVISION OF REGULATIONS AND CURRICULUM

The Institution may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and scheme of examinations through the Academic Council with the approval of Board of Studies.

ABBREVIATIONS

SEC	Skill Enhancement Course
AEC	Ability Enhancement Course
BSC	Basic Science Courses
MDC	Multidisciplinary Core
PCC	Program Core Courses
PEC	Professional Elective Courses
MDE	Multidisciplinary Elective

VAC	Value Added Course
PRD	Project report and Dissertation
SI	Summer Internship

CURRICULUM STURUCTURE

B.Tech Electrical and Electronics Engineering

Total number of Credits: 165

SEMESTER I										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	VAC	Theory	Universal Human Values – Understanding Harmony	3	0	0	3	3	40	60
2	BSC	Theory	Mathematics I - (Calculus and Linear Algebra)	3	0	2	5	4	40	60
3	BSC	Theory	Engineering Physics	3	0	0	3	3	40	60
4	MDC	Theory	Engineering Graphics	2	0	2	4	3	40	60
5	MDC	Theory	Computer programming using C	3	0	0	3	3	40	60
6	BSC	Practical	Engineering Physics Lab	0	0	3	3	1.5	40	60
7	MDC	Practical	Computer programming using C Lab	0	0	3	3	1.5	40	60
8	MDC	Practical	Fabrication and Workshop Practices Lab	0	0	3	3	1.5	40	60
9	VAC	Theory	Constitution of India	2	0	0	2	0	-	-
10	VAC	Theory	Student Induction Program	-	-	-	-	-	-	-
			Total	16	0	13	29	**20.5**	-	-
Total Credits for Semester 1 – 20.5										

SEMESTER II										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	AEC	Theory	Technical English	2	0	0	2	2	40	60
2	BSC	Theory	Mathematics – II (Multivariable Calculus and Complex Analysis)	3	0	2	5	4	40	60
3	BSC	Theory	Engineering Chemistry	3	0	0	3	3	40	60
4	BSC	Theory	Fundamentals of Electrical and Electronics Sciences	3	0	0	3	3	40	60
5	BSC	Theory	Fundamentals of Battery Science and Energy	3	0	0	3	3	40	60

			Storage							
6	MDC	Theory	Computer programming using Python	3	0	0	3	3	40	60
7	AEC	Practical	Technical English Lab	0	0	2	2	1	40	60
8	BSC	Practical	Engineering Chemistry Lab	0	0	3	3	1.5	40	60
9	BSC	Practical	Fundamentals of Electrical and Electronics Sciences Lab	0	0	3	3	1.5	40	60
10	SEC	Mandatory	Idea Lab	0	0	2	2	0	-	-
			Total	17	0	12	29	**22**	-	-
Total Credits for Semester II – 22										

SEMESTER III										
S.No	**Course Category**	**Course Type**	**Course Title**	**L**	**T**	**P**	**SL**	**C**	**Marks**	
									CIA	**SEE**
1	BSC	Theory	Mathematics - III (Probability and Statistics)	3	1	0	4	4	40	60
2	SEC	Theory	Design Thinking	2	0	0	2	2	40	60
3	PCC	Theory	Electrical Machines - I	3	0	0	3	3	40	60
4	PCC	Theory	Electric Circuits and Networks	3	0	0	3	3	40	60
5	PCC	Theory	Electromagnetic Fields	3	0	2	4	4	40	60
6	PEC	Theory	Professional Elective - I	3	0	0	3	3	40	60
7	PCC	Practical	Electric Circuits and Networks Lab	0	0	3	3	1.5	40	60
8	PCC	Practical	Electrical Machines – I Lab	0	0	3	3	1.5	40	60
9	SEC	Theory	Quantitative Skills Practice –I	2	0	0	2	2	40	60
10	VAC	Mandatory	Gender, Institution, and Society	2	0	0	2	0	-	-
			Total	21	1	8	29	**24**	-	-
Total Credits for Semester III – 24										

SEMESTER IV

S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	MDC	Theory	Fundamentals of Artificial Intelligence	3	0	0	3	3	40	60
2	PCC	Theory	Electrical Machines - II	3	0	0	3	3	40	60
3	PCC	Theory	Analog Electronics	3	0	0	3	3	40	60
4	PCC	Theory	Measurements and Instrumentation	3	0	0	3	3	40	60
5	PEC	Theory	Professional Elective - II	3	0	0	3	3	40	60
6	PCC	Practical	Electrical Machines – II Lab	0	0	3	3	1.5	40	60
7	PCC	Practical	Analog and Instrumentation Lab	0	0	3	3	1.5	40	60
8	SEC	Theory	Aptitude and coding skills - I	2	0	0	2	2	40	60
9	SEC	Project	Curricular and Co-Curricular activities / Community Connect	0	0	2	2	1	-	-
10	VAC	Mandatory	Basic life skills	0	0	2	2	0	-	-
			Total	17	0	10	27	**21**	-	-
Total Credits for Semester IV – 21										

SEMESTER V										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	BSC	Theory	Environmental Science Engineering and SDGs	2	0	0	2	2	40	60
2	PCC	Theory	Solid State Drives	3	0	0	3	3	40	60
3	PCC	Theory	Power Electronics	3	0	0	3	3	40	60
4	PCC	Theory	Power Systems	3	0	2	4	4	40	60
5	PCC	Theory	Digital Systems	3	0	0	3	3	40	60
6	PEC	Theory	Professional Elective – III	3	0	0	3	3	40	60
7	PCC	Practical	Power Electronics and Drives Lab	0	0	3	3	1.5	40	60
8	SEC	Theory	Aptitude and coding skills – II	2	0	0	2	2	40	60
9	PRD	Practical	Mini Project	0	0	2	2	1	40	60
			Total	19	0	7	25	**22.5**	-	-
Total Credits for Semester V – 22.5										
SEMESTER VI										

S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	AEC	Theory	Innovations and Entrepreneurships	1	0	0	1	1	40	60
2	PCC	Theory	Electric Power Transmission and Distribution	3	0	0	3	3	40	60
3	PCC	Theory	Control Systems	3	0	2	4	4	40	60
4	PCC	Theory	Microprocessor and Microcontrollers	3	0	0	3	3	40	60
5	PEC	Theory	Professional Elective – IV	3	0	0	3	3	40	60
6	MDE	Theory	Open Elective - I	3	0	0	3	3	40	60
7	PCC	Practical	Microprocessor and Microcontrollers Lab	0	0	3	3	1.5	40	60
8	SEC	Theory	Soft skill Development	2	0	0	2	2	40	60
9	SI	Practical	Internship	0	0	2	2	1	40	60
			Total	18	0	7	24	**21.5**	-	-
Total Credits for Semester VI – 21.5										

SEMESTER VII										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	PCC	Theory	Power System Operation and Control	3	0	0	3	3	40	60
2	PCC	Theory	Protection Switch Gear	3	0	0	3	3	40	60
3	PCC	Theory	Electric Energy Utilization and Conservation	3	0	0	3	3	40	60
4	PEC	Theory	Professional Elective - V	3	0	0	3	3	40	60
5	PEC	Theory	Professional Elective - VI	3	0	0	3	3	40	60
6	PCC	Practical	Power Systems Lab	0	0	3	3	1.5	40	60
7	SEC	Project	Curricular and Extracurricular activities /Community Connect	0	0	2	2	1	40	60
8	PRD	Practical	Project Phase – 1 /MNC Company Internship (Minimum 3 Months)	0	0	6	6	3	40	60
			Total	15	0	11	26	**20.5**	-	-
Total Credits for Semester VII – 20.5										
EMESTER VIII										

S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	MDE	Theory	Open Elective - II	3	0	0	3	3	40	60
2	MDE	Theory	Open Elective - III	3	0	0	3	3	40	60
3	PRD	Project	Project Phase – II / Startups	0	0	14	14	7	40	60
			Total	6	0	14	20	13	-	-
Total Credits for Semester VIII - 13										

Professional Electives (PE) Courses



Electric Mobility										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	PEC	Theory	Electric Vehicle Technology	3	0	0	3	3	40	60
2	PEC	Theory	Electric Vehicle Charging Infrastructure	3	0	0	3	3	40	60
3	PEC	Theory	Battery Technologies and Management Systems for Electric Vehicles	3	0	0	3	3	40	60
4	PEC	Theory	Intelligent Transport Systems	3	0	0	3	3	40	60
5	PEC	Theory	Energy Storage systems	3	0	0	3	3	40	60
6	PEC	Theory	Autonomous and Connected Vehicles	3	0	0	3	3	40	60

Power Electronics and Industrial Drives										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	PEC	Theory	Special Electrical Machines	3	0	0	3	3	40	60
2	PEC	Theory	Embedded Systems and IoT	3	0	0	3	3	40	60
3	PEC	Theory	PLC and SCADA Systems	3	0	0	3	3	40	60
4	PEC	Theory	Power Electronics for Renewable Energy Systems	3	0	0	3	3	40	60
5	PEC	Theory	SMPS and UPS	3	0	0	3	3	40	60
6	PEC	Theory	HVDC Systems	3	0	0	3	3	40	60

Power System and Smart Grid										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	PEC	Theory	Smart Grid	3	0	0	3	3	40	60
2	PEC	Theory	Flexible AC Transmission System	3	0	0	3	3	40	60
3	PEC	Theory	Smart Grid Operation and Planning	3	0	0	3	3	40	60
4	PEC	Theory	Electrical power quality	3	0	0	3	3	40	60
5	PEC	Theory	Power System Transients	3	0	0	3	3	40	60
6	PEC	Theory	High Voltage Engineering	3	0	0	3	3	40	60

Renewable Energy and SDGs										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	PEC	Theory	Solar PV Fundamental and Applications	3	0	0	3	3	40	60
2	PEC	Theory	Wind Energy Conversion Systems	3	0	0	3	3	40	60
3	PEC	Theory	Natural Resources for Sustainable Development	3	0	0	3	3	40	60
4	PEC	Theory	AI in Smart Buildings and Electric Vehicles	3	0	0	3	3	40	60
5	PEC	Theory	Sustainable Challenges in Cities	3	0	0	3	3	40	60
6	PEC	Theory	Grid Integration of Renewable Systems	3	0	0	3	3	40	60

Discipline Specific											
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks		
									CIA	SEE	
1	PEC	Theory	Linear Integrated Circuits	3	0	0	3	3	40	60	
2	PEC	Theory	Communication Systems	3	0	0	3	3	40	60	
3	PEC	Theory	Digital Image Processing	3	0	0	3	3	40	60	
4	PEC	Theory	Power Plant Engineering	3	0	0	3	3	40	60	
5	PEC	Theory	Renewable Energy Systems	3	0	0	3	3	40	60	
6	PEC	Theory	Power Quality	3	0	0	3	3	40	60	
7	PEC	Theory	Fundamentals of Robotics	3	0	0	3	3	40	60	
8	PEC	Theory	Fibre Optics and Laser Instrumentation	3	0	0	3	3	40	60	
9	PEC	Theory	Energy Auditing	3	0	0	3	3	40	60	
10	PEC	Theory	Biomedical Instrumentation	3	0	0	3	3	40	60	
11	PEC	Theory	Unmanned Aerial Vehicle	3	0	0	3	3	40	60	
12	PEC	Theory	Smart Sensors and Instrumentation	3	0	0	3	3	40	60	

