

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

UNDER GRADUATE DEGREE PROGRAMME

B.Tech. Mechanical Engineering
Four Years

CURRICULUM AND SYLLABUS

REGULATIONS 2026

Effective from the Academic year 2026 - 2027

Department of Mechanical Engineering

School of Engineering

PALLAVARAM

VELS
INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
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VISION OF THE DEPARTMENT
The Department of Mechanical Engineering envisages to be recognized as a role model in advanced fields of Mechanical Engineering Education and Research and to cater the ever changing industrial demands and social needs.

MISSION OF THE DEPARTMENT	
M1	To impart strong fundamental knowledge and advanced technical competency in Mechanical Engineering through effective teaching–learning practices and modern educational methodologies.
M2	To nurture professionally competent, ethically responsible, and lifelong learning engineers through value-based education, professional activities, and continuous skill development.
M3	To enhance employability, leadership, and industry readiness of students through industrial training, internships, industrial visits, multidisciplinary learning, and skill-oriented programs.
M4	To foster innovation, entrepreneurship, research, and industrial collaboration for developing sustainable engineering solutions that address societal and global needs with high ethical standards.



PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	
PEO 1	Graduates will establish successful careers as Mechanical Engineers and allied professionals in diverse sectors, including manufacturing, automotive, aerospace, energy, infrastructure, academia, research and development organizations, and government institutions, contributing effectively to technological advancement and societal development.
PEO 2	Graduates will pursue higher education, research, entrepreneurship, and continuous professional development in Mechanical Engineering and related interdisciplinary fields.
PEO 3	Graduates will apply engineering knowledge and innovative technologies to develop effective solutions for improving industrial processes, energy systems, transportation, and societal infrastructure.
PEO 4	Graduates will demonstrate leadership, teamwork, ethical values, ecological responsibility, and decision-making skills to work effectively in multidisciplinary and global environments.



PROGRAM OUTCOMES (POs)

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Engineering tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and the world: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO7	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO8	Individual and collaborative team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO10	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO11	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)	
PSO1	Graduates will demonstrate a strong foundation in core Mechanical Engineering principles and apply them to solve real-world problems in industrial and societal contexts, while adhering to ethical standards and demonstrating environmental consciousness.
PSO2	Graduates will contribute to nation building by leveraging technological concepts and tools in emerging fields, coupled with managerial and entrepreneurial skills to drive innovation, sustainability, and economic growth.

Department of Mechanical Engineering			
PO 1:Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an Engineering specialization for the solution of complex engineering problems.			
1.1	Demonstrate competence in mathematical modeling.	1.1.1	Apply mathematical techniques such as calculus, linear algebra, and statistics to solve problems
		1.1.2	Apply advanced mathematical techniques to model and solve mechanical 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 inengineering fundamentals	1.3.1	Apply fundamental engineering concepts to solve engineering problems
1.4	Demonstratecompetence in specialized engineering knowledge to the program	1.4.1	Apply mechanical engineering concepts to solve engineering problems.
PO 2: Problem analysis: Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
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 in terms 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 solutions for complex engineering problems and design systemcomponents or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations			
	Demonstrate an ability to	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	define a complex/ open-ended problem in engineering terms	3.1.4	Extract engineering requirements from relevant engineering Codes and Standards such as IEEE, ISO, ITU-R, ITU-T 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: Use research-based knowledge and research methods Including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.			
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 and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			
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.
5.3	Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.31	Discuss limitations and validate tools, techniques and resources.
		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: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice. Understand the impact of the professional engineering solutions inSocietal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.			
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.
6.3	Demonstrate an understanding of the impact of engineering and industrial practices onsocial, environmental and in economic contexts	6.3.1	Identify risks/impacts in the life-cycle of an engineering product or activity Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability.
PO7: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
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 Mechanical professional code of ethics.
		7.2.2	Examine and apply moral & ethical principles to known case studies.
PO8: Individual and collaborative team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
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, conflict resolution and leadership skills	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.

8.3	Demonstrate success in a 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 on complex engineering activities with the engineeringcommunity and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.			
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: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, 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	Analyzeandselectthemostappropriateproposalbasedoneconomican dfinancial 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 11: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.			
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: Graduate will be able to acquire core Mechanical Engineering knowledge and able to solve industrial as well as societal problems with ethical and environmental consciousness.			
12.1	Demonstrate and understanding of the impact of engineering and industrial practices onsocial, environmental and in economic contexts	12.1.1	Understand the relationship between the technical, socio-economic and environmental dimensions of sustainability.
		12.1.2	Identify risks/impacts in the life-cycle of an engineering product or activity.
12.2	Demonstrate an ability to apply the Code of Ethics	12.2.1	Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public.
		12.2.1	Examine and apply moral & ethical principles to known case studies.
PSO 2: Graduate will be able to build the nation, by imparting technological concepts and tools on emerging fields through the Managerial and entrepreneurs skills.			
13.1	Demonstrate an ability to identify/ create modern engineering tools, techniques and resources	13.1.1	Identify modern engineering tools and techniques and resources for Engineering activities.
		13.1.2	Create/adapt/modify/extend tools and techniques to solve engineering Problems.
13.2	Demonstrate an ability to form a team and define a role for each member	13.2.1	Recognize a variety of working and learning preferences; appreciate the value of diversity on a team
		13.2.2	Implement the norms of practice (e.g., rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
13.3	Demonstrate an ability to identify changing trends in engineering knowledge and practice	13.3.1	Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current.
		13.3.2	Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field.

REGULATION 2026

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

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SCHOOL OF ENGINEERING UG REGULATIONS - 2026

CHOICE BASED CREDIT SYSTEM (CBCS)

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:

i. "**Programme**" refers to the Degree Programme that is B.Tech.

ii. "**Discipline**" refers to specialization or branch of B.Tech. Degree Programme, like Electronics and Communication Engineering, Computer Science and Engineering etc.

iii. "**Course**" refers to theory or laboratory subject like Engineering Physics, Computer Programming etc.

iv. **"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.

v. **"Controller of Examinations"** refers to the authority of the Institution who is responsible for all activities related to examinations

vi. **"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.

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 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.
Professional 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)	Courses on Mini project, Project Phase I and II

4.2 Course Components

Each course includes one or more of the following components,

4.2.1 **Lecture:** Structured classroom teaching focused on theoretical concepts and subject knowledge delivery.

4.2.2 **Tutorial:** Interactive learning session intended for discussion, problem-solving, clarification, and guided practice.

4.2.3 **Practical:** Hands-on learning activity designed to apply theoretical knowledge through experiments, demonstrations, or fieldwork.

4.2.4 **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

Certain courses may be offered with prerequisite course requirements. Students shall successfully complete the prescribed prerequisite course(s) before registering for the respective advanced course. The Department shall notify the prerequisite requirements as part of the curriculum and course registration process.

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

- **Honors:** An additional specialization within the same department earned by completing 18–20 extra credits in an emerging, multidisciplinary, or region-specific area.
- **Minor:** An additional specialization from another department earned by completing 18–20 extra credits alongside the primary degree programme.
- Students fulfilling the prescribed eligibility criteria may choose to pursue either an Honors Programme or a Minor Degree

- The Department shall offer Honors or Minor programmee irrespective of the number of students enrolled.
- If a student discontinues Honors:
  - 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 parent 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 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).

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 Candidates who secure less than 65% of overall attendance shall not be permitted to write the examination at the end of the semester and permitted to move to the next semester. They are required to repeat the incomplete semester in the next academic year, as per the norms prescribed.

6.9 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 5)	**20***
2	Model Examination	(1 x 5)	**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:

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.

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.

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).

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.

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

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%).

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

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.

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.

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,

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

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

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.

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.

A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time.

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. LIGIBILITY FOR THE AWARD OF THE DEGREE

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

1. Successfully gained the required number of total credits as specified in the Curriculum corresponding to his/her Programme within the stipulated time.
2. No disciplinary action is pending against him/her.
3. Successfully completed the field visit / industrial training, if any, as prescribed in the curriculum.
4. 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 REGULATION 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.

AEC	**Ability Enhancement Courses**
SEC	**Skill Enhancement Courses**
PCC	**Program Core Courses**
MDC	**Multidisciplinary Core**
MDE	**Multidisciplinary Elective**
PEC	**Professional Elective Courses**
VAC	**Value Added Courses**
PRD	**Project Report and Dissertation**
SI	**Summer Internships**
BSC	**Basic Science Courses**

VELSINSTITUTEOFSCIENCE, TECHNOLOGYANDADVANCEDSTUDIES

SCHOOL OF ENGINEERING

DEPARTMENTOFMECHANICALENGINEERING

B.Tech. MECHANICAL ENGINEERING

CURRICULUM STRUCTURE

TOTAL NUMBER OF CREDITS: 165

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER I										
BSC	**26CGMA11**	Mathematics - I (Calculus and Linear Algebra)	3	0	2	4	4	40	60	100
BSC	**26CGMA12**	Engineering Physics (Electromagnetism)	3	0	0	3	3	40	60	100
BSC	**26CGMA13**	Engineering Chemistry	3	0	0	3	3	40	60	100
MDC	**26MBME11**	Engineering Graphics	2	1	0	3	3	40	60	100
MDC	**26MBME12**	Fundamentals of Digital Manufacturing Processes	3	0	0	3	3	40	60	100
VAC	**26CUHV11**	Universal Human Values - Understanding Harmony	3	0	0	3	3	40	60	100
MDC	**26MBME13**	Fabrication and workshop practices LAB	0	0	3	3	1.5	40	60	100
BSC	**26CGMA14**	Engineering Physics (Electromagnetism) LAB	0	0	3	3	1.5	40	60	100
BSC	**26CGMA15**	Engineering Chemistry LAB	0	0	3	3	1.5	40	60	100
		Total	**17**	**1**	**11**	**28**	**23.5**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER II										
BSC	**26GCMA26**	Mathematics - II (Differential Equations and Complex Analysis)	3	0	2	4	4	40	60	100
MDC	**26MBME21**	Fundamentals of Electrical and Electronics Science	3	0	0	3	3	40	60	100
AEC	**26ABME21**	Technical English	2	0	0	2	2	40	60	100
PCC	**26CBME21**	Engineering Mechanics	3	0	0	3	3	40	60	100
MDC	**26MBCE22**	Computer Programming using C and C++	3	0	0	3	3	40	60	100
MDC	**26CBME21**	Engineering Material Science and Testing	3	0	0	3	3	40	60	100
MDC	**26MBCE23**	Computer Programming using C and C++ LAB	0	0	3	3	1.5	40	60	100
AEC	**26ABME22**	Technical English LAB	0	0	3	3	1.5	40	60	100
MDC	**26MBCE24**	Fundamentals of Electrical and Electronics Sciences LAB	0	0	3	3	1.5	40	60	100
SEC	**26SBME21**	IDEA LAB	0	0	2	2	0	-	-	100
		Total	**17**	**0**	**13**	**29**	**22.5**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER III										
BSC	26GCMA31	Mathematics – III (Transforms and Boundary Value Problems)	3	1	0	4	4	40	60	100
MDC	26MBME31	Electrical Drives and Control	3	0	0	3	3	40	60	100
PCC	26CBME31	Engineering Thermodynamics	3	0	0	3	3	40	60	100
PCC	26CBME32	Fluid Mechanics and Machinery	3	0	0	3	3	40	60	100
SEC	26SBME31	Design Thinking	2	1	0	3	2	40	60	100
PCC	26CBME33	Manufacturing Technology	3	0	0	3	3	40	60	100
VAC	26GLCI31	Basic Life Skills	2	0	0	2	0	40	60	100
SEC	26SUPD31	Personality Development – I (Aptitude & Coding Skills – I)	2	0	0	2	2	40	60	100
VAC	26GLCI32	Constitution of India	1	0	0	1	0	40	60	100
PCC	26CBME33	Fluid Mechanics and Machinery LAB	0	0	3	3	1.5	40	60	100
PCC	26CBME34	Manufacturing Technology LAB	0	0	3	3	1.5	40	60	100
		Total	**22**	**2**	**6**	**30**	**23**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER IV										
BSC	**26GCMA41**	Mathematics – IV (Numerical Methods)	3	1	0	4	4	40	60	100
PCC	**26CBME41**	Engineering Metrology and Measurements Blended	3	0	2	4	4	40	60	100
PCC	**26CBME42**	Strength of Materials	3	0	0	3	3	40	60	100
PCC	**26CBME43**	Theory of Machines	3	1	0	3	3	40	60	100
MDC	**26MBME41**	Fundamentals of Artificial Intelligence	3	0	0	3	3	40	60	100
VAC	**26GGIS41**	Gender Institution and Society	2	0	0	2	0	40	60	100
SEC	**26SUPD41**	Personality Development – II (Aptitude & Coding Skills – II)	2	0	0	2	2	40	60	100
SEC	**26CINE41**	Curricular and Extracurricular activities (NCC/NSS and other activities)	-	1	-	3	1	-	-	100
PCC	**26CBME44**	Computer Aided Machine Design LAB	0	0	3	3	1.5	40	60	100
PCC	**26CBME45**	Kinematics and Dynamics LAB	0	0	3	3	1.5	40	60	100
		Total	**19**	**3**	**8**	**30**	**23**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER V										
PCC	26CBME51	Design of Machine Elements	3	1	0	3	3	40	60	100
PCC	26CBME52	Thermal Engineering	3	1	0	3	3	40	60	100
PCC	26CBME53	Finite Element Analysis	3	1	2	4	3	40	60	100
BSC	26EVSE51	Environmental Science Engineering and SDGs	3	0	0	3	2	40	60	100
PEC	26PBME51	Professional Elective Course - I	3	0	0	3	3	40	60	100
PEC	26PBME52	Professional Elective Course - II	3	0	0	3	3	40	60	100
SEC	26SUPD51	Personality Development – III (Aptitude & Coding Skills – III)	2	0	0	2	2	40	60	100
PCC	26CBME54	Thermal Engineering LAB	0	0	3	3	1.5	40	60	100
		Total	**20**	**3**	**5**	**24**	**20.5**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER VI										
PCC	**26CBME61**	Design of Transmission Systems	3	1	0	4	3	40	60	100
PCC	**26CBME62**	Heat and Mass Transfer	3	1	0	3	3	40	60	100
PEC	**26PBME61**	Professional Elective Course - III	3	1	0	3	3	40	60	100
MDE	**26MBME61**	Multidisciplinary Elective Course– I	3	1	0	3	3	40	60	100
AEC	**26ABME61**	Innovation and Entrepreneurship	2	0	0	2	1	40	60	100
SI	**26CINE61**	Industrial Training/ Internship /MOOC	0	0	2	2	1	40	60	100
SEC	**26SEPD61**	Personality Development – IV(Aptitude & Coding Skills – IV)	2	0	-	2	2	-	-	100
PCC	**26PBME62**	Advanced Manufacturing LAB	0	1	3	3	1.5	40	60	100
PRD	**26RBME61**	Project - Design and Development	0	0	3	3	1.5	40	60	100
		Total	**16**	**5**	**8**	**25**	**19**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER VII										
PCC	26PBME71	Mechatronics	3	1	0	3	3	40	60	100
PEC	26PBME7A	Professional Elective Course - IV	3	0	0	3	3	40	60	100
MDE	26MBME71	Multidisciplinary Elective Course- II	3	0	0	3	3	40	60	100
MDE	26MBME72	Multidisciplinary Elective Course- III	3	0	0	3	3	40	60	100
PEC	26PBME7B	Professional Elective Course - V	3	1	0	3	3	40	60	100
SEC	26CINE71	Curricular and Extracurricular activities	1	0	0	1	1	-	-	100
PRD	26RBME71	Project Phase I	0	0	6	6	3	40	60	100
PCC	26PBME72	MATLAB for Mechanical Engineering	0	0	3	3	1.5	40	60	100
		Total	**16**	**2**	**9**	**25**	**20.5**			

Category	Code No.	Course	Hours/ Week				Credits	Maximum Marks		
			L	T	P	SL		CA	SEE	Total
SEMESTER VIII										
PRD	26RBME81	Project Phase II	0	0	14	14	7	40	60	100
PEC	26PBME8A	Professional Elective Course – VI	3	0	0	3	3	40	60	100
MDE	26MBME81	Multidisciplinary Elective Course– IV	3	0	0	3	3	40	60	100
		Total	**6**	**0**	**14**	**20**	**13**			

CIA - Continuous Internal Assessment SEE - Semester End Examination
L – Lecture, T- Tutorial, P- Practical, SL – Self – Learning

B.Tech. MECHANICAL ENGINEERING

LIST OF PROFESSIONAL ELECTIVE COURSES (PEC)

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
PEC	26PBMEXX	Special Casting Techniques	3	0	0	3	3
PEC	26PBMEXX	Failure Analysis and Design	3	0	0	3	3
PEC	26PBMEXX	Manufacture and Inspection of Gears	3	0	0	3	3
PEC	26PBMEXX	Refrigeration and Air Conditioning	3	0	0	3	3
PEC	26PBMEXX	Welding Technology	3	0	0	3	3
PEC	26PBMEXX	Cryogenic Engineering	3	0	0	3	3
PEC	26PBMEXX	Renewable Energy Sources	3	0	0	3	3
PEC	26PBMEXX	Composite Materials and Mechanics	3	0	0	3	3
PEC	26PBMEXX	Automobile Engineering	3	0	0	3	3
PEC	26PBMEXX	Design of Pressure Vessels and Piping	3	0	0	3	3
PEC	26PBMEXX	Vibration and Noise Engineering	3	0	0	3	3
PEC	26PBMEXX	Gas Dynamics and Jet Propulsion	3	0	0	3	3
PEC	26PBMEXX	Design of Jigs, Fixtures and Press Tools	3	0	0	3	3
PEC	26PBMEXX	Industrial Automation, CNC and Robotics	3	0	0	3	3
PEC	26PBMEXX	Unconventional Machining Processes	3	0	0	3	3
PEC	26PBMEXX	Manufacture of Automotive Components	3	0	0	3	3
PEC	26PBMEXX	Additive Manufacturing	3	0	0	3	3
PEC	26PBMEXX	Design of Heat Exchangers	3	0	0	3	3
PEC	26PBMEXX	Rapid Prototyping, Tooling and Manufacture	3	0	0	3	3
PEC	26PBMEXX	Computer Integrated Manufacturing	3	0	0	3	3
PEC	26PBMEXX	Power Plant Engineering	3	0	0	3	3
PEC	26PBMEXX	Computational Fluid Dynamics	3	0	0	3	3
PEC	26PBMEXX	Advanced I.C. Engines	3	0	0	3	3
PEC	26PBMEXX	Fundamentals of Nano science	3	0	0	3	3
PEC	26PBMEXX	Product Development and Manufacture	3	0	0	3	3
PEC	26PBMEXX	Non Destructive Testing and Materials	3	0	0	3	3
PEC	26PBMEXX	Industrial Robotics	3	0	0	3	3
PEC	26PBMEXX	Micro Electro Mechanical Systems	3	0	0	3	3
PEC	26PBMEXX	Flexible Manufacturing System	3	0	0	3	3
PEC	26PBMEXX	Applied Hydraulics and Pneumatics	3	0	0	3	3