Industry Connected Professional Electives (PE) Courses

Electric Vehicle Technology											
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks		
									CIA	SEE	
1	PEC	Theory	Introduction to Electric Vehicles	3	0	0	3	3	40	60	
2	PEC	Theory	Embedded Systems for Automotive Applications	3	0	0	3	3	40	60	
3	PEC	Theory	Advanced Driver Assistance Systems	3	0	0	3	3	40	60	
4	PEC	Theory	CAN Bus Communication	3	0	0	3	3	40	60	
5	PEC	Theory	Modelling and Simulation of Electric Vehicles	3	0	0	3	3	40	60	
6	PEC	Theory	Performance Analysis of Electric Vehicle Components	3	0	0	3	3	40	60	

Multidisciplinary Electives (MDE) Courses

Multidisciplinary Electives (MDE) Courses										
S.No	Course Category	Course Type	Course Title	L	T	P	SL	C	Marks	
									CIA	SEE
1	OEC	Theory	Electric Mobility Systems	3	0	0	3	3	40	60
2	OEC	Theory	Drone Technologies and Applications	3	0	0	3	3	40	60
3	OEC	Theory	Electric Vehicles - Fundamentals	3	0	0	3	3	40	60
4	OEC	Theory	Fundamentals of Renewable Energy	3	0	0	3	3	40	60
5	OEC	Theory	Electrical Safety and Standards	3	0	0	3	3	40	60
6	OEC	Theory	French	3	0	0	3	3	40	60
7	OEC	Theory	German	3	0	0	3	3	40	60
8	OEC	Theory	Japanese	3	0	0	3	3	40	60
9	OEC	Theory	Heritage of Tamils	3	0	0	3	3	40	60
10	OEC	Theory	Internet of things	3	0	0	3	3	40	60
11	OEC	Theory	Introduction to wireless technology	3	0	0	3	3	40	60
12	OEC	Theory	Electronic Sensors and Actuators	3	0	0	3	3	40	60
13	OEC	Theory	Introduction To Data Analytics	3	0	0	3	3	40	60
14	OEC	Theory	Block Chain Technologies	3	0	0	3	3	40	60
15	OEC	Theory	Biomedical Signal Processing	3	0	0	3	3	40	60
16	OEC	Theory	Introduction to Psychology	3	0	0	3	3	40	60
17	OEC	Theory	Industry 4.0	3	0	0	3	3	40	60
18	OEC	Theory	Quality Control and Reliability Engineering	3	0	0	3	3	40	60
19	OEC	Theory	Data Science for Biological Applications	3	0	0	3	3	40	60
20	OEC	Theory	Basics of Cyber Security	3	0	0	3	3	40	60
21	OEC	Theory	Foundation of Machine Learning	3	0	0	3	3	40	60
22	OEC	Theory	Project Management for Engineers	3	0	0	3	3	40	60
23	OEC	Theory	Total Quality Management	3	0	0	3	3	40	60
24	OEC	Theory	Engineering Economics & Cost Analysis	3	0	0	3	3	40	60
25	OEC	Theory	Entrepreneurship in Energy Sector	3	0	0	3	3	40	60
26	OEC	Theory	Intellectual Property Rights	3	0	0	3	3	40	60

27	OEC	Theory	Embedded Systems for Engineers	3	0	0	3	3	40	60
28	OEC	Theory	Engineering Ethics and Sustainable Practices	3	0	0	3	3	40	60
29	OEC	Theory	Principles of Management	3	0	0	3	3	40	60
30	OEC	Theory	Energy Conservation and Management	3	0	0	3	3	40	60
31	OEC	Theory	Engineering Mechanics	3	0	0	3	3	40	60
32	OEC	Theory	Digital Twin Technology	3	0	0	3	3	40	60
33	OEC	Theory	Electric Mobility Systems	3	0	0	3	3	40	60
34	OEC	Theory	Cyber Physical Systems	3	0	0	3	3	40	60
35	OEC	Theory	Blockchain Applications in Energy	3	0	0	3	3	40	60
36	OEC	Theory	Green Hydrogen Technologies	3	0	0	3	3	40	60
37	OEC	Theory	Sustainable Manufacturing Systems	3	0	0	3	3	40	60
38	OEC	Theory	Edge AI for Engineers	3	0	0	3	3	40	60
39	OEC	Theory	Data Visualization for Engineers	3	0	0	3	3	40	60
40	OEC	Theory	Sustainable Manufacturing System	3	0	0	3	3	40	60
41	OEC	Theory	Cloud Computing for Engineers	3	0	0	3	3	40	60

CIA - Continuous Internal Assessment ***ESE - End Semester Examination***

****L – Lecture, *T- Tutorial, *P- Practical, SL- Self learning, C - Credit***

CREDIT DISTRIBUTION

Minimum credits to be earned: 165

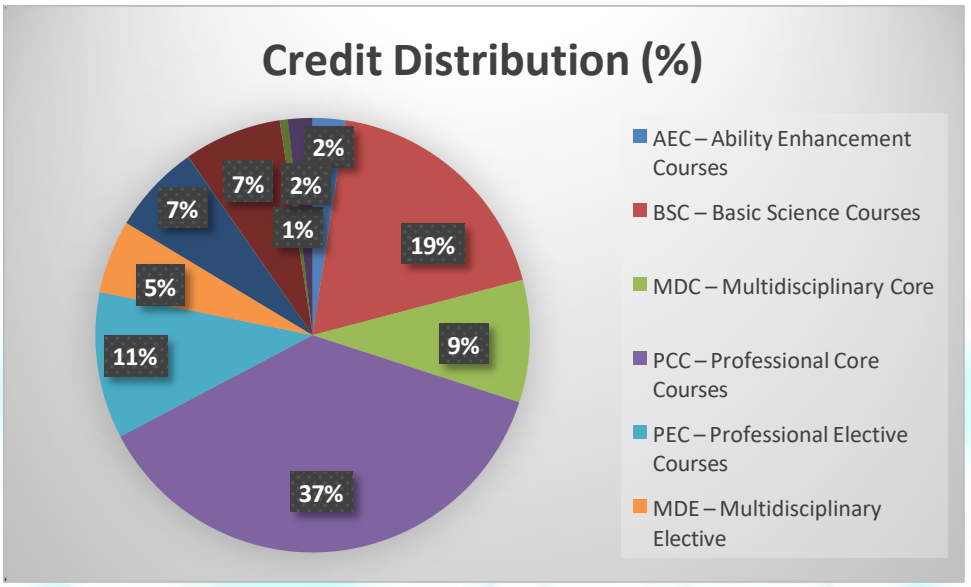
S.No	Subject Area	I	II	III	IV	V	VI	VII	VIII	Total credits
1	AEC – Ability Enhancement Courses	-	3	-	-	-	1	-	-	4
2	BSC – Basic Science Courses	8.5	16	4	-	2	-	-	-	30.5
3	MDC – Multidisciplinary Core	9	3	-	3	-	-	-	-	15
4	PCC – Professional Core Courses	-	-	13	12	14.5	11.5	10.5	-	61.5
5	PEC – Professional Elective Courses	-	-	3	3	3	3	6	-	18
6	MDE – Multidisciplinary Elective	-	-	-	-	-	3	-	6	9
7	PRD – Project Report and Dissertation	-	-	-	-	1	-	3	7	11
8	SEC – Skill Enhancement Courses	-	-	4	3	2	2	1	-	12
9	SI – Summer Internships	-	-	-	-	-	1	-	-	1
10	VAC – Value added Courses	3	-	-	-	-	-	-	-	3
	Total credit	20.5	22	24	21	22.5	21.5	20.5	13	**165**

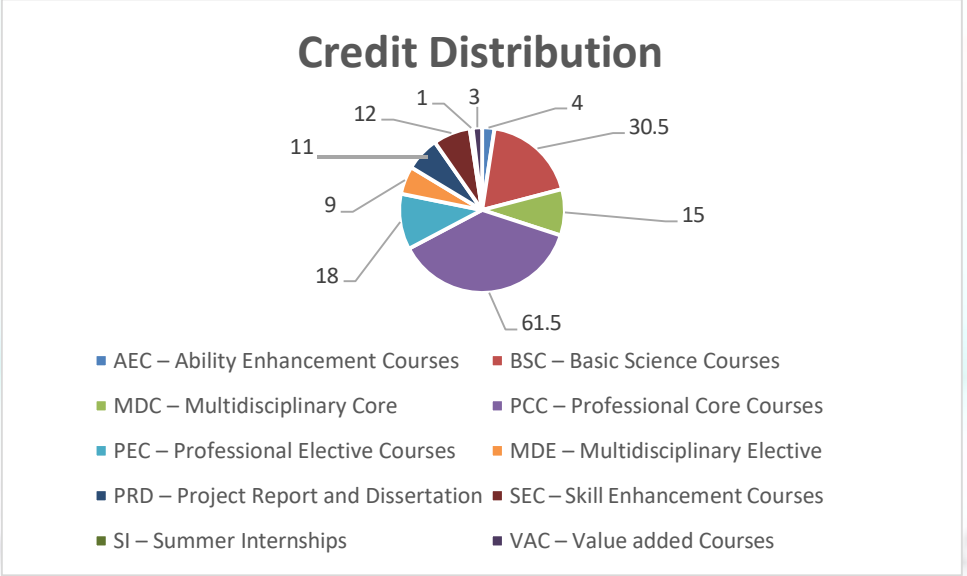
Definition of Credit:

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit

Course code and definition

Code	Definition
L	Lecture
T	Tutorial
P	Practical
SL	Self-Learning
C	Credits





ABBREVIATIONS

AEC	Ability Enhancement Course
BSC	Basic Science Courses
MDC	Multidisciplinary Course.
MDE	Multidisciplinary Electives.
PCC	Program Core Courses
PEC	Professional Elective Courses
SEC	Skill Enhancement Course
SI	Summer Internship
VAC	Value Added Course
PRD	Project Dissertation

SEMESTER I

COURSE CODE	Universal Human Values- Understanding Harmony		L	T	P	SL	C
			3	0	0	3	3
PRE REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To understand the need, significance, and process of value education for achieving continuous happiness and prosperity in human life.
- To develop self-exploration and right understanding about harmony within oneself, including the relationship between the self ('I') and the body.
- To analyze and appreciate harmony in family, society, nature, and existence through mutual trust, respect, and coexistence.
- To apply holistic human values and ethical principles in professional life for developing socially responsible and eco-friendly technologies and management practices

UNIT I	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education	9 Hours

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT II	Understanding Harmony in the Human Being - Harmony in Myself	9 Hours

Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health

UNIT III	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	9 Hours

Understanding harmony in the Family- the basic unit of human interaction, Understanding values in a human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!.