B.Tech. MECHANICAL ENGINEERING

LIST OF MULTIDISCIPLINARY CORE/ ELECTIVE COURSES (MDC)

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
MDC	26MBMEXX	Principles of Management	3	0	0	3	3
MDC	26MBMEXX	Operations Research	3	0	0	3	3
MDC	26MBMEXX	Quality Control and Reliability Engineering	3	0	0	3	3
MDC	26MBMEXX	Total Quality Management	3	0	0	3	3
MDC	26MBMEXX	Production Planning and Control	3	0	0	3	3
MDC	26MBMEXX	Quality Control and Reliability Engineering	3	0	0	3	3
MDC	26MBMEXX	Process Planning and Cost Estimation	3	0	0	3	3
MDC	26MBMEXX	Supply Chain Management	3	0	0	3	3
MDC	26MBMEXX	Industrial Marketing and Market Research	3	0	0	3	3
MDC	26MBMEXX	Intellectual Property Rights	3	0	0	3	3
MDC	26MBMEXX	Robotics welding Technology	3	0	0	3	3
MDC	26MBMEXX	Industry 4.0	3	0	0	3	3
MDC	26MBMEXX	Engineering Economics and cost analysis	3	0	0	3	3
MDC	26MBMEXX	Indian Knowledge systems	3	0	0	3	3
MDC	26MBMEXX	Disaster Management	3	0	0	3	3
MDC	26MBMEXX	Computer programming using Python	3	0	0	3	3

B.Tech. MECHANICAL ENGINEERING

LIST OF ABILITY ENHANCEMENT COURSES (AEC)

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
AEC	26ABME21	Technical English	2	0	0	2	2
AEC	26ABME22	Technical English Lab	0	0	2	2	1
AEC	26CUHV11	Universal Human Values :Understanding Harmony	3	0	0	3	3
AEC	26SUPD31	Personality Development – I (Aptitude & Coding Skills – I)	2	0	0	2	2
AEC	26SUPD41	Personality Development – I (Aptitude & Coding Skills – I)	2	0	0	2	2
AEC	26SUPD51	Personality Development – I (Aptitude & Coding Skills – I)	2	0	0	2	2
AEC	26SUPD61	Personality Development – I (Aptitude & Coding Skills – I)	2	0	0	2	2

LIST OF BASIC SCIENCE COURSES (BSC)

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
BSC	26CGMA12	Engineering Physics (Electromagnetism)	3	0	0	3	3
BSC	26CGMA11	Mathematics–I (Calculus and Linear Algebra)	3	0	2	4	4
BSC	26CGMA12	Engineering Physics (Electromagnetism)	3	0	0	3	3
BSC	26CGMA14	Engineering Physics (Electromagnetism) LAB	0	0	3	2	1.5
BSC	26CGMA13	Engineering Chemistry	3	0	0	3	3
BSC	26CGMA15	Engineering Chemistry LAB	0	0	3	2	1.5
BSC	26GCMA26	Mathematics - II (Differential Equations and Complex Analysis)	3	0	2	4	4
BSC	26GCMA31	Mathematics – III (Transforms and Boundary Value Problems)	3	1	0	4	4
BSC	26GCMA41	Mathematics – IV (Numerical Methods)	3	1	0	4	4
BSC	26EVSE51	Environmental Science Engineering and SDGs	3	0	0	2	2

B.Tech. – MECHANICALENGINEERING

LIST OF MULTIDISCIPLINARY CORE COURSES (MDC)

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
MDC	26MBMEXX	Fundamentals of Electrical and Electronics Sciences	3	0	0	3	3
MDC	26MBMEXX	Fundamentals of Electrical and Electronics Sciences LAB	0	0	3	2	1.5
MDC	26MBMEXX	Engineering Graphics	2	1	0	3	3
MDC	26MBMEXX	Electrical Engineering Lab	0	0	3	2	1.5
MDC	26MBMEXX	Computer Programming using C and C++	3	0	0	3	3
MDC	26MBMEXX	Computer Programming using C and C++ LAB	0	0	3	2	1.5
MDC	26MBMEXX	Engineering Material Science and Testing	3	0	0	3	3
MDC	26MBMEXX	Fabrication and workshop practices LAB	0	0	3	2	1.5
MDC	26MBMEXX	Electrical Drives and Control	3	0	0	3	3
MDC	26MBMEXX	Strength of Materials	3	0	0	3	3
MDC	26MBMEXX	IDEA LAB	0	0	2	2	0
MDC	26MBMEXX	Design Thinking	2	0	0	2	2
MDC	26MBMEXX	Fundamentals of Artificial Intelligence	2	1	0	3	3

LIST OF PROJECT COURSES (PR)

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
PR	**26CINE51**	Curricular and Extracurricular activities (NCC/NSS and other activities)	-	1	-	2	2
PR	**26CINE61**	Industrial Training/ Internship /MOOC (Extra-Curricular Activity)	0	0	2	2	1
PR	**26RBME61**	Project – Design and Development	0	0	3	3	1.5
PR	**26RBME71**	Project Phase I	0	0	6	6	3
PR	**26RBME81**	Project Phase II	0	0	14	14	7

B.Tech. MECHANICAL ENGINEERING

CURRICULUM

Professional Elective Course (18 Credits)

1. SMART Manufacturing

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
PEC	26PBMEXX	Industrial IOT and Industry 4.0	3	0	0	3	3
PEC	26PBMEXX	Industrial Automation & Robotics	3	0	0	3	3
PEC	26PBMEXX	Additive Manufacturing Processes	3	0	0	3	3
PEC	26PBMEXX	Intelligent Manufacturing Systems	3	0	0	3	3
PEC	26PBMEXX	AI & Data Analytics	3	0	0	3	3
PEC	26PBMEXX	Digital Twin	3	0	0	3	3

2. Electric Vehicle

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
PEC	26PBMEXX	Electric & Hybrid Vehicles	3	0	0	3	3
PEC	26PBMEXX	Energy Storage System and Management System	3	0	0	3	3
PEC	26PBMEXX	Electric Drives and Controls for Electric Vehicles	3	0	0	3	3
PEC	26PBMEXX	Materials for Electric and Hybrid Electric Vehicles	3	0	0	3	3
PEC	26PBMEXX	Automotive Electricals and Electronics	3	0	0	3	3
PEC	26PBMEXX	Vehicle Body and Aerodynamics Engineering	3	0	0	3	3

3. Drones Technology

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
PEC	26PBMEXX	Introduction to drones	3	0	0	3	3
PEC	26PBMEXX	Engineering materials for unmanned aerial vehicles	3	0	0	3	3
PEC	26PBMEXX	Theory of drones	3	0	0	3	3
PEC	26PBMEXX	Introduction to UAV Electronics	3	0	0	3	3
PEC	26PBMEXX	Advanced drone sensors and payloads	3	0	0	3	3
PEC	26PBMEXX	Aerodynamics and Flight Mechanics of UAS	3	0	0	3	3

4. Mechatronics and Industrial Automation

Category	Code	Course	Hours / Week				C
			L	T	P	SL	
PEC	26PBMEXX	Sensors and Actuators	3	0	0	3	3
PEC	26PBMEXX	Microcontroller and PLC	3	0	0	3	3
PEC	26PBMEXX	Robotics & Machine Vision System	3	0	0	3	3
PEC	26PBMEXX	Micro Electro Mechanical Systems	3	0	0	3	3
PEC	26PBMEXX	Mechatronics Systems Design	3	0	0	3	3
PEC	26PBMEXX	Industrial Electronics and Applications	3	0	0	3	3

VELSINSTITUTEOFSCIENCE, TECHNOLOGYANDADVANCEDSTUDIES

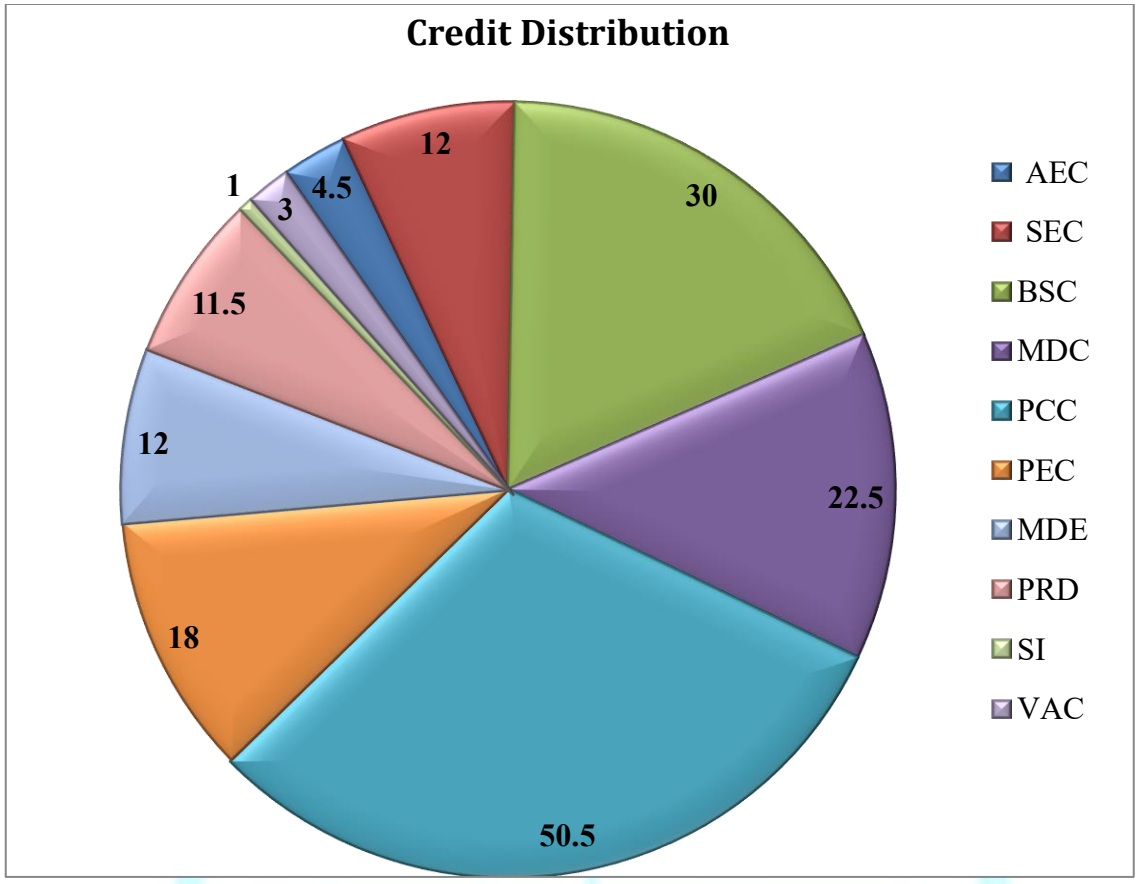
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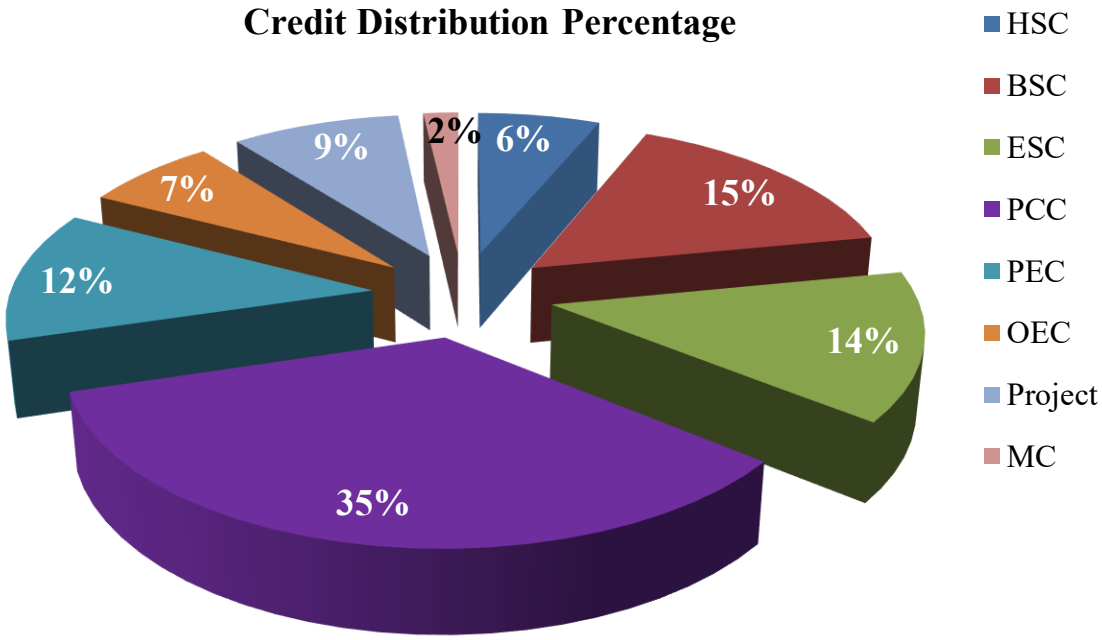
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B.Tech. MECHANICAL ENGINEERING

CREDITS DISTRIBUTION

S.No	Subject Area	I	II	III	IV	V	VI	VII	VIII	Total Credits
1	Ability Enhancement Courses (AEC)		3.5				1			4.5
2	Skill Enhancement Courses (SEC)			4	3	2	2	1		12
3	Basic Science Courses (BSC)	13	4	4	4	2				30
4	Multidisciplinary Core (MDC)	7.5	12	3	3					22.5
5	Program Core Courses (PCC)		3	12	13	10.5	7.5	4.5		50.5
6	Professional Elective Courses (PEC)					6	3	6	3	18
7	Multidisciplinary Elective (MDE)						3	6	3	12
8	Project Report and Dissertation (PRD)						1.5	3	7	11.5
9	Summer Internships (SI)						1			1
10	Value Added Courses (VAC)	3								3
	Total credits	23.5	22.5	23	23	20.5	19	20.5	13	165


Credit Distribution
12
30
4.5
1
3
11.5
12
22.5
18
50.5
AEC
SEC
BSC
MDC
PCC
PEC
MDE
PRD
SI
VAC


Credit Distribution Percentage
9%
2%
6%
7%
15%
12%
14%
35%
HSC
BSC
ESC
PCC
PEC
OEC
Project
MC

SEMESTER I

26CGMA11	MATHEMATICS-I (CALCULUS AND LINEAR ALGEBRA)	L	T	P	SL	C
		3	0	2	4	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 normals.

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 Maclaurinseries.Limit continuity, partial derivatives and total derivative, Jacobian-Functional dependence andIndependence, 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 Eigen vectors and their properties (without proof), Cayley-Hamilton theorem (without proof),Diagonalisation

UNIT V	VECTOR SPACES	12 HOURS

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 HOURS: 60 HOURS &SELF LEARNING : 60 HOURS

TEXT BOOKS:

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

2. RamanaB.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. 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

TEXT BOOKS :

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

REFERENCE BOOKS :

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

WEBLINK:

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

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**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	-	-	-	3	-
CO2	2	3	-	2	-	-	-	-	-	-	-	3	-
CO3	3	3	-	2	3	-	-	-	-	-	-	3	2
CO4	2	3	-	-	3	-	-	-	-	-	-	3	-
CO5	3	2	-	-	3	-	-	-	-	-	-	3	2
AVG	**2.6**	**2.6**	-	**2**	**3**	-	-	-	-	-	-	3	2

26CGMA12	ENGINEERING PHYSICS (ELECTROMAGNETISM)	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	Engineering Physics (Electromagnetism) LAB

COURSE OBJECTIVES

- To learn the basics of electrostatics in a vacuum, dielectric behavior, and magneto statics in a linear magnetic medium.
- To apply these fundamental principles to electromagnetic waves.

UNIT I	ELECTROSTATICS IN VACUUM	9 HOURS

Basic concepts – Electrostatic charge - coulomb - relative permittivity - Coulomb's inverse square law - Superposition principle - Gauss law - differential form of Gauss law and its application (intensity at a point due to a charged sphere and cylinder) - Laplace's and Poisson's equations for electrostatic potential -Equipotential surface - Potential at a point due to a point charge.

UNIT II	ELECTROSTATICS IN A LINEAR DIELECTRIC MEDIUM	9 HOURS

Electric dipole - dipole moment - torque and potential energy of a dipole in a uniform electric field - Electric field lines - Field due to an electric dipole (axial point and equatorial line) - Dielectrics - properties - polar and nonpolar molecules - Dielectric constant - Electric susceptibility - types of polarisations -Derivation of internal field (Lorentz method) - Clausius-Mossotti (C-M) equation.