UNIT IV	Understanding Harmony in the Nature and Existence	9 Hours
Understanding the harmony in Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.		
UNIT V	**Implications of the above Holistic Understanding of Harmony on Profession**	**9 Hours**
Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for the transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.		

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. R R Gaur, R Sangal, G P Bagaria, Human Values and Professional Ethics Excel Books, New Delhi, 2023

REFERENCE BOOKS:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins,USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs,Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Explain the importance of value education, self-exploration, and human aspirations for achieving happiness and prosperity.	**K 2**

CO2	Analyze harmony within the human being by understanding the relationship between self ('I') and body, and practice self-discipline and healthy living.	**K 4**
CO3	Demonstrate understanding of human relationships, family values, trust, respect, and social harmony for peaceful coexistence.	**K 3**
CO4	Interpret the interconnectedness and mutual fulfilment among human beings, nature, and existence from a holistic perspective	**K 4**
CO5	Apply ethical human values and professional ethics in engineering, technology, and management practices for sustainable and human-centered development.	**K 5**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	2	2	-	-	-	3	2	3	2	2	-	-	-
CO2	2	2	-	-	-	3	2	3	2	2	-	-	-
CO3	-	2	-	-	-	3	2	3	3	2	2	-	-
CO4	-	2	-	-	-	2	3	3	2	2	2	-	2
CO5	2	2	2	-	2	3	3	3	2	2	2	2	3
AVG	**2**	**2**	**2**	**-**	**2**	**2.8**	**2.4**	**3**	**2.2**	**2**	**2**	**2**	**2.5**

COURSE CODE	Mathematics I -Calculus and Linear algebra		L	T	P	SL	C
			3	0	2	5	4
PRE REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To build knowledge in differential, integral and multivariable calculus for solving engineering and scientific problems.
- To impart fundamental concepts of matrices, vector spaces, eigenvalues, eigenvectors and linear transformations used in engineering applications.
- To provide a strong mathematical foundation for advanced studies in mathematics, data science and engineering disciplines.

UNIT I	Calculus	12 Hours

Rolle's theorem-Mean value theorems-Taylor's and Maclaurin theorems - Indeterminate forms and L'Hospital's rule-Curvature – cartesian and polar coordinates – Circle of curvature – Involutes and Evolutes – Envelopes –properties of envelopes – Evolute as envelope of normal.

UNIT II	Sequences and Series And Multivariable Calculus	12 Hours

Limits of sequence of numbers, Calculation of limits, Infinite series, Tests for convergence, Power series, Taylor and Maclaurin series. Limit continuity, partial derivatives and total derivative, Jacobian-Functional dependence and Independence, Maxima and minima and saddle points, Method of Lagrange multipliers.

UNIT III	Integral Calculus (Multiple Integrals)	12 Hours

Introduction - Double integrals- triple integrals- change of order of integration- change of variables to polar- cylindrical and spherical coordinates-Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

UNIT IV	Matrices	12 Hours

Introduction, -Types of matrices. Rank of a matrix - echelon form, normal form, consistency system of linear equations (Homogeneous and Non-Homogeneous). Eigen values and Eigenvectors and their properties (without proof), Cayley-Hamilton theorem (without proof), Diagonalisation.

UNIT V	Vector spaces	12 Hours

Vector Space- linear Independence and dependence of vectors, basis, dimension- Linear transformations (maps), range and kernel of a linear map, rank and nullity- Inner product spaces-Gram-Schmidt Orthogonalization.

Total: 60 Hours

Self-Learning: 60 Hours

TEXTBOOKS:

1. Joel R. Hass, Christopher E. Heil, Maurice D. Weir, Przemysław Bogacki, Thomas' Calculus, 15thEdition, Pearson,2022.

2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, First Edition,2025-26.
3. N.P. Bali and Manish Goyal, A textbook of Engineering and Mathematics I, Laxmi Publications, 10th Edition, 2023.

REFERENCE BOOKS:

1. P. Sivaramakrishna Das and C. Vijayakumari, Mathematics-I, Pearson India,2019.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 11th Edition, Wiley India, 2025.
3. Veerarajan T., Engineering Mathematics for First Year, Tata McGraw-Hill, New Delhi, Latest Reprint.
4. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, 45th Edition, New Delhi, 2024.

WEB LINKS:

1. https://www.khanacademy.org/math/multivariable-calculus/applications-of-multivariable-derivatives/optimizing-multivariable-functions/a/maximums-minimums
2. https://www.geeksforgeeks.org/rolles-and-lagranges-mean-value-theorem/
3. https://home.iitk.ac.in/~arlal/MTH102/la.pdf

NPTEL LINKS:

1. Engineering Mathematics – I, By Prof. Jitendra Kumar | IIT Kharagpur https://onlinecourses.nptel.ac.in/noc20_ma37/preview

LIST OF EXPERIMENTS:

Sl.No	List of Experiments
1	Introduction to Calculus through MATLAB – Symbolic Computations
2	Plotting and visualising curves and surfaces
3	Evaluating maxima and minima of functions of several variables
4	Evaluation of maxima and minima, applying the Lagrange multiplier method
5	Evaluation of volume under a surface by double Integral
6	Evaluating triple integrals
7	*Evaluation of eigenvalues and eigen vectors*

TEXTBOOKS:

1. Ronald L. Lipsman, Jonathan M. Rosenberg, Multivariable Calculus with MATLAB with applications to Geometry and Physics, Springe, 2017.

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply the principles of differential and multivariable calculus, to solve mathematical problems.	**K3**
CO2	Analyze sequences, series, and multivariable functions	**K4**
CO3	Evaluate double and triple integrals for engineering applications	**K5**
CO4	Solve linear algebra problems using concepts of vector spaces.	**K3**
CO5	Apply concepts of matrices and vector spaces for solving problems in liner algebra.	**K3**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	-	-	-	2	2
CO2	2	3	-	2	-	-	-	-	-	-	-	2	2
CO3	3	3	-	2	3	-	-	-	-	-	-	2	**3**
CO4	2	3	-	-	3	-	-	-	-	-	-	3	2
CO5	3	2	-	-	3	-	-	-	-	-	-	3	3
AVG	**2.6**	**2.6**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2.4**	**2.4**

COURSE CODE	Engineering Physics		L	T	P	SL	C
			3	0	0	3	3
PRE REQUISITE	Nil	CO-REQUISITE	Engineering Physics Lab				

COURSE OBJECTIVES

- To learn the basics of electronic, semiconducting materials and their interaction with light, new engineered semiconductor devices.
- To apply these fundamental principles to solve practical problems related to materials used in engineering applications.

UNIT I	Band Theory of Solids	9 Hours

Energy bands in solids: conductors, semiconductors, and insulators – Band gaps in semiconductors - Direct and indirect band gaps semiconductors – Classical free electron theory - Drude and Lorentz classical free electron theory - electrical conductivity and thermal conductivity – Wiedemann-Franz Law – Lorentz number - Fermi distribution function - Effect of temperature on Fermi function – Density of energy states.

UNIT II	Semiconductors	9 Hours

Introduction - Properties of semiconductors – Classification of semiconductors – Types: Intrinsic and Extrinsic semiconductor - Carrier concentration of intrinsic and extrinsic (derivation) – Carrier concentration in n type and p type semiconductor – Variation of Fermi level with temperature and impurity concentration.

UNIT III	Light-Semiconductor interaction	9 Hours

Optical transitions in bulk semiconductors: Stimulated absorption - spontaneous and stimulated emission – Excitons - Population Inversion - Einstein's A & B coefficient (derivation) – Principle and working of Photovoltaic effect and Solar cells – Applications.

UNIT IV	Semiconductor Devices and Measurements	9 Hours

Semiconductor diodes – Characteristics - construction and working – Types of semiconductor diodes – Light Emitting Diode (LED) – Measurements: Principle and working of UV-Vis spectrophotometer - Hall effect – Hall effect in n-type and p-type semiconductor (derivation) – Experimental determination of Hall coefficient – Applications.

UNIT V	Advanced Engineered semiconductor materials	9 Hours

Metallic glasses, preparation, properties and applications - Shape Memory Alloys – Characteristics, Properties of Ni-Ti alloy - Applications – Quantum nanostructures - Semiconductor Nanomaterials: - Properties -Synthesis (top-down and bottom-up approach) – Pulsed Laser deposition – Chemical vapour deposition – Applications

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. Murugeshan R, Kiruthiga Sivaprasath, 'Modern Physics',19th Edition, S Chand Publisher, 2026.

2. Dr. Mani P, 'A textbook of Engineering Physics – II', Shri Dhanam Publisher, Chennai, 2016
3. Rajendran V, and Marikani A, 'Materials Science', Tata McGraw-Hill publications, New Delhi, 2011
4. Vijaya, M., and Rangarajan, G., 'Materials Science', Tata McGraw-Hill Publications, New Delhi.

REFERENCE BOOKS:

1. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
2. Charles Kittel 'Introduction to Solid State Physics', John Wiley and Sons, 7th edition,
3. Singapore 2008.
4. Kasap S.O, "Principles of Electronic Materials", 3rd edition, McGraw-Hill Higher Education, 2006.
5. Pradeep T, "A textbook of Nanoscience and Nanotechnology, " McGraw-Hill Higher Education, 2012.
6. Palanisamy P.K, 'Materials Science', Scitech publications, Chennai, 2007.
7. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
8. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).

NPTEL Course:

1. Fundamentals of Semiconductor devices, IISc Bangalore, Prof. Digbijoy N. Nath
2. Introduction to Semiconductor Devices, Prof. Naresh Kumar Emani, IIT Hyderabad

WEB LINKS:

1. https://nptel.ac.in/courses/115102026/2
2. https://nptel.ac.in/courses/115102026/15
3. http://textofvideo.nptel.ac.in/115102026/lec18.pdf
4. https://nptel.ac.in/courses/122103010/34
5. http://orbit.dtu.dk/files/4817236/petersen.pdf

COURSE OUTCOMES

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

C.OURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Identify the behavior of free electrons in conducting materials.	**K3**
CO2	Analyze the type of semiconducting materials and their applications.	**K4**
CO3	Identify the applications of photovoltaic and solar cells.	**K3**

CO4	Demonstrate the construction and working of various semiconductor devices.	**K2**
CO5	Develop the design and fabrication of nanostructures.	**K3**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	2	2
CO2	2	3	-	2	-	-	-	-	-	-	-	3	2
CO3	3	3	3	-	-	-	-	-	-	-	3	2	**3**
CO4	2	2	3	-	-	-	-	-	-	-	2	3	2
CO5	-	2	3	3	-	-	-	-	-	-	3	3	3
AVG	**2.5**	**2.6**	**2.75**	**2.5**	**-**	-	-	-	-	-	**2.66**	**2.6**	**2.4**

COURSE CODE	Engineering Graphics		L	T	P	SL	C
			2	1	0	3	3
PRE REQUISITE	NIL	CO-REQUISITE	NIL				

COURSE OBJECTIVES

- To introduce the fundamentals of engineering drawing standards, conventions, and BIS specifications used in engineering practice.
- To develop the ability to visualize and construct orthographic projections of points, lines, planes, and solids.
- To impart knowledge in sectional views and development of surfaces of engineering components.
- To enhance spatial visualization and graphical communication skills through isometric and orthographic projections.
- To provide practical exposure to computer-aided drafting (CAD) tools for preparing engineering drawings and models

UNIT I	Engineering Curves	9 Hours

Engineering curves used in mechanical and design applications – Construction of conic sections (ellipse, parabola, hyperbola) using eccentricity and auxiliary methods – Cycloid, epicycloid, and hypocycloid with applications in gear tooth profiles – Involute of square and circle with relevance to power transmission – Construction of tangents and normal – CAD tools with engineering applications through component-based examples.