UNIT III	MAGNETO STATICS IN A LINEAR MAGNETIC MEDIUM	9 HOURS

Magnetic induction – flux - Biot-Savart law –Applications - Magnetic induction at a point due to a straight conductor carrying current - Ampere's circuital law –Applications – Magnetic induction due to long straight current carrying wire - Magnetic field inside a long solenoid - Intensity of Magnetisation - Magnetic susceptibility and permeability - Classification of magnetic materials – soft and hard materials – Dia, Para and Ferro magnetic materials – Hysteresis - B-H curve.

UNIT IV	ELECTROMAGNETIC INDUCTION	9 HOURS

Laws of electromagnetic induction – Lenz's law - Differential form of Faraday's law - Self and mutual inductance - Self-inductance of a long solenoid - Experimental determination of self-inductance by Rayleigh's method - Mutual inductance - Coefficient of coupling - Experimental determination of Mutual Inductance.

UNIT V	MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES	9 HOURS

Maxwell's equations - Physical significance - Derivation of Maxwell's equations - Wave equation - Relation between electric and magnetic fields of an electromagnetic wave - Energy carried by electromagnetic waves - Hertz experiment: production and detection of electromagnetic waves.

TOTAL HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS

1. R. Murugeshan, Electricity and Magnetism, S. Chand & Co, (2017).
2. Tai L. Chow, Introduction to Electromagnetic Theory: A Modern Perspective, Laxmi Publications (2012).

REFERENCE BOOKS

1. RJ: David Griffiths, Introduction to Electrodynamics, Pearson Publishers, (2015).
2. Halliday and Resnick, Physics, Wiley, (2018).
3. Dr Wayne M. Saslow, Electricity, Magnetism and Light, Academic Press, (2002).

WEB LINKS:

1. https://onlinccourscs.nptel.ac.in/noc19_yh08/preview
2. https://onlinccourses.nptel.ac.in/noc19_mm 16/preview
3. https://onlinccourses.nptel.ac.in/noc21_ce83/previcw

NPTEL LINKS:

1. Electromagnetism, Prof. NirmalGanguli, IISER Bhopal
2. Electromagnetic Theory, IIT Kanpur, Prof. Pradeep Kumar K

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Analyse the charges, Gauss theorem and their applications.	**K4**
CO2	Identify the applications of dielectric materials.	**K1**
CO3	Understand and classify the magnetic materials.	**K1**
CO4	Understand and apply the principles of electromagnetic induction.	**K1**
CO5	Analyse Maxwell's equations, interpret their physical significance.	**K4**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	3	-	-	-	-	-	-	3	-
CO2	2	3	-	2	2	-	-	-	-	-	2	3	-
CO3	2	2	-	2	2	-	-	-	-	-	2	3	-
CO4	2	-	3	3	-	-	-	-	-	-	3	3	-
CO5	3	-	3	3	3	-	-	-	-	-	3	3	2
AVG	**2.4**	**2.66**	**2.66**	**2.5**	**2.5**	-	-	-	-	-	**2.5**	3	2

26CGMA13	ENGINEERING CHEMISTRY	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	Engineering Chemistry LAB

COURSE OBJECTIVES

- 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. Principle of UV–Visible spectroscopy - Electronic transitions - Beer–Lambert law - Instrumentation and working of UV spectrophotometer. Fluorescence and phosphorescence - Importance and applications. Vibrational, rotational spectroscopy of diatomic molecules, 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: H2-O2fuel 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 HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

1. Engineering Chemistry, by PrasantaRath, B, Rama Devi, C H VenkataRamana Reddy, SubenduChakraborthy, 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_M

aps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Thermodynamics/Chemical_Energetics/FreeEnergyandEquilibrium

4. https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Supplemental_Modules_and_Websites_(Inorganic_Chemistry)/Descriptive_Chemistry/Periodic_Trends_of_Elemental_Properties/Periodic_Properties_of_the_Elements
5. https://www.bcebhagalpur.ac.in/wp-content/uploads/2020/03/Organic-Reactions-Synthesis-of-Drug-Molecule.pdf

NPTEL LINKS:

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 properties and oxidation states of elements.	**K2**
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**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	2	-	-	2	-	-	-	2	2	-
CO3	3	3	-	2	-	2	2	-	-	-	2	2	-
CO4	2	2	-	2	-		-	-	-	-	2	2	-
CO5	3	2	2	-	-	2	2	-	-	-	2	2	-
AVG	**2.6**	**2.2**	**2.0**	**2.0**	**-**	**2.0**	**2.0**	**-**	**-**	**-**	**2.2**	**2**	**-**

26MBME11	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.

CONCEPTS AND CONVENTIONS

Importance of engineering graphics in product design and manufacturing – Use of drafting instruments – BIS/ISO standards and conventions – Drawing sheet layout, folding, and presentation – Lettering, dimensioning, scaling practices and tolerances used in industry.

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	SECTIONS 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 HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

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

REFERENCE BOOKS:

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 LINKS:

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 and interpret 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	Analyze and develop sectional and surface development drawings	K4
CO5	Utilize CAD tools for preparing accurate engineering drawings and graphical representations.	K3

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	2	–	–	–	–	–	2	–	–
CO2	3	2	2	–	–	–	–	–	–	–	2	3	–
CO3	3	2	2	–	–	–	–	–	–	–	2	2	–
CO4	2	3	2	–	2	–	–	–	–	–	2	2	-
CO5	–	–	2	–	3	–	–	–	–	–	3	2	-
AVG	**2.7**	**2.2**	**2**	**–**	**2.3**	**–**	**–**	**–**	**–**	**–**	**2.2**	**2.2**	**-**

26MBME12	FUNDAMENTALS OF DIGITAL MANUFACTURING	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	NIL

COURSE OBJECTIVES

- To understand the core concepts and evolution of digital manufacturing and its role in modern production systems.
- To familiarize students with CNC machines, additive manufacturing, and advanced manufacturing technologies enabled by digital tools.
- To develop knowledge of manufacturing data management and digital factory concepts.
- To expose students to Industry 4.0 technologies such as IoT, cyber-physical systems, and smart manufacturing.
- To enable application of simulation, virtual manufacturing, and optimization tools for improved manufacturing performance.

UNIT I	INTRODUCTION TO DIGITAL MANUFACTURING	9 HOURS

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Society –Specialized sub disciplines in Mechanical - Definition of digital manufacturing, Historical perspective on industrial production and outlook, Industrial Revolutions, Industry 4.0.

UNIT II	BASICS OF AUTOMATION AND ROBOTICS	9 HOURS

Introduction to the concepts of Mechanization and Automation, Robotics - Historical development of Robotics, Definitions of Industrial Robot, Type and Classification of Robots, Asimov‘s laws of robotics, Robot configurations, Robot Components, Robot Degrees ofFreedom- Pick and Place Robot.

UNIT III	INTRODUCTION TO COMPUTER NUMERICAL CONTROL MACHINES	9 HOURS

Evolution of CNC Technology, principles, features, advantages, applications, NC ,CNC and DNC concept, classification of CNC Machines Open loop system-Closed loop system-Adaptive control system.

UNIT IV	CONCEPT OF REVERSE ENGINEERING	9 HOURS

Forward engineering and reverse engineering- Need, Reverse engineering process, Reverse engineering hardware and software, Geometric model development- coordinate measuring machines, laser scanners, and 3D scanners.

UNIT V	ADDITIVE MANUFACTURING	9 HOURS

Introduction to additive manufacturing, Additive manufacturing process chain, Materials for Additive Manufacturing Technology, Manufacturing, Post processing, Additive manufacturing technologies and processes. Additive Manufacturing Technology in product development-– Tooling - Applications.

TOTAL HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

1. M. P. Groover Fundamentals of Modern Manufacturing", Wiley, 2025.
2. G. K. Lal, Digital Manufacturing, I.K. International Publishing House, 2023.
3. M. Adithan& A. M. Saravana Kumar, Computer Integrated Manufacturing, PHI Learning, 2022.

REFERENCE BOOKS:

1. S. R. Deb, Industrial Robotics & Automation**,** Tata McGraw Hill, 2021.
2. R. K. Rajput, CAD/CAM/CNC and Automation, S. Chand, 2023.

WEB LINKS:

1. https://www.youtube.com/watch?v=jdFrBtHeJbs&t=2s
2. https://www.youtube.com/watch?v=w5aBJ6g7pbY&t=1s
3. https://www.youtube.com/watch?v=oIwZziX1yOE&t=2s
4. https://www.youtube.com/watch?v=8ETBAdEQr7M

NPTEL LINKS:

1. https://nptel.ac.in/courses/112107219

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Explain the concepts of digital manufacturing, industrial revolutions, and Industry 4.0 in modern manufacturing systems.	**K2**
CO2	Understand the fundamentals of automation and robotics, including robot configurations, components, and applications.	**K2**

CO3	Apply the principles and operational concepts of NC, CNC, and DNC systems in manufacturing applications	**K3**
CO4	Analyze the concepts and processes involved in reverse engineering and geometric model development using modern scanning technologies.	**K4**
CO5	Utilize additive manufacturing technologies, materials, and processes for product development and industrial applications.	**K3**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	–	–	–	–	–	2	–	3	–
CO2	3	2	2	–	–	–	–	–	–	2	–	3	–
CO3	2	3	2	2	–	–	–	–	–	2	–	3	–
CO4	2	2	3	2	–	–	–	–	–	2	–	2	–
CO5	2	3	2	2	–	–	–	–	–	3	–	2	–
AVG	**2.4**	**2.4**	**2.2**	**2**	**–**	**–**	**–**	**–**	**–**	**2.2**	**–**	**2.6**	**–**

26CUHV11	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 analyse 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	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 fulfillment 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 fulfillment 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 PROFESSIONAL**	**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 HOURS: 45 HOURS & SELF LEARNING : 45 HOURS

TEXT BOOKS:

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.

WEB LINKS:

1. https://www.youtube.com/watch?v=nlh9V5gd8hg&t=4s
2. https://www.youtube.com/watch?v=XiN8iqJGb48

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.	**K2**
CO2	Analyze harmony within the human being by understanding the relationship between self ('I') and body, practice self-discipline and healthy living.	**K4**
CO3	Demonstrate understanding of human relationships, family values, trust, respect, and social harmony for peaceful coexistence.	**K3**
CO4	Interpret the interconnectedness and mutual fulfillment among human beings, nature, and existence from a holistic perspective.	**K2**
CO5	Apply ethical human values and professional ethics in engineering, technology, and management practices.	**K3**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	2	-	3	-	-	-	-	2
CO2	-	-	-	-	-	2	-	3	-	-	-	-	2
CO3	-	-	-	-	-	3	2	3	-	-	-	-	2
CO4	-	-	-	-	-	3	3	3	-	-	-	-	2
CO5	-	-	-	-	2	2	2	3	-	-	-	2	2
AVG	**-**	**-**	**-**	**-**	**2**	**2.5**	**2.3**	**3**	**-**	**-**	**-**	**2**	**2**

26MBME13	FABRICATION AND WORKSHOP PRACTICES LAB	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) — **15 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 HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

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

4. REFERENCE BOOKS:

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.

WEB LINKS:

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

NPTEL LINKS:

2. Engineering Mathematics – I - By Prof. Jitendra Kumar | IIT Kharagpur

https://onlinecourses.nptel.ac.in/noc20_ma37/preview

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	**K3**

	for basic engineering and residential applications.	
CO5	Measure electrical quantities and demonstrate safe workshop practices while working individually and in teams.	**K3**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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**	**–**

26CGMA14	ENGINEERING PHYSICS LAB	L	T	P	SL	C
		0	0	3	3	1.5

PRE-REQUISITE	Engineering Physics (Electromagnetism)	CO-REQUISITE	NIL

COURSE OBJECTIVES

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

LIST OF EXPERIMENTS (Any Eight)

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 HOURS: 45 HOURS & SELF LEARNING : 45 HOURS

TEXT BOOKS:

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

REFERENCE BOOKS:

1. G.L. Squires, Practical Physics, 5th Edition, Cambridge University Press, 2023.
2. D. Chattopadhyay, P.C. Rakshit, B. Saha, "An Advanced Course in Practical Physics", 2nded., Books & Allied Ltd., Calcutta, 2022.

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	Apply laser techniques to evaluate the wavelength and particle size of a semiconductor diode laser	**K3**
CO2	Analyze the wavelength of spectral lines using spectrometer and diffraction grating	**K4**
CO3	Evaluate the band gap energy of a semiconductor material using experimental techniques	**K5**
CO4	Apply ultrasonic interferometer techniques to study the compressibility of liquids.	**K3**
CO5	Apply bending methods to evaluate the Young's modulus of solid materials.	**K3**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	3	-	-	-	-	-	2	2	-
CO2	3	3	2	3	3	-	-	-	-	-	2	2	-
CO3	3	3	3	3	2	-	-	-	-	-	2	2	-
CO4	3	2	2	3	3	-	-	-	-	-	2	2	-
CO5	3	2	2	3	2	-	-	-	-	-	2	2	-
AVG	**3.0**	**2.4**	**2.2**	**2.8**	**2.6**	**-**	**-**	**-**	**-**	**-**	**2.0**	**2.0**	**-**

26CGMA15	ENGINEERING CHEMISTRYLAB	L	T	P	SL	C
		0	0	3	3	1.5

PRE-REQUISITE	Engineering Chemistry	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 (Any Eight)

1. Determination of type and amount of alkalinity present in the given water sample.
2. Determination of strength of the given acid by pH metry.
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.
7. Estimation of the amount of chloride present in the water sample by Argentometric analysis.
8. 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 HOURS: 45 HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

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. Viswanathan Pvt. Ltd 3rd edition 2011.

REFERENCE BOOKS:

1. Vogel's– "Textbook of qualitative organic Analysis", Longmann, 12th edition, 2011
2. J.N.GurtuandR.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/experimental-determination-of-rate-laws
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**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	-	-	-	-	2	-	-	-	-	2	-
CO3	3	3	2	3	-	-	3	-	-	-	-	2	-
CO4	3	2	2	2	-	-	-	-	-	-	-	2	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	-
AVG	2.6	2.4	2.0	2.5	-	-	2.5	-	-	-	-	2.0	-

SEMESTER – II

26GCMA26	MATHEMATICS-II MULTIVARIABLE CALCULUS AND COMPLEX ANALYSIS	L	T	P	SL	C
		3	0	2	4	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 HOURS: 60 HOURS & SELF LEARNING : 60 HOURS

TEXT BOOKS:

1. Joel R. Hass, Christopher E. Heil, Maurice D. Weir, PrzemysławBogacki, 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. JitendraKumar,IITKharagpur
- Course link:https://onlinecourses.nptel.ac.in/noc26_ma39/preview

LIST OF EXPERIMENTS

Sl. No	List of 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

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	2	2	-	-	-	-	-	-	-	2
CO2	3	2	-	2	3	-	-	-	-	-	-	-	2
CO3	3	2	-	-	3	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	3	-	-	-	-	-	-	-	2
AVG	**3**	**2.2**	**2**	**2**	**2.75**							**-**	**2**

26MBME21	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS SCIENCES	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	Fundamentals of Electrical and Electronics Sciences LAB

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 - Kirchhoff'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 MACHINES	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 HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

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 LINKS:

1. 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	Analyze AC circuits using phasors, impedance concepts and power parameters under sinusoidal steady-state conditions.	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

COURSE ARTICULATION MATRIX

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

26ABME21	TECHNICAL ENGLISH	L	T	P	SL	C
		2	0	0	2	2

PRE-REQUISITE	NIL	CO-REQUISITE	Technical English LAB

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 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 HOURS: 30 HOURS &SELF LEARNING : 30 HOURS

TEXT BOOKS:

1. BikramjitSen, DrGurpreet Singh Saund, Communicative English Skills: An Easy Guide. N.p., Notion Press Media Pvt. Limited, 2025.
2. S. Mekala, GeethaR,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 LINKS:

- **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**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	2	2	3	2	-	-	2
CO2	-	-	-	-	-	-	-	2	3	-	-	-	2
CO3	-	-	-	-	-	-	2	3	2	-	-	-	2
CO4	-	-	-	-	-	-	2	-	3	2	-	-	2
CO5	-	-	-	-	-	-	-	-	2	2	3	-	2
AVG	-	-	-	-	-	-	**2**	**2.3**	**2.6**	**2**	**3**	-	2

26CBME21	ENGINEERING MECHANICS	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	NIL

COURSE OBJECTIVES

- To enable students to understand and apply scalar and vector representation of forces and moments in engineering systems.
- To develop competency in analyzing static equilibrium of particles and rigid bodies in two- and three-dimensional space.
- To impart fundamental knowledge of work–energy principles, friction, and their influence on equilibrium and motion.
- To introduce kinematics and dynamics of particles and rigid bodies using Newton's laws of motion.
- To strengthen analytical and problem-solving skills through engineering mechanics applications relevant to mechanical systems.

UNIT I	BASICS AND STATICS OF PARTICLES	9 HOURS

Introduction to engineering mechanics – Units and dimensions – Laws of mechanics – Force systems – Lami's theorem – Parallelogram, triangular and polygon laws of forces – Vector representation of forces and moments – Vector operations (addition, subtraction, dot product, cross product) – Coplanar and non-coplanar force systems – Resolution and composition of forces – Equilibrium of a particle in two and three dimensions – Equivalent force systems – Principle of transmissibility – Single resultant force.

UNIT II	EQUILIBRIUM OF RIGID BODIES	9 HOURS

Free body diagrams – Types of supports and reactions – Conditions of static equilibrium – Moments and couples – Moment of a force about a point and an axis – Vector and scalar representation of moments – Varignon's theorem – Equilibrium of rigid bodies in two dimensions – Equilibrium of rigid bodies in three dimensions – Engineering problem-solving applications.

UNIT III	PROPERTIES OF SURFACES AND SOLIDS	9 HOURS

Centroid and centre of gravity – First moment of area – Determination of centroids of simple plane areas (rectangle, triangle, circle) using integration – Centroids of composite sections (T, I, angle and hollow sections) using standard formulae – Second and product moments of area - Polar moment of inertia – Principal moments and principal axes of inertia – Mass moment of inertia – Mass moments of inertia of rectangular lamina by first principles – Relationship between area and mass moments of inertia.