UNIT II	Projection of points, Lines and Plane Surfaces	9 Hours

Projection of points and straight lines in all quadrants – Determination of true length and true inclination using Change of Position Methods and auxiliary planes – Projection of plane surfaces such as polygonal plates and circular lamina inclined to reference planes – Visualization techniques for interpreting multi-view drawings – Engineering applications involving structural plates, brackets, and machine elements.

UNIT III	Projection of solids	9 Hours

Projection of simple solids including prisms, pyramids, cylinders, and cones – Axis inclined to one reference plane using change of position method - Auxiliary views for complex orientations – Visualization-based problem solving using real engineering components and assemblies.

UNIT IV	Section of solids and development of surfaces	9 Hours

Concept and necessity of sectioning in engineering drawings – Sections of solids by cutting planes inclined to one reference plane – True shape of sections using auxiliary views. Development of lateral surfaces of simple and truncated solids. Applications in sheet metal fabrication and packaging

UNIT V	Isometric projections and orthographic projections	9 Hours

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. General principles of orthographic projection – Need for importance of multiple views and their placement - layout views -Visualization and interpretation of time three-dimensional engineering objects from multi-view drawing. Introduction to 2D CAD drafting: basic commands,

layers, dimensioning, and drawing standards- Applications in professional engineering documentation

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, Latest Edition,2023
2. K. V. Natarajan, A Textbook of Engineering Graphics, Dhanalakshmi Publishers,2024

REFERENCES:

1. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International Publishers,2024.
2. M. S. Kumar, Engineering Graphics, D. D. Publications,2024.
3. M. B. Shah and B. C. Rana, Engineering Drawing, Pearson Education,2022.
4. Dhananjay A. Jolhe, Engineering Drawing with CAD Applications, Tata McGraw-Hill,2020.
5. David C. Planchard, Engineering Design with SOLIDWORKS, SDC Publications, 2023.

WEB LINKS:

1. https://nitc.ac.in/imgserver/uploads/attachments/Ed 5c3343c5-c3f9-468a-b114-8f33556810b4 .pdf
2. https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing

NPTEL LINK:

1. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_me128

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Understand the principles of engineering drawing, BIS conventions, scales, lettering, dimensioning, and geometrical constructions	**K2**
CO2	Construct orthographic projections of points, lines, planes, and solids in different positions	**K3**
CO3	Apply principles of projection to draw and analyze projections of solid objects	**K3**

CO4	Develop sectional and surface development drawings	**K4**
CO5	Utilize CAD tools for preparing accurate engineering drawings and graphical representations	**K3**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	–	–	2	–	–	–	–	–	2	–	–
CO2	3	2	2	–	–	–	–	–	–	–	2	–	–
CO3	3	2	2	–	–	–	–	–	–	–	2	–	–
CO4	2	3	2	–	2	–	–	–	–	–	2	–	2
CO5	–	–	2	–	3	–	–	–	–	–	3	2	2
AVG	**2.7**	**2.2**	**2**	**–**	**2.3**	**–**	**–**	**–**	**–**	**–**	**2.2**	**2**	**2**

COURSE CODE	Computer Programming using C		L	T	P	SL	C
			3	0	0	3	3
PRE-REQUISITE	Nil	CO-REQUISITE	Practical – Computer Programming Using C				

COURSE OBJECTIVES

- To equip engineering students with the foundational knowledge and practical skills in 'C' programming to analyse and solve computational problems effectively.
- To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.

UNIT I	Basics of Computer Hardware and Software	9 Hours

Basics of Computer Hardware and Software Basics of Computer Architecture: processor, Memory, Input& Output devices Application Software & System software: Compilers, interpreters, High level and low level languages.

Introduction to structured approach to programming: Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, program structure, Compilation & Execution process, Interactive and Script mode, Comments, Indentation, Error messages.

UNIT II	C Program Basics	9 Hours

Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types , Constants, Console IO Operations, printf and scanf

Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence

Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements.

UNIT III	Arrays and strings	9 Hours

Arrays: Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array

String processing: In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets) Linear search program, bubble sort program, simple programs covering arrays and strings

UNIT IV	Functions	9 Hours

Functions : Introduction to modular programming, writing functions, formal parameters, actual parameters, Call by Value, Call by Reference, Recursion, Arrays as Function Parameters

Structure & Union : Structure, union

Storage Classes : Scope and life time of variables, simple programs using functions

UNIT V	Pointers and Files	9 Hours

Basics of Pointer: declaring pointers, accessing data though pointers, NULL pointer, array access using pointers, pass by reference effect

File Operations: open, close, read, write, append Sequential access and random access to files: In built file handling functions (rewind() ,fseek(), ftell(), feof(), fread(),

fwrite()), simple programs covering pointers and files.

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. Balagurusamy, E., Programming in ANSI C, 9th Edition, McGraw Hill, 2024.
2. Thareja, R., Programming in C, 3rd Edition, Oxford University Press India, 2023.
3. Kamthane, A.N., Programming in C, 3rd Edition, Pearson, 2024.

REFERENCE BOOKS:

1. Kanetkar, Y.P., Let Us C, 20th Edition, BPB Publications, 2022.
2. Kernighan, B.W., Ritchie, D.M., The C Programming Language, 2nd Edition, Pearson, 1988 (Reprint 2021).

WEB LINKS:

1. Learn-C.org - Learn C - Free Interactive C Tutorial Learn C - Free Interactive C Tutorial
2. GeeksforGeeks - C Programming - https://www.geeksforgeeks.org/c-programming language/
3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/

NPTEL LINK:

1. NPTEL Course: Problem Solving Through Programming In C" by Prof. Anupam Basu, IIT Kharagpur
   https://nptel.ac.in/courses/106105171

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply algorithms, flowcharts, and pseudocode to design solutions for computational problems.	**K3**
CO2	Develop C programs using appropriate data types, operators, and control structures to solve basic problems.	**K3**
CO3	Analyze and implement arrays and string operations for efficient data manipulation.	**K4**
CO4	Design modular programs using functions, recursion, and structured programming concepts.	**K4**
CO5	Apply pointers and file handling techniques to perform dynamic memory access and data	**K3**

	storage operations.	

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	3	-	–	2	–	–	–	–	–	–	2	–
CO2	3	3	3	–	3	–	–	–	–	–	–	2	–
CO3	3	3	-	2	3	–	–	–	–	–	–	**2**	–
CO4	3	2	3	3	2	–	–	–	–	–	–	**2**	2
CO5	3	2	-	–	3	–	–	–	–	–	–	**3**	2
AVG	**3.0**	**2.6**	**3**	**2.5**	**2.6**	**–**	**–**	**–**	**–**	**–**	**–**	**2.2**	**2.0**

COURSE CODE	Engineering Physics Lab		L	T	P	SL	C
			0	0	3	3	1.5
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To enable the student to explore the field of Properties of Matter and Optics.
- To gain knowledge in the scientific methods and learn the process of measuring different Physical variables.

LIST OF EXPERIMENTS

1. Determination of Rigidity Modulus – Torsional pendulum
2. Determination of wavelength and particle size using laser
3. Ultrasonic Interferometer
4. Determination of band gap of a semiconductor material
5. Hooke's law – Determination of spring constant
6. Determination of Young's Modulus – Uniform Bending
7. Determination of Young's Modulus – Non Uniform Bending
8. Determination of Viscosity of a liquid - Poiseuille's method
9. Spectrometer – Grating
10. Deflection Magnetometer - Tan A position
11. Deflection Magnetometer - Tan B position
12. Potentiometer - Calibration of low range Voltmeter

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. Biswajit Saha, Practical Physics Book, LAP LAMBERT Academic Publishing, 1st Edition, 2020.
2. C. C. Ouseph, U. J. Rao, V. Vjiayendran, Practical Physics,1st Edition, 2015.

REFERENCES:

1. G.L. Squires, Practical Physics, 4th Edition, Cambridge University Press, 2001.
2. D. Chattopadhyay, P.C. Rakshit, B. Saha, "An Advanced Course in Practical Physics", 2nd ed., Books & Allied Ltd., Calcutta, 1990.

WEB LINKS:

1. http://amrita.olabs.edu.in/?sub=1&brch=5&sim=155&cnt=2
2. https://vlab.amrita.edu/index.php?sub=1&brch=280&sim=1509&cnt=4

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Measure the wavelength and particle size of the semiconductor diode laser.	**K5**
CO2	Analyze the coefficient of viscosity of a liquid.	**K4**
CO3	Estimate the band gap energy of the given semiconductor material.	**K5**
CO4	Determine the compressibility of the liquid using an ultrasonic interferometer	**K5**
CO5	Measure the Young's modulus of the given solid materials.	**K5**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	-	-	3	3	3	3	-	-	-	-	-	2	-
CO2	-	-	-	2	2	2	-	-	-	-	-	-	-
CO3	-	-	3	3	3	-	-	-	-	-	3	2	2
CO4	-	-	2	3	-	2	-	-	-	-	-	2	-
CO5	-	-	3	3	2	-	-	-	-	-	2	-	2
AVG	-	-	**2.75**	**2.80**	**2.5**	**2.33**	-	-	-	-	**2.5**	**2.0**	**2.0**

COURSE CODE	Practical – Computer Programming using C		L	T	P	SL	C
			0	0	3	3	1.5
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To provide fundamental knowledge of computer programming concepts and problem-solving techniques using the C programming language.
- To develop the ability to design, implement, and debug C programs using control structures, arrays, functions, pointers, and file handling concepts.
- To enhance logical thinking, modular programming, and computational skills for solving engineering and real-world problems effectively.

LIST OF EXPERIMENTS

I. Basics of C Programming and Decision Making

1. Basic arithmetic operations using operators.
2. Largest of three numbers using decision-making statements.
3. Even or odd number checking using if–else statement.
4. Leap year checking program.
5. Simple calculator using switch statement.
6. Multiplication table generation using loops.
7. Fibonacci series generation.
8. Factorial of a number using loops and recursion.
9. Prime number checking.
10. Reverse and palindrome number checking.

II. Arrays and Strings

11. Sum, average, largest, and smallest element in a one-dimensional array.
12. Linear search and bubble sort using arrays.
13. Matrix addition and matrix multiplication using two-dimensional arrays.
14. String operations using built-in string handling functions.
15. Counting vowels, consonants, digits, and spaces in a string.

III. Functions, Structures, and Pointers

16. Functions demonstrating Call by Value and Call by Reference.
17. Recursive function to find the GCD of two numbers.
18. Structures and unions for storing and displaying student details.
19. Pointer operations including swapping numbers and array access using pointers.

IV. File Handling

20. File handling operations including create, read, write, append, copy, and random-access functions.

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. Balagurusamy, E., Programming in ANSI C, 9th Edition, McGraw Hill, 2024.
2. Kamthane, A.N., Programming in C, 3rd Edition, Pearson, 2024.

REFERENCES:

1. Kanetkar, Y.P., Let Us C, 20th Edition, BPB Publications, 2022.
2. Deitel, P. and Deitel, H., C How to Program, 9th Edition, Pearson Education, 2022.
3. Kernighan, B.W., Ritchie, D.M., The C Programming Language, 2nd Edition, Pearson, 1988 (Reprint 2021).

WEB LINKS:

1. Learn-C.org - Learn C - Free Interactive C Tutorial Learn C - Free Interactive C Tutorial
2. GeeksforGeeks - C Programming - https://www.geeksforgeeks.org/c-programming language/
3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/

NPTEL LINK:

1. Problem Solving Through Programming In C" by Prof. Anupam Basu, IIT Kharagpur
   https://nptel.ac.in/courses/106105171

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Design algorithms, flowcharts, and structured C programs to solve computational problems.	**K4**
CO2	Develop C programs using data types, operators, control structures, and looping constructs for problem-solving applications.	**K4**
CO3	Evaluate array and string operations for efficient data manipulation and processing.	**K5**
CO4	Design modular and reusable programs using functions, recursion, structures, unions, and pointers.	**K5**
CO5	Develop applications using pointers and file handling concepts for efficient memory management and data processing.	**K5**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	3	–	–	2	–	–	–	–	–	–	2	–
CO2	3	–	3	–	3	–	–	–	–	–	–	2	–
CO3	3	3	–	3	3	–	–	–	–	–	–	2	–
CO4	3	–	3	2	3	–	–	–	–	–	–	3	2
CO5	–	2	–	3	3	–	–	–	–	–	–	3	2
AVG	**3.0**	**2.6**	**3.0**	**2.6**	**2.8**				–	–	–	**2.4**	**2.0**

COURSE CODE	Fabrication and Workshop Practices Laboratory		L	T	P	SL	C
			0	0	3	3	1.5
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To familiarize students with fabrication processes, machine tools and material handling techniques used in manufacturing industries.
- To provide hands-on training in basic manufacturing, fabrication and workshop practices using conventional tools and equipment.
- To develop teamwork, problem-solving ability and professional work ethics through practical workshop exercises and mini fabrication activities.
- To encourage creativity and product realization skills through fabrication and manufacturing-based practical assignments.

GROUP A Fabrication (MECHANICAL ENGINEERING) (30 hours)

1. Machine Shop

Machining: Basics of Machining Processes Equipment's, Simple turning of cylindrical surface on MS rod using lathe machine tool, To make Facing and plain turning, step turning, drilling in the lathe

2. Sheet Metal

To make products as per the given dimensional tolerances, Tools and demonstration of producing model.

3. Welding Shop

To make single, butt, lap and T fillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.
To make simple Dust pan, Rectangular trays in sheet metal with the jigs as per the given Dimensions.

4. Plumbing Works

Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings. Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

GROUP B (ELECTRICAL ENGINEERING) (30 hours)

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring
4. Measurement of electrical quantities -voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. B. S. Raghuwanshi, Workshop Technology – Part I & II, Dhanpat Rai& Sons,2024
2. Dr. R. K. Jain, Manufacturing Practices Lab, S. Chand,2023,
3. R. L. Keshavamurthy, Experiments in Manufacturing Processes, Vikas Publishing, 2022.

REFERENCES:

1. P. N. Rao, Manufacturing Processes – I & II, Tata McGraw Hill, 2022
2. Roy A. Lindberg, Processes and Materials of Manufacturing, Pearson, 2020
3. Helmi A. Youssef / A. Elbestawi / William W. Worek, Manufacturing Technology – Volume II, Pearson, 2022.

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Explain the principles, tools, equipment, and safety procedures involved in manufacturing and electrical workshop practices	**K2**
CO2	Perform basic machining operations such as facing, turning, step turning, and drilling using lathe machines	**K3**
CO3	Fabricate sheet metal and welding joints/products according to given dimensions and tolerances	**K3**
CO4	Apply plumbing techniques and electrical wiring methods for basic engineering and residential applications	**K3**
CO5	Measure electrical quantities and demonstrate safe workshop practices while working individually and in teams	**K3**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	2	-	–	2	–	–	–	–	–	–	–	2	–
CO2	2	2	2	2	–	–	–	–	–	–	2	2	–
CO3	3	2	3	3	–	–	–	–	–	–	2	2	–
CO4	2	2	2	-	–	–	–	–	–	–	2	2	–
CO5	2	2	-	2	–	–	–	–	–	–	3	2	–
AVG	**2.2**	**2**	**2.3**	**2.2**	**–**	**–**	**–**	**–**	**–**	**–**	**2.2**	**2**	**–**

COURSE CODE	CONSTITUTION OF INDIA		L	T	P	SL	C
			2	0	0	2	0
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To introduce the basic concepts, features, and structure of the Constitution of India.
- To understand the Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties.
- To understand the constitutional provisions related to amendments, emergencies, and local self-government.
- To develop awareness of constitutional values, rights, duties, and democratic governance.

UNIT I	Nature, Object and Scope of the Constitution	6 Hours

Nature, object and scope of Constitutional Law and Constitutionalism – Historical Perspective of the Constitution of India – Salient Features and Characteristics of Constitution of India

UNIT II	Fundamental Rights	6 Hours

Nature and scope of Fundamental Rights – Scheme of Fundamental Rights – Right to Equality – Right to Freedom of Speech and Expression – Right to Life – Right against Exploitation – Right to Religious Freedom – Minority Rights.

UNIT III	Directive Principles of State Policy and Fundamental Duties	6 Hours

Directive Principles of State Policy – Importance and Implementation – Scheme of Fundamental Duties and its Legal Status.

UNIT IV	Federal Structure	6 Hours

Federal Structure – Distribution of Legislative and Financial Powers between the Union and the States – Parliamentary Form of Government in India – Constituent Powers and Status of the President of India

UNIT V	Amendment and Emergency Provisions	6 Hours

Amendment of the Constitution – Procedure – Historical Perspective of the Constitutional Amendments in India – Emergency Provisions – National Emergency – President Rule – Financial Emergency – Local Self Government – Constitutional Scheme in India.

Total: 30 Hours

Self-Learning: 30 Hours

TEXT BOOKS:

1. Basu, Durga Das, *Introduction to the Constitution of India*, 26th Edition, LexisNexis, New Delhi, 2023.
2. Agarwal, R. C., *Indian Political System*, Revised Edition, S. Chand and Company, New Delhi, 2022.
3. MacIver and Page, *Society: An Introductory Analysis*, Reprint Edition, Macmillan India Ltd., New Delhi, 2023.
4. Sharma, K. L., *Social Stratification in India: Issues and Themes*, Reprint Edition, Rawat Publications, New Delhi, 2023.

REFERENCE BOOKS:

1. Mahajan, V. D., *Constitutional Law of India*, Revised Edition, Eastern Book Company, 2022.
2. Seervai, H. M., *Constitutional Law of India*, 4th Edition, Universal Law Publishing, 2015.
3. Sharma, Brij Kishore, *Introduction to the Constitution of India*, 13th Edition, Prentice Hall of India, New Delhi, 2022.
4. Gahai, U. R., *Indian Political System*, Revised Edition, New Academic Publishing House, Jalandhar, 2021.
5. Sharma, R. N., *Indian Social Problems*, Latest Revised Edition, Media Promoters and Publishers Pvt. Ltd., 2022.

COURSE OUTCOMES

After completion of the course, the student will be able to

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Explain the basic principles, features, and structure of the Constitution of India.	**K2**
CO2	Describe the rights, duties, and responsibilities of Indian citizens under the Constitution.	**K2**
CO3	Explain the role of constitutional provisions in governance and administration.	**K2**
CO4	Describe the functioning of the provisions related to constitutional amendments and emergencies.	**K2**
CO5	Apply constitutional knowledge to understand democratic governance and responsible citizenship.	**K3**

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	-	-	-	-	-	2	3	2	-	-	2	-	-
CO2	-	-	-	-	-	3	3	2	-	-	2	-	-
CO3	-	-	-	-	-	3	3	2	-	-	2	-	-
CO4	-	-	-	-	-	3	3	2	-	-	2	-	-
CO5	-	-	-	-	-	3	3	2	-	-	3	-	-
AVG	-	-	-	-	-	**2.8**	**3**	**2**	-	-	**2.2**	-	-

SEMESTER II

COURSE CODE	Technical English		L	T	P	SL	C
			2	0	0	2	2
PRE-REQUISITE	Nil	CO-REQUISITE	Practical - Technical English				

COURSE OBJECTIVES

- To develop students' vocabulary and word formation skills for effective written communication.
- To enhance learners' ability to construct grammatically correct and meaningful sentences.
- To enable students to identify and correct common errors in English usage.
- To improve students' skills in precise, coherent, and context-appropriate writing.
- To train learners in various forms of practical writing, including letters, reports, essays, and comprehension-based responses.

UNIT I	Vocabulary Building	6 Hours

General Vocabulary, Parts of Speech, Nouns--Compound nouns, Pronouns, Adjectives, Synonyms & Antonyms, Prefixes & Suffixes, Homonyms, Homographs & Homophones, Verb Forms, Blending and Clipping.

UNIT II	Basic writing	6 Hours

Sentences structures –Kinds of sentences, Types of sentences, Clauses and Phrases, Numerical Expressions, Summarizing, Paragraph Writing, Checklist, Definitions, Precise Writing.

UNIT III	Common errors in English	6 Hours

To enable students to identify and correct grammatical and syntactic errors, in English Language use such as Pronouns - Relative pronouns, Demonstrative pronouns, Articles, Prepositions, Tenses, Subject-verb Agreement, Misplaced Modifiers, Redundancies, Infinitives & Gerund.

UNIT IV	Nature and style of sensible writing	6 Hours

Definitions, Numerical Expressions, Precise writing, Conversations/ Situational Dialogues, Process description, Recommendation, Information Transfer- Flow chart Bar chart and Pie chart, Letter Writing, Report Writing..

UNIT V	Fundamentals of Communication	6 Hours

Listening to general information-specific details- conversation: Introduction to classmates, Telephone conversation, Debates and panel discussions, Self-Introduction, Introducing a friend; Conversation, Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Group discussions, and Expressing opinions, Simulations & Role play. Reading editorials; and Opinion Blogs.

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. Bikramjit Sen, Dr Gurpreet Singh Saund, Communicative English Skills: An Easy Guide. N.p., Notion Press Media Pvt. Limited, 2025.
2. S. Mekala, Geetha R,Contemporary ELT Strategies in Engineering Pedagogy: Theory and Practice. India, Taylor & Francis, 2022
3. Leech, Geoffrey, and Jan Svartvik. A communicative grammar of English. Routledge, 2013.
4. MacKenzie, Ian. Professional English in Use. Cambridge University Press, 2006.
5. Ibbotson, Mark. Professional English in Use: Engineering: Technical English for Professionals. Cambridge University Press, 2009.