UNIT IV	DYNAMICS OF PARTICLES	9 HOURS
Kinematics of particles – Displacement, velocity and acceleration – Rectilinear and curvilinear motion – Relative motion – Newton's laws of motion – Dynamics of particles – Work–energy principle – Impulse and momentum – Conservation laws – Impact of elastic and inelastic bodies.		
UNIT V	**FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS**	**9 HOURS**
Laws of dry (Coulomb) friction – Static and kinetic friction – Friction on inclined planes – Simple contact friction – Rolling resistance – Belt friction – Translation and rotation of rigid bodies – Velocity and acceleration relations – General plane motion of rigid bodies – Engineering applications.		

TOTAL HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

1. Beer, F. P. & Johnson, E. R., Vector Mechanics for Engineers, Vol. I – Statics & Vol. II – Dynamics, McGraw-Hill,2024.
2. Rajasekaran, S. &Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House,2023.
3.

REFERENCE BOOKS:

1. Hibbeler, R. C., Engineering Mechanics – Statics and Dynamics, Pearson Education, 2023.
2. Palanichamy, M. S. &Nagam, S., Engineering Mechanics, Tata McGraw-Hill,2021.
3. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, Pearson Education,2020.
4. Ashok Gupta, Interactive Engineering Mechanics – Statics, Pearson Education, 2021.

WEB LINKS:

1. https://www.youtube.com/watch?v=A-3W1EbQ13k&t=2s
2. https://www.youtube.com/watch?v=ljDIIMvx-eg
3. https://www.youtube.com/watch?v=UsMyQ7yPHk8&t=1s
4. https://www.youtube.com/watch?v=74pm8A0RJ-0
5. https://www.youtube.com/watch?v=tJw_-gx-i-0&t=1s

NPTEL LINKS:

- https://nptel.ac.in/courses/112106286

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply principles of force, displacement, velocity and acceleration to solve engineering mechanics problem	**K3**
CO2	Analyze equilibrium conditions of rigid bodies in two- and three-dimensional space	**K4**
CO3	Determine centroids, areas, volumes and moments of inertia of surfaces and solids	**K3**
CO4	Apply laws of motion, work–energy, impulse and momentum principles to particle dynamics	**K3**
CO5	Analyze frictional effects and basic rigid body motion in engineering applications	**K4**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	–	2	–	–	–	–	–	3	3	–
CO2	3	2	2	–	2	–	-	–	–	–	-	3	–
CO3	3	2	2	–	-	–	–	–	–	–	-	3	–
CO4	3	-	2	2	-	–	–	–	–	–	2	3	–
CO5	2	2	2	2	-	–	–	–	–	–	2	3	–
AVG	**2.8**	**2**	**2**	**2**	**2**	–	–	–	–	–	**2.3**	**3**	–

26MBCE22	COMPUTER PROGRAMMING USING C AND C++	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	Computer Programming using C and C++ LAB

COURSE OBJECTIVES

- To impart fundamental knowledge of structured programming concepts and problem-solving techniques using the C programming language.
- To develop programming proficiency in arrays, functions, pointers, structures, and file handling for designing efficient computational solutions.
- To build competency in object-oriented programming concepts using C++ for developing modular, reusable, and scalable applications.

UNIT I	FUNDAMENTALS OF C PROGRAMMING	9 HOURS

Introduction to programming paradigms – Overview and applications of C – Structure of a C program – Algorithm and flowchart basics – Data types, variables, constants, and keywords – Operators and expressions – Operator precedence and associativity – Input/Output statements – Conditional statements (if, if-else, nested if) – Switch statement – Looping statements (for, while, do-while) – Preprocessor directives – Compilation and execution process.

UNIT II	ARRAYS, STRINGS, AND FUNCTIONS IN C	9 HOURS

Arrays: Declaration, initialization, one-dimensional and two-dimensional arrays – String handling: basic operations (length, copy, concatenate, compare) – Introduction to functions: function prototype, definition, function call – Parameter passing (pass by value) – Recursion (basic concepts and examples) – Simple algorithms: linear search, selection sort.

UNIT III	POINTERS AND USER-DEFINED DATA TYPES IN C	9 HOURS

Pointers: Declaration, initialization, pointer operators, pointer arithmetic – Arrays and pointers – Passing parameters by reference – Structures: declaration, initialization, nested structures, array of structures – Union and typedef – Storage classes and scope – FILE PROCESSING: Files – Types of file processing: Sequential access, Random access – Sequential access file – Random access file – Command line arguments.

UNIT IV	INTRODUCTION TO C++ AND OBJECT-ORIENTED PROGRAMMING	9 HOURS

Transition from C to C++ – Basic structure of C++ program – Input/Output using cin and cout – Introduction to Object-Oriented Programming concepts – Classes and objects – Access specifiers (public, private, protected) – Constructors and destructors (default and parameterized) – Basic

examples.		
UNIT V	**OBJECT-ORIENTED FEATURES AND FILE HANDLING IN C++**	**9 HOURS**
Inheritance: single and multilevel inheritance – Function overloading– Introduction to polymorphism – Virtual functions and abstract classes – Exception handling (try, catch, throw) – File handling in C++: file streams, reading and writing text files – Basic introduction to templates.		

TOTAL HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

1. Balagurusamy, E., Programming in ANSI C, 9th Edition, McGraw Hill Education (India) Pvt. Ltd., 2024.
2. Kanetkar, Y.P., Let Us C, 20th Edition, BPB Publications, 2022.
3. Lippman, S.B., Lajoie, J., Moo, B.E., C++ Primer, 6th Edition, Addison-Wesley / Pearson, 2024.

REFERENCE BOOKS:

1. King, K.N., C Programming: A Modern Approach, 2nd Edition, W.W. Norton & Company, 2020
2. Stroustrup, B., A Tour of C++, Addison-Wesley. ISBN-10: 0-13-681648-7. 3rd Edition, 2022

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/
4. https://en.cppreference.com/w/cpp

NPTEL LINKS:

1. “Problem Solving Through Programming In C” by Prof. AnupamBasu, IIT Kharagpurhttps://nptel.ac.in/courses/106105171

2. Programming in Modern C++ By Prof. ParthaPratim Das IIT Kharagpurhttps://nptel.ac.in/courses/106105234

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Apply fundamental programming concepts, control structures, and operators to develop C programs for computational problem solving.	**K3**
CO2	Implement arrays, strings, functions, pointers, and user-defined data types in C for structured programming applications.	**K4**
CO3	Develop programs using file handling techniques and command line arguments for data processing applications.	**K4**
CO4	Design object-oriented programs using classes, objects, constructors, inheritance, and polymorphism in C++.	**K5**
CO5	Develop modular C++ applications using exception handling, virtual functions, templates, and file handling concepts.	**K5**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	3	-	-	-	-	-	-	3	-
CO2	3	–	2	–	2	-	-	-	-	-	-	3	-
CO3	3	3	3	2	-	-	-	-	-	-	-	3	-
CO4	3	3	–	–	3	-	-	-	-	-	-	3	3
CO5	3	–	3	3		-	-	-	-	-	-	3	3
AVG	**3.0**	**2.6**	**2.6**	**2.5**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	3	3

26CBME21	ENGINEERING MATERIAL SCIENCE AND TESTING	L	T	P	SL	C
		3	0	0	3	3

PRE-REQUISITE	NIL	CO-REQUISITE	NIL

COURSE OBJECTIVES

- Develop the knowledge on the structure, properties, Heat treatment, testing of various materials.
- Understands the applications of Engineering metals and non-metallic materials.
- Identify and select suitable materials for various engineering applications.

UNIT I	ALLOYS AND PHASE DIAGRAMS	9 HOURS

Constitution of alloys – Solid solutions, substitution and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast- Iron microstructure, properties and application.Examination of crystal structure by using Metallography / Materialography Machines-To study the Carbon composition of given Ferrous material.

UNIT II	HEAT TREATMENT	9 HOURS

Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening.

Experiments on Muffle Furnace for various Heat treatment processes.-Determination of Hardenability of a given specimen-Determination of Coating Thickness of a hardened surface of specimen Tempering- Improvement Mechanical properties Comparison Unhardened specimen, Quenched Specimen and Quenched and tempered specimen.

UNIT III	FERROUS AND NON-FERROUS METALS	9 HOURS

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels – HSLA, Maraging steels – Cast Iron - Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni- based super alloys and Titanium alloys. Microscopic Examination of Hardened samples and Hardened and tempered samples by using Metallurgical Microscopes Analysis of alloy composition of a given specimen using Metal Tester/Alloy Analyzer Effect of hardening- Improvement in hardness and impact resistance of steels.

UNIT IV	NON-METALLIC MATERIALS	9 HOURS

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON –Composites-

Classifications- Metal Matrix and FRP - Applications of Composites. Estimate the composition of the given specimen using Polymer/Ceramic Tester Experiments on Polariscope Strain Viewer.		
UNIT V	**MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS**	**9 HOURS**
Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test lzod and charpy, fatigue and creep failure mechanisms. Surface Testing-SEM,AFM,EDS,XRD and Residual stress Tension test on a mild steel rod-Double shear test on Mild steel and Aluminiumrods Torsion test on mild steel rod-Impact test on metal specimen-Hardness test on metals - Brinnell and Rockwell Hardness Number-Deflection test on beams-Compression test on helical springs-Strain Measurement using Rosette strain gauge-Fracture Image analyser AFM/XRD/ SEM/TEM.		