REFERENCE BOOKS:.

1. M Saranya & Mrs M Linju,Professional English II. N.p., Notion Press Media Pvt. Limited, 2024.
2. Technical English (English, Sambaiah M, Wiley India Pvt, Ltd, Genre Technology & Engineering , ISBN-9788126551354, 2014 Edition.
3. Tebeaux, Elizabeth. The emergence of a tradition: Technical writing in the English Renaissance, 1475-1640. Routledge, 2018.
4. Tyagi, Kavita, and Padma Misra. Basic technical communication. PHI Learning Pvt. Ltd., 2011.
5. Olohan, Maeve. Scientific and technical translation. Routledge, 2015.

WEB LINKS:

1. https://ehlion.com/magazine/technical-english/
2. https://www.kkcl.org.uk/pdf/KKCL_Technical_English_for_Engineers_Brochure.pdf

NPTEL LINK:

1. https://onlinecourses.nptel.ac.in/noc26_hs74/preview

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply English language skills in listening, speaking, reading, and writing for technical communication.	**K3**
CO2	Utilize listening skills for academic and professional communication.	**K3**
CO3	Demonstrate effective speaking skills in English for real-life situations.	**K4**
CO4	Develop effective writing skills for technical, formal, and professional communication.	**K3**
CO5	Identify self-learning strategies and learner autonomy for continuous language development.	**K4**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	-	-	-	-	-	-	2	2	3	2	-	-	-
CO2	-	-	-	-	-	-	-	2	3	-	-	2	2
CO3	-	-	-	-	-	-	2	3	2	-	-	2	3
CO4	-	-	-	-	-	-	2	-	3	2	-	3	2
CO5	-	-	-	-	-	-	-	-	2		3	-	-
AVG	-	-	-	-	-	-	**2.0**	**2.3**	**2.6**	**2.0**	**3.0**	**2.33**	**2.3**

COURSE CODE	Mathematics-II Multivariable Calculus and Complex Analysis	L	T	P	SL	C
		3	0	2	5	4

PRE-REQUISITE	Nil	CO-REQUISITE	Nil

COURSE OBJECTIVES

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable.

UNIT I	Vector Calculus	12 Hours

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II	Ordinary Differential Equations	12 Hours

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III	LAPLACE TRANSFORM	12 Hours

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms – Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform –Statement of Convolution theorem – Initial and final value theorems.

UNIT IV	ANALYTIC FUNCTIONS	12 Hours

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: $w = z+k$, kz, $1/z$, z^2, e^z and bilinear transformation.

UNIT V	COMPLEX INTEGRATION	12 Hours

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

Total: 60 Hours

Self-Learning: 60 Hours

TEXT BOOKS:

1. Joel R. Hass, Christopher E. Heil, Maurice D. Weir, Przemysław Bogacki, Thomas' Calculus, 15thEdition, Pearson,2022.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, First Edition,2025-26.
3. N.P. Bali and Manish Goyal, A text book of Engineering and Mathematics I, Laxmi Publications, 10th Edition, 2023.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 11th Edition, Wiley India, 2025.
2. B.S. Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers, New Delhi, 2024.
3. Dass, H.K., "Higher Engineering Mathematics", S. Chand Private Ltd., 2020.

NPTEL LINKS:

Engineering Mathematics II-Prof. Jitendra Kumar,IIT Kharagpur
Course link:https://onlinecourses.nptel.ac.in/noc26_ma39/preview

LIST OF EXPERIMENTS:

Sl.No	Experiments
1	Check whether the vector field is irrotational or solenoidal.
2	Solve a second-order linear differential equation with constant coefficients.
3	Compute the Laplace transform and inverse Laplace transform of a given function.
4	Apply the Laplace transform technique to solve a linear differential equation
5	Verify the Cauchy-Riemann equations for a complex function
6	Determine the singularities and residues of a complex function.
7	Use the residue theorem to evaluate a contour integral.

TEXT BOOKS:

1. Ronald L. Lipsman , Jonathan M. Rosenberg, Multivariable Calculus with MATLAB with applications to Geometry and Physics, Springe, 2017.
2. Dean G. Duffy, Advanced Engineering Mathematics with MATLAB, CRC Press, 2022.

REFERENCE BOOKS:

1. Dean G. Duffy, Advanced Engineering Mathematics with MATLAB, CRC Press, 2022.

COURSE OUTCOMES

After completion of the course, the student will be able to

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply concepts of vector calculus and ordinary differential equations for solving engineering problems involving physical systems.	**K3**
CO2	Solve linear time-dependent engineering systems using Laplace transform techniques along with differential equation methods	**K3**
CO3	Analyze complex functions using Cauchy-Riemann technique.	**K4**
CO4	Use Cauchy's theorem and integral formula for solving real and complex integral problems	**K3**
CO5	Apply knowledge of vector calculus, Laplace transforms, and complex variables to formulate complex engineering problems	**K3**

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	-	2	2	-	-	-	-	-	-	2	2
CO2	3	2	-	2	3	-	-	-	-	-	-	3	2
CO3	3	2	-	-	3	-	-	-	-	-	-	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	2	2	3	-	-	-	-	-	-	3	2
AVG	**3**	**2.2**	**2**	**2**	**2.75**							**2.4**	**2.0**

COURSE CODE	Engineering Chemistry		L	T	P	SL	C
			3	0	0	3	3
PRE-REQUISITE	Nil	CO-REQUISITE	Practical - Engineering Chemistry				

COURSE OBJECTIVES

- To gain knowledge of molecular orbitals, ionic interactions, and periodic trends.
- To analyze periodic properties, including ionization energy, electronegativity, and oxidation states.
- To outline the key chemical reactions involved in molecular synthesis.

UNIT I	Periodic properties of Elements	9 Hours

Introduction to Periodic Properties- Modern periodic law, Classification of elements, variation of s, p, d and f-block elements - orbital energies of atoms in the periodic table, Effective nuclear charge, penetration of orbitals. Atomic and Ionic Radii, Ionization Energy, Electron Affinity, Electronegativity - Definition - Scales of electronegativity (Pauling scale – qualitative) - Valency and Oxidation States, Periodic variation of properties.

UNIT II	Spectroscopic techniques and applications	9 Hours

Interaction of electromagnetic radiation with matter - Types of spectra: absorption and emission - Regions of electromagnetic spectrum. Principles of spectroscopy and selection rules. Electronic transitions - Beer–Lambert law - Principle of UV–Visible spectroscopy - Instrumentation and working of UV spectrophotometer and its applications. Fluorescence and phosphorescence- Importance and applications. Rotational spectroscopy of diatomic molecules and Vibrational Spectroscopy, Instrumentation and working of IR spectrophotometer - Applications.

UNIT III	Thermodynamics, Electrochemistry and Corrosion	9 Hours

Thermodynamic functions: energy, entropy, free energy. Free energy and emf.Cell potentials, the Nernst equation and its applications. Electrochemical and electrolytic cells – primary and secondary batteries. Fuel cells: H_2-O_2fuel cell- photovoltaic cell - Solar cells. Water Quality parameters, Water Treatment – Demineralization Process – Reverse osmosis process. Corrosion – Wet and Dry Corrosion, Methods of Corrosion Control – Sacrificial anodic protection and impressed current cathodic Protection methods.

UNIT IV	Atomic and molecular structure, Coordination Chemistry	9 Hours

Molecular orbital diagrams of diatomic molecules. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Ionic, dipolar and van Der Waals interactions, Band structure of solids and the role of doping on band structures. Coordination numbers and geometries, hard soft acids and bases, molecular geometries.

UNIT V	Organic reactions and synthesis of a drug molecule	9 Hours

Introduction to Organic Reactions - Classification of organic reactions - Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization, Coupling reaction and ring openings. Synthesis of a

commonly used drug molecule - Stepwise synthesis of Aspirin / Paracetamol / Ibuprofen

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. Engineering Chemistry, by Prasanta Rath, B, Rama Devi, C H Venkata Ramana Reddy, Subendu Chakraborthy, Cengage Learning Publication India Private Limited, Edition 2018.
2. Engineering Chemistry, Jain & Jain, 16th Edition , 2018.
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

REFERENCE BOOKS:

1. B R Puri, L R Sharma and M S Pathania, Principles of Physical Chemistry, S. Nagin Chand & Company Ltd, 49th edition 2025
2. Atkins' Physical Chemistry: International, 2018, Eleventh edition, Oxford University Press; UK
3. Colin Banwell, Elaine McCash, Fundamentals for Molecular Spectroscopy, 4th Edition, McGraw Hill, 2016 US
4. Solid State Chemistry and its Applications, Anthony R. West. 2022, 2nd edition, Wiley, UK.

WEB LINKS:

1. https://opentextbc.ca/chemistry/chapter/10-1-intermolecular-forces/
2. https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod2.pdf
3. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_
4. https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_
5. https://www.bcebhagalpur.ac.in/wp-content/uploads/2020/03/Organic-Reactions-Synthesis-of-Drug-Molecule.pdf

NPTEL LINK:

1. Concepts of Chemistry in Engineering: https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cy55

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Explain the periodic trends in atomic and molecular properties, including chemical	**K2**

	properties and oxidation states of elements.	
CO2	Apply the fundamental principles of spectroscopic techniques to determine molecular structure, bonding, and material characteristics.	**K3**
CO3	Illustrate the concepts of chemical equilibrium using thermodynamic functions, electrochemical cells, and corrosion processes.	**K3**
CO4	Explain the principles of atomic and molecular structure, including molecular orbital theory, crystal field theory, band structure, and the electronic structure of solids.	**K2**
CO5	Demonstrate the fundamental organic reaction mechanisms and synthetic strategies for the preparation of a commonly used drug molecule.	**K2**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	2	-	-	-	-	2	-
CO3	3	3	-	2	-	2	2	-	-	-	-	2	3
CO4	2	2	-	2	-		-	-	-	-	-	3	2
CO5	3	2	2	-	-	2	2	-	-	-	-	-	-
AVG	**2.6**	**2.2**	**2.0**	**2.0**	**-**	**2.0**	**2.0**	**-**	**-**	**-**	**-**	**2.33**	**2.5**

COURSE CODE	Fundamentals of Electrical and Electronic Science		L	T	P	SL	C
			3	0	0	3	3
PRE-REQUISITE	Nil	CO-REQUISITE	Practical - Fundamentals of Electrical And Electronic Science				

COURSE OBJECTIVES

- To impart the foundational concepts of electrical circuits and digital electronics in various applications.

UNIT I	DC Fundamentals	9 Hours

Electrical quantities, Ohm's Law, Resistors - Series and parallel combinations, Current Division rule, Voltage Division rule, Source transformation – Kirchoff's laws, node voltage and mesh current methods, Delta-star and star delta conversion, Superposition principle, Thevenin's and Norton's theorems.