TOTAL HOURS: 45HOURS &SELF LEARNING : 45 HOURS

TEXT BOOKS:

1. Avner, S.H., “Introduction to Physical Metallurgy”, McGraw Hill Book Company,II Edition,2022.
2. Williams D Callister, “Material Science and Engineering” Wiley India Pvt. Ltd, Revised Indian Edition 2024.

REFERENCE BOOKS:

1. Raghavan. V, “Materials Science and Engineering”, Prentice Hall of India Pvt. Ltd., 6th Edition,2025.
2. Kenneth G. Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hallof India Private Limited, 4th Indian Reprint, 2020.
3. Upadhyay. G.S. and Anish Upadhyay, “Materials Science and Engineering”, Viva Books Pvt. Ltd., New Delhi, 2022.
4. U.C. Jindal: Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2023.

WEB LINKS:

1. https://www.digimat.in/nptel/courses/video/113107078/L01.html
2. https://www.digimat.in/nptel/courses/video/113102080/L43.html

NPTEL LINKS:

1. https://nptel.ac.in/courses/113102080

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Understand the constitutions of alloys phase diagram, Iron-Iron carbon diagram and steel classification	**K2**
CO2	Analyze isothermal transformation, continuous cooling diagrams and different heat treatment processes	**K4**
CO3	Evaluate the role of alloying elements in modifying the properties of ferrous and non-ferrous metals	**K5**
CO4	Explain the properties and applications of non-metallic materials.	**K2**
CO5	Test the mechanical properties of materials	**K3**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	–	–	–	–	–	2	–	2	–
CO2	2	2	2	2	–	–	–	–	–	2	–	2	–
CO3	3	2	2	2	–	–	–	–	–	3	–	3	–
CO4	3	2	2	2	–	–	–	–	–	3	–	2	–
CO5	3	2	2	2	–	–	–	–	–	2	–	2	–
AVG	**2.8**	**2**	**2**	**2**	–	–	–	–	–	2.4	–	**2.2**	–

26MBCE23	COMPUTER PROGRAMMING USING C AND C++ LAB	L	T	P	SL	C
		0	0	3	3	1.5

PRE-REQUISITE	Computer Programming using C and C++	CO-REQUISITE	NIL

COURSE OBJECTIVES

- To develop fundamental programming skills using structured programming concepts and problem-solving techniques.
- To apply control structures, arrays, functions, pointers, and user-defined data types for solving computational problems effectively.
- To implement modular programming and file handling concepts for developing efficient software applications.

LIST OF EXPERIMENTS

Fundamentals of Programming using C

1. Introduction to programming environment and execution of simple C programs.
2. Solving basic problems using arithmetic expressions and operators.
3. Implementation of decision-making using conditional statements.
4. Development of programs using looping constructs.
5. Operations on one-dimensional arrays.
6. Solving problems using two-dimensional arrays (matrices).

Functions, Strings, Pointers, and File Processing in C

7. Design and implementation of user-defined functions.
8. Implementation of recursive techniques.
9. Basic string handling operations.
10. Applications of pointers and structures.
11. Implementation of file handling operations including sequential and random access.
12. Development of simple searching and sorting algorithms.

Fundamentals of Object-Oriented Programming using C++

13. Introduction to C++ programming environment and execution of simple programs.
14. Solving basic problems using arithmetic expressions in C++.
15. Implementation of classes and objects.

16. Demonstration of constructors, destructors, and function overloading.
17. Development of programs using inheritance concepts.
18. Exception handling using try, catch, and throw blocks.

TOTAL HOURS: 30 HOURS &SELF LEARNING : 30 HOURS

TEXT BOOKS:

1. Programming in ANSI C – E. Balagurusamy, 8th Edition, McGraw Hill Education (India) Pvt. Ltd, 2022
2. 2.Object Oriented Programming with C++ – E. Balagurusamy, 8th Edition, McGraw Hill.2022

REFERENCE BOOKS:

1. Stroustrup, B., A Tour of C++, Addison-Wesley. ISBN-10: 0-13-681648-7. 3rd Edition, 2022 2.C: The Complete Reference – Herbert Schildt, 4th Edition, McGraw Hill ,2000
2. 3. C++ Primer – Stanley B. Lippman, JoséeLajoie, Barbara E. Moo, 5th Edition, Pearson Education, 2012

WEB LINKS:

1. Learn-C.org - Learn C - Free Interactive C TutorialLearn 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/
4. https://en.cppreference.com/w/cpp

NPTEL LINKS:

1. "Problem Solving Through Programming In C" by Prof. Anupam Basu, IIT Kharagpurhttps://nptel.ac.in/courses/106105171
2. Programming in Modern C++ By Prof. Partha Pratim Das IIT Kharagpurhttps://nptel.ac.in/courses/106105234

COURSE OUTCOMES

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

COURSE OUTCOMES	DESCRIPTION	KNOWLEDGE LEVEL
CO1	Design structured C programs using operators, control statements, arrays, and functions for problem solving.	**K4**
CO2	Develop C programs using pointers, structures, recursion, and file handling techniques for efficient data processing.	**K5**
CO3	Evaluate searching, sorting, and string handling techniques using structured programming concepts.	**K5**
CO4	Design object-oriented programs using classes, objects, constructors, inheritance, and polymorphism in C++.	**K5**
CO5	Develop modular C++ applications using exception handling and file processing concepts.	**K5**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	–	3	-	-	-	-	-	-	2	-
CO2	3	3	3	–	–	-	-	-	-	-	-	2	-
CO3	3	2	-	2	2	-	-	-	-	-	-	2	-
CO4	3	2	3	-	-	-	-	-	-	-	-	2	-
CO5	3	3	-	3	3	-	-	-	-	-	-	2	-
AVG	**3**	**2.6**	**2.6**	**2.5**	**2.6**	-	-	-	-	-	-	**2**	-

26ABME22	TECHNICAL ENGLISH LAB	L	T	P	SL	C
		0	0	3	3	1.5

PRE-REQUISITE	Technical English	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

13. Introduction to English sounds
14. Consonants and vowels
15. Syllable and Stress
16. Intonation
17. Communication Skills
18. Summarizing
19. Report Writing
20. Information Transfer
21. Presentation Skills
22. Group Discussion
23. Letter Writing
24. Cover letter and Resume

TOTAL HOURS: 30 HOURS &SELF LEARNING : 30 HOURS

TEXT BOOKS:

1. M. Ashraf Rizvi, “Effective Technical Communication”, Tata McGraw-Hill Publishing Company Limited, New Delhi.2005.
2. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
4. 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.	**K5**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	2	-	2	-	2
CO2	-	-	-	-	-	-	-	-	3	2	-	-	2
CO3	-	-	-	-	-	-	-	-	2	-	-	-	2
CO4	-	-	-	-	-	-	-	3	-	2	-	-	2
CO5	-	-	-	-	-	-	-	3	-	2	-	-	2
AVG	-	-	-	-	-	-	-	3	2.3	2	2	-	2

26MBCE24	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS SCIENCES LAB	L	T	P	SL	C
		0	0	3	3	1.5
PRE-REQUISITE	Fundamentals of Electrical and Electronics Science	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. Swinburne's test

TOTAL HOURS: 30 HOURS & SELF LEARNING : 30 HOURS

TEXT BOOKS:

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

REFERENCE BOOKS:

3. E. Hughes, Electrical and Electronic Technology, 12th Edition, Pearson Education, 2023.

4. Schaum's Outline Series, Basic Electrical Engineering, 3rd Edition, McGraw Hill, 2024.

5. 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**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	3	2	-	-	-	-	-	-	2	-
CO2	3	3	-	3	2	-	-	-	-	-	-	2	-
CO3	3	2	-	3	2	-	-	-	-	-	-	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	-	-	3	3	-	-	-	-	-	-	3	-
AVG	**2.8**	**2.5**	**-**	**3**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**-**

26SBME21	IDEA LAB	L	T	P	SL	C
		0	0	3	3	0

PRE-REQUISITE	NO	CO-REQUISITE	NIL

COURSE OBJECTIVES

- To provide practical exposure to modern fabrication 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 HOURS: 30 HOURS &SELF LEARNING : 30 HOURS

TEXT BOOKS:

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	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**

COURSE ARTICULATION MATRIX

CO - PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	–	–	–	3	–	–	–	–	–	–	2	–
CO2	2	3	3	–	2	–	–	–	–	2	–	3	3
CO3	3	2	3	–	3	–	–	–	–	2	–	3	2
CO4	2	3	3	–	3	–	–	–	–	2	–	2	3
CO5	2	3	3	–	2	–	–	–	–	2	–	2	–
AVG	**2.2**	**2.7**	**3**	**–**	**2.6**	**–**	**–**	**–**	**–**	**2**	–	**2.4**	**2.6**