UNIT II	AC Fundamentals	9 Hours

Sinusoids and phasor relationships, Impedance and Admittance; sinusoidal steady-state analysis; AC power analysis- Instantaneous and average power, RMS, apparent and PF, complex power.

UNIT III	Fundamentals of Electrical Science	9 Hours

DC motor - Construction– principle of operation – torque equation – types – electrical & mechanical characteristics–starting – speed control – various testing – braking. Transformers – principle of operation – types – basic construction – equivalent circuit - regulation and efficiency – auto transformer.

UNIT IV	Sources of Energy	9 Hours

General structure of electrical power systems, Power transmission and distribution via overhead lines and underground cables, Steam, Hydel, Gas and Nuclear power generation. Renewable Energy: Solar and Wind.

UNIT V	Basic Semiconductor devices	9 Hours

PN junction diode- construction and operation, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Breakdown in PN Junction Diodes. Applications- Rectifiers, Limiting and Clamping Circuits, Zener diode-construction and VI characteristics. Design and Experimental Verification of Diode Characteristics (PN and Zener) and applications (Rectifiers and Voltage Regulators).

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, 4th Edition, Tata McGraw Hill, 2025
2. B.L. Theraja & A.K. Theraja, A Textbook of Electrical Technology (Vol. I), S.

Chand Publishing, 2024.
3. V.K. Mehta & Rohit Mehta, Principles of Electrical Engineering, S. Chand Publishing, 2023.

REFERENCE BOOKS:

1. E. Hughes, Electrical and Electronic Technology, 12th Edition, Pearson Education, 2023.
2. Charles K. Alexander & Matthew N.O. Sadiku, Fundamentals of Electric Circuits, 7th Edition, McGraw Hill Education, 2023.
3. Schaum's Outline Series, Basic Electrical Engineering, 3rd Edition, McGraw Hill, 2024.
4. J.B. Gupta, Fundamentals of Electrical Engineering, Kataria & Sons, 2023.
5. S. Salivahanan & N. Suresh Kumar, Basic Electrical and Electronics Engineering, 2nd Edition, McGraw Hill Education, 2024.

WEB LINKS:

1. https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/#features
2. https://www.wolframalpha.com/examples/society-and-culture/economic-data/energy-data/energy-resources/

NPTEL LINK:

1. NPTEL Course: Fundamentals of Electrical Engineering by Prof. Debapriya Das, IIT Kharagpur
   https://nptel.ac.in/courses/108105112

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply electrical laws and network theorems to solve DC circuits using various methods and transformations.	**K3**
CO2		**K4**
CO3	Explain the construction, working principles, and performance characteristics of DC machines and transformers.	**K2**
CO4	Describe the structure and operation of power systems in conventional and renewable energy sources.	**K2**
CO5	Understand the operation and characteristics of semiconductor devices in practical circuits.	**K2**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	-	-	-	2	2
CO2	3	3	-	-	2	-	-	-	-	-	-	2	2
CO3	3	2	-	-	2	-	-	-	-	-	-	2	3
CO4	2	2	-	-	-	3	2	-	-	-	-	3	3
CO5	3	-	-	-	3	-	-	-	-	-	-	3	2
AVG	2.8	2.5	-	-	2.25	3	2	-	-	-	-	2.4	2.4

COURSE CODE	Fundamentals of Battery Science and Energy Storage		L	T	P	SL	C
			3	0	0	3	3
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To understand key concepts of electricity, magnetism, and electromagnetic waves relevant to energy storage.
- To describe the principles, structure, and operation of various batteries and electrochemical cells.

UNIT I	Fundamentals of Electricity, Magnetism and Electromagnetic Waves	9 Hours

Basic concepts – Electrostatic charge Electric dipole - dipole moment - electric field - Electric field lines - Field due to an electric dipole -Magnetic induction – flux - Magnetic field inside a long solenoid - Intensity of Magnetisation - Magnetic susceptibility and permeability – Laws of electromagnetic induction – Self and mutual inductance - Self-inductance of a long solenoid -Relation between electric and magnetic fields of an electromagnetic wave - Energy carried by electromagnetic waves - Hertz experiment: production and detection of electromagnetic waves.

UNIT II	Introduction to Energy Storage Systems	9 Hours

Role of energy storage in modern power systems – Importance in renewable energy integration – Classification of energy storage systems (electrochemical, mechanical, electrical, thermal) – Comparison of storage technologies.

UNIT III	Battery Fundamentals	9 Hours

Primary vs secondary batteries – Cell, module, and pack configurations – Voltage, current, capacity, energy density, power density – Charge/discharge characteristics – Efficiency and cycle life.

UNIT IV	Electrochemical Fundamentals	9 Hours

Structure of an electrochemical cell – Anode, cathode, electrolyte, separator – Working principle – Redox reactions – Electrode potential – EMF and its measurement – Application of Nernst Equation

UNIT V	Types of Batteries and Applications of Batteries in EEE	9 Hours

Overview of next-generation batteries – Solid-state batteries – Lead-acid battery – Lithium-ion battery basics Sodium-ion batteries – Nickel-based batteries (Ni-Cd, Ni-MH) – Metal-air batteries – Comparison with conventional batteries. Electric vehicles (EVs) – Renewable energy systems (solar PV and wind integration) – Smart grid and microgrid applications – UPS and backup systems – Consumer electronics - Battery disposal issues – Recycling methods – Environmental impact – Sustainability considerations.

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. Electrochemistry and Energy Storage Systems, Mallikarjun T. B., Charushila A. Kulkarni, and K. S. K. Reddy, Notion Press, 2024.
2. Electrochemical Energy Storage Systems and Devices – Suman Gandi, Saidi Reddy Parne, and Damodar Reddy Edla, Multi-Spectrum Publications, 2021.
3. Energy Storage Systems: An Introduction – Edited by Dr Satyender Singh, Nova Science Publishers, 2020.
4. Energy Storage Technologies in Grid Modernisation – Sandeep Dhundhara and Yajvender Pal Verma, Scrivener Publishing/Wiley, 2023.
5. Recent Trends in Fuel Cell Science and Technology – Edited by Suddhasatwa Basu, Springer, 2007.

REFERENCE BOOKS:

1. Energy Storage Devices for Renewable Energy Systems: Rechargeable Batteries and Supercapacitors – Nihal Kularatna, Elsevier, 2021.
2. Electrochemistry of Next-Generation Solid-State Batteries, Alok Kumar Rai, Vivek Mishra, and Satendra Pal Singh (Eds.), Springer, 2025.
3. Electrochemical Reduction of Carbon Dioxide: Fundamentals and Technologies, edited by Jinli Qiao et al., contributions by Suddhasatwa Basu, CRC Press, 2016.
4. Electrochemical Energy Storage: Batteries, Fuel Cells and Supercapacitors, Various Indian contributors and researchers, McGraw-Hill Education.
5. Energy Storage and Conversion Devices: Supercapacitors, Batteries and Hydroelectric Cells – Edited by Anurag Gaur, A. L. Sharma, and Anil Arya, CRC Press.

WEB LINKS:

1. NPTEL – Electrochemical Energy Storage Course (IIT Kharagpur) – Covers fundamentals of electrochemical energy storage, Li-ion batteries, sodium-ion batteries, supercapacitors, and battery recycling.
2. NPTEL – Sustainable Energy Technology – Includes lectures on energy storage systems, batteries, renewable energy integration, and EV technologies.
3. NPTEL – Smart Grid: Basics to Advanced Technologies – Covers smart grids, microgrids, renewable integration, and energy storage technologies.

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Illustrate electric and magnetic field distribution in dipoles and solenoids.	**K2**
CO2	Identify suitable batteries for engineering applications.	**K3**
CO3	Apply electrochemical concepts in battery analysis.	**K3**

CO4	Classify energy storage systems used in electrical and renewable energy applications.	**K4**
CO5	Compare conventional and advanced battery technologies based on performance and applications.	**K4**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	2	3	2	-	3	-	-	-	-	-	-	2	2
CO2	3	2	-	3	2	-	-	-	-	-	2	2	3
CO3	2	3	-	3	2	-	-	-	-	-	-	2	3
CO4	2	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	-	3	2	-	-	-	-	-	-	-	2	3
AVG	**2.4**	**2.75**	**2.66**	**2.66**	**2.33**	-	-	-	-	-	**2.5**	**2.2**	**2.8**

COURSE CODE	Computer Programming using Python		L	T	P	SL	C
			3	0	0	3	3
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To develop foundational programming skills using Python syntax, control structures, data structures, and problem-solving techniques.
- To apply functions, arrays, exception handling, and modular programming concepts for developing efficient Python applications.
- To build competency in Python libraries, file handling, modules, and packages for data analysis and application development.

UNIT I	Python Basics	9 Hours

Introduction to Python – Python Interpreter and its working – Syntax and Semantics - Variables and Data Types : Numbers, Booleans, Strings - Assignments and Expressions - Precedence Rules, Operators - Interactive vs Script mode Programming - Input and Output Statements - Control Flow Statements

UNIT II	Core Python Concepts and Data Structures	9 Hours

Local Variables and Global Variables - Lists and String Basics - Tuples and Sets - Dictionaries: Basics, Operations, Methods - Accumulation Techniques - Comprehensions (List, Set, Dictionary) - String Manipulation and Operations - Exception Handling

UNIT III	Arrays and Functions	9 Hours

Introduction to Arrays - Use of Arrays - Declaration and Usage of Arrays – Two - Dimensional Arrays - Need for Modular Programming - Function Definition and Invocation - Parameter Passing Techniques - Passing Arrays to Functions - Recursion - Python Built-in Functions and Lambda Functions

UNIT IV	Introduction to NumPy, Pandas & Matplotlib	9 Hours

Introduction to NumPy (arrays, indexing, slicing, operations) – Introduction to Pandas (Series, DataFrame, data manipulation, handling missing data) – Introduction to Matplotlib (line, bar, scatter plots, labels)

UNIT V	Files, Modules, and Packages	9 Hours

Files and exception: text files - reading and writing files - command line arguments - errors and exceptions - handling exceptions – modules - packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation.

Total: 45 Hours

Self-Learning: 45 Hours

TEXTBOOKS:

1. Matthes, E., Python Crash Course, 3rd Edition, No Starch Press, 2023.
2. McKinney, W., Python for Data Analysis, 3rd Edition, O'Reilly, 2022.
3. Sweigart, A., Automate the Boring Stuff with Python, 3rd Edition, No Starch Press, 2023

REFERENCE BOOKS:

1. Ramalho, L., Fluent Python, 2nd Edition, O'Reilly, 2022.
2. Romano, F., Learn Python Programming, 4th Edition, Packt, 2023.

WEB LINKS:

1. https://www.python.org/
2. https://www.learnpython.org/
3. https://www.sitepoint.com/python
4. https://realpython.com/

NPTEL LINK:

1. The Joy of Computing using Python By Prof. Sudarshan Iyengar IIT Ropar https://nptel.ac.in/courses/106106182

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Develop Python programs using syntax, operators, control structures, and data types for problem solving.	**K3**
CO2	Implement Python data structures such as lists, tuples, sets, dictionaries, and string operations for data manipulation.	**K4**
CO3	Design modular Python programs using arrays, functions, recursion, lambda functions, and exception handling techniques.	**K4**
CO4	Utilize NumPy, Pandas, and Matplotlib libraries for data analysis, manipulation, and visualization tasks.	**K3**
CO5	Develop Python applications using file handling, modules, and packages for efficient data processing and software development.	**K5**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	3	-	-	3	–	–	–	–	–	–	2	–
CO2	3	2	-	3	2	–	–	–	–	–	–	2	–
CO3	3	3	2	-	3	–	–	–	–	–	–	2	2
CO4	3	2	3	-	3	–	–	–	–	–	–	3	2

CO5	3	3	**-**	2	3	–	–	–	–	–	–	3	2
AVG	**3.0**	**2.8**	**2.5**	**2.5**	**2.8**	–	–	–	–	–	–	**2.4**	**2.0**

COURSE CODE	Practical - Technical English		L	T	P	SL	C
			0	0	2	2	1
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To enable the student to explore the knowledge in communication skills.
- To gain knowledge in the process of Placement Interviews, Group Discussions and other recruitment procedures.
- To teach appropriate pronunciation, word accent, intonation.

LIST OF EXPERIMENTS

1. Introduction to English sounds
2. Consonants and vowels
3. Syllable and Stress
4. Intonation
5. Communication Skills
6. Summarizing
7. Report Writing
8. Information Transfer
9. Presentation Skills
10. Group Discussion
11. Letter Writing
12. Cover letter and Resume

Total: 30 Hours,

Self-Learning: 30 Hours

TEXTBOOKS:

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
2. M.AshrafRizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, New Delhi.2005.
3. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
4. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
5. Practical English Usage 4th International Edition 2016 by Michael Swan, Oxford Publisher.

WEB LINKS:

1. https://onlinemasters.ohio.edu/blog/engineering-communication/
2. https://online.rice.edu/courses/communication-skills-for-engineers-specialization

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Analyze listening and written contexts to understand implied meanings and respond appropriately.	**K4**
CO2	Apply appropriate pronunciation, stress, and rhythm in oral communication.	**K3**
CO3	Interpret written communication in official contexts such as narrative, descriptive, analytical, and report writing.	**K2**
CO4	Analyze different genres of texts and evaluate their ideas and methods of oral presentation.	**K4**
CO5	Apply suitable communicative strategies to express ideas effectively in discussions, negotiations, and conversations.	**K3**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	3	2	-	-	-
CO3	-	-	-	-	-	-	-	-	2	-	-	2	-
CO4	-	-	-	-	-	-	-	3	-	2	-	2	-
CO5	-	-	-	-	-	-	-	3	-	2	-	2	-
AVG	-	-	-	-	-	-	-	**3.0**	**2.3**	**2.0**	**2.0**	**2.0**	-

COURSECODE	Practical – Engineering Chemistry		L	T	P	SL	C
			3	0	3	3	1.5
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To analyze water and solution quality using chemical methods such as alkalinity, hardness, and chloride determination.
- To apply electrochemical techniques including conductometry, potentiometry and pH-metry for precise measurements.
- To investigate kinetics and adsorption through experiments on reaction rate constants and adsorption studies.

LIST OF EXPERIMENTS

1. Determination of type and amount of alkalinity present in the given water sample.
2. Determination of strength of the given acid by pH metre.
3. Determination of the amount of strong acid present in the given solution by conductometric titration.
4. Determination of mixture of acids by conductometric method.
5. Determination of cell constant and conductance of solution.
6. Estimation of amount of ferrous ion present in the whole of the given solution by Potentiometric method.
6. Estimation of the amount of chloride present in the water sample by Argentometric analysis.
7. Determination of total, temporary and permanent hardness of the given water sample by EDTA method.
9. Determination of the rate constant of a reaction.
10. Estimation of adsorption of acetic acid by charcoal.

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. Dr. Sunita Rattan Engineering Chemistry (With Experiments), published by S.K.Kataria& Sons 2024.
2. Dr. N. Rama Jyothi, Engineering Chemistry Lab Manual, Shine Book Publishing,2023
3. Sundaramand K.Raghavan “Practical Chemistry”, S.Viswanathan. Co. 3rd edition 2011.
4. Gnanaprakasam, Ramamurthy, “Organic Chemistry Lab Manual”S. Viswanatha Pvt. Ltd 3rd edition 2011.

REFERENCE BOOKS:

1. Vogel’s– “Textbook of qualitative organic Analysis”, Longmann, 12th edition, 2011
2. J.N.Gurtuand, R.Kapoor “Advanced experimental Chemistry”, S.Chand and Co.6th edition, 2010.

WEB LINKS:

1. https://www.khanacademy.org/science/ap-chemistry-beta/x2eef969c74e0d802:kinetics/x2eef969c74e0d802:introduction-to-rate-law/v/rate-law-and-reaction-order
2. https://www.youtube.com/watch?v=qdmKGskCyh8
3. https://www.youtube.com/watch?v=7_6_dKlo67k

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Explain the principles of volumetric and instrumental analytical methods used in chemical analysis.	**K2**
CO2	Interpret the experimental data obtained from pH-metric, conductometric, and potentiometric techniques.	**K3**
CO3	Apply analytical methods to determine water quality parameters such as alkalinity, hardness, and chloride content.	**K3**
CO4	Analyze the reaction kinetics of a reaction using the experimentally generated kinetic data.	**K3**
CO5	Determine the adsorption parameters of acetic acid on charcoal through adsorption studies.	**K3**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	-	-	-	-	2	-	-	-	-	2	-
CO3	3	3	2	3	-	-	3	-	-	-	-	2	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-
AVG	**2.6**	**2.4**	**2.0**	**2.5**	**-**	**-**	**2.5**	**-**	**-**	**-**	**-**	**2.0**	**-**

COURSE CODE	Practical - Fundamentals of Electrical and Electronic Sciences		L	T	P	SL	C
			0	0	3	3	1.5
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- Understand and verify the fundamental laws and theorems of electrical circuits through laboratory experiments.
- Investigate the performance and operating characteristics of electrical machines and transformers through load and performance tests.
- Study the characteristics and applications of basic electronic devices, including PN junction diodes, Zener diodes, and rectifier circuits.

LIST OF EXPERIMENTS

1. Verification of Ohm's law and Kirchhoff's laws.
2. To measure single phase power by using three ammeter method.
3. To measure the single phase power by using three voltmeter method
4. VI characteristics of PN junction and Zener diode
5. Implementation of Half wave and Full wave rectifier
6. Load Test on Single phase transformer
7. O.C and S.C Test on Single phase transformer
8. Load test on DC Shunt motor
9. Load test on DC series motor
10. Swimburne's test

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, 4th Edition,Tata McGraw Hill, 2025.

REFERENCE BOOKS:

1. E. Hughes, Electrical and Electronic Technology, 12th Edition, Pearson Education, 2023.
2. Schaum's Outline Series, Basic Electrical Engineering, 3rd Edition, McGraw Hill, 2024.
3. J.B. Gupta, Fundamentals of Electrical Engineering, Kataria & Sons, 2023.

WEB LINKS:

1. https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/#features
2. https://www.wolframalpha.com/examples/society-and-culture/economic-data/energy-data/energy-resources/

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Realize the electrical safety precautions	**K2**
CO2	Apply fundamental circuit theorems to solve DC electrical circuits	**K3**
CO3	Comprehend the principles of electrical machines.	**K2**
CO4	Apply electrical laws and network theorems to solve DC circuits using various methods	**K3**
CO5	Analyse the performance of electrical circuits and machines through experiments.	**K4**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	3	-	3	2	-	-	-	-	-	-	-	-
CO2	3	3	-	3	2	-	-	-	-	-	-	2	2
CO3	3	2	-	3	2	-	-	-	-	-	-	2	3
CO4	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	3	-	-	3	3	-	-	-	-	-	-	3	3
AVG	**2.8**	**2.5**	**-**	**3**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**2.25**	**2.5**

COURSE CODE	Idea Lab		L	T	P	SL	C
			0	0	2	0	0
PRE-REQUISITE	Nil	CO-REQUISITE	Nil				

COURSE OBJECTIVES

- To provide practical exposure to modern tools, rapid prototyping techniques and digital manufacturing processes.
- To develop skills in electronic circuit design embedded systems programming and integration of hardware and software.
- To encourage innovation, creativity, problem solving and teamwork through mini projects and capstone project implementation.
- To improve technical communication, project documentation and presentation skills through project reporting and demonstrations

LIST OF EXPERIMENTS

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit.
2. Machining of 3D geometry on soft material such as softwood or modelling wax.
3. 3D scanning of computer mouse geometry surface. 3D printing of scanned geometry using FDM or SLA printer.
4. 2D profile cutting of press fit box/casing in acrylic (3- or 6-mm thickness)/cardboard, MDF (2 mm) board using laser cutter & engraver.
5. 2D profile cutting on plywood/MDF (6-12 mm) for press fit designs.
6. Familiarity and use of welding equipment.
7. Familiarity and use of CNC Milling and CNC router.
8. Embedded programming using Arduino and/or Raspberry Pi.
9. Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure.
10. Discussion and implementation of a mini project.
11. Documentation of the mini project (Report and video).

Total: 30 Hours

Self-Learning: 30 Hours

TEXTBOOKS:

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd. 2023
2. Workshop/ Manufacturing Practices (with Lab Manual), Khanna Book Publishing. 2022

REFERENCE BOOKS

1. Ulrich and Eppinger, Product Design and Development, 7th Edition, McGraw Hill, 2020.
2. The Big Book of Maker Skills: Tools & Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018.

3. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top-Selling Product. Sean Michael Ragan, Weldon Owen, 2017.
4. Programming Arduino: Getting Started with Sketches, 2nd edition, Simon Monk, McGraw Hill.2022

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Demonstrate a comprehensive understanding of the tools, equipment, safety procedures and inventory associated with the IDEA Lab.	**K2**
CO2	Apply ideation and creative thinking techniques to generate innovative solutions for engineering design challenges and real-world problems.	**K3**
CO3	Develop practical skills in mechanical and electronic fabrication processes through hands-on experience with machines, tools, embedded systems and manufacturing techniques.	**K3**
CO4	Design and develop innovative products by integrating user requirements, market needs and technological advancements into the product development process.	**K4**
CO5	Apply iterative design methodologies to analyze, refine and improve engineering solutions based on testing, evaluation, feedback and usability considerations.	**K4**

CORRELATION OF COURSE OUTCOMES WITH POs AND PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	2	–	–	–	3	–	–	–	–	–	–	2	2
CO2	2	3	3	–	2	–	–	–	–	2	–	2	2
CO3	3	2	3	–	3	–	–	–	–	2	–	3	2
CO4	2	3	3	–	3	–	–	–	–	2	–	2	3
CO5	2	3	3	–	2	–	–	–	–	2	–	2	3
AVG	**2.2**	**2.7**	**3.0**	**–**	**2.6**	**–**	**–**	**–**	**–**	**2.0**	–	**2.6**	**2.4**