

Mahatma Education Society's

Pillai College of Engineering

(Autonomous)

Affiliated to University of Mumbai

Dr. K. M. Vasudevan Pillai's Campus, Sector 16, New Panvel – 410 206.



Department of Computer Engineering

Syllabus

of

B.Tech. in Computer Engineering

for

The Admission Batch of AY 2024-25

First Year - Effective from Academic Year **2024-25**

Second Year - Effective from Academic Year **2025-26**

Third Year - Effective from Academic Year **2026-27**

Fourth Year - Effective from Academic Year **2027-28**

as per

Choice Based Credit and Grading System

Mahatma Education Society's

Pillai College of Engineering

Vision

Pillai College of Engineering (PCE) will admit, educate and train a diverse population of students who are academically prepared to benefit from the Institute's infrastructure and faculty experience, to become responsible professionals or entrepreneurs in a technical arena. It will further attract, develop and retain, dedicated, excellent teachers, scholars and professionals from diverse backgrounds whose work gives them knowledge beyond the classroom and who are committed to making a significant difference in the lives of their students and the community.

Mission

To develop professional engineers with respect for the environment and make them responsible citizens in technological development both from an Indian and global perspective. This objective is fulfilled through quality education, practical training and interaction with industries and social organizations.



Dr. K. M. Vasudevan Pillai's Campus , Sector - 16, New Panvel – 410 206

Department of Computer Engineering

Vision

To evolve as a centre of academic excellence and to adapt itself to the rapid advancements in the Computer Engineering field.

Mission

To produce highly qualified, well rounded and motivated graduates who can meet new technical challenges, contribute effectively as team members and be innovators in computer hardware, software, design and application. To pursue creative research and new technologies in computer engineering and across disciplines in order to serve the needs of industry, government, society and the scientific community. To inculcate strong ethical values and responsibility towards society.

Program Educational Objectives (PEOs):

- I. Our graduates will have knowledge, skills and attitude that will allow them to contribute significantly to the research and the discovery of new knowledge and methods in computing and enable them to communicate effectively and work in a team.
- II. Our graduates will function ethically and responsibly, and will remain informed and involved as full participants in our profession and our society. Our graduates will successfully function in multi-disciplinary teams.
- III. Our graduates will apply the basic principles and practices of engineering in the computing domain to the benefit of society and to pursue lifelong learning and professional developments.
- IV. Our graduates will use theoretical and technical computer science knowledge to specify requirements, develop a design, and implement and verify a solution for computing systems of different levels of complexity.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes:

Engineering Graduates will be able to:

1. Engineering knowledge:
Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. Problem analysis:
Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. Design/development of solutions:
Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. Conduct investigations of complex problems:
Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid

- conclusions. (WK8).
5. Engineering Tool Usage:
Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
 6. The engineer and The World:
Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
 7. Ethics:
Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
 8. Individual and Collaborative Team work:
Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
 9. Communication:
Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
 10. Project management and finance:
Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
 11. Life-long learning:
Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs):

1. To analyze, design and develop computer programs using appropriate hardware, software and mathematical models in the areas related to algorithms, system software, multimedia, mobile and web technology, data storage and computing, and networking for efficient and secure systems.
2. To use professional engineering practices, logic and strategies for creating innovative career paths to be an entrepreneur, and an urge to pursue higher studies.
3. To Formulate and solve real life engineering problems for the public health and safety with social and environmental awareness along with ethical responsibility.

The Autonomous status of the institute has given an opportunity to design and frame the curriculum in such a way that it incorporates all the needs and requirements of recent developments in all fields within the scope of the technical education. This curriculum will help graduates to attain excellence in their respective field. The curriculum has a blend of basic and advanced courses along with provision of imparting practical knowledge to students through minor and major projects. The syllabus has been approved and passed by the Board of Studies.

Outcome based education is implemented in the academics and a very necessary step is undertaken to attain the requirements. Every course has its objectives and outcomes defined in the syllabus which are met through continuous assessment and end semester examinations. Evaluation is done on the basis of Choice Based Credit and Grading System (CBCGS). Optional courses are offered at department and institute level. Selection of electives from the same specialization makes the student eligible to attain a B. Tech. degree with respective specialization.

Every learner/student will be assessed for each course through (i) an Internal/Continuous assessment during the semester in the form of either Practical Performance, Presentation, Demonstration or written examination and (ii) End Semester Examination (ESE), in the form of either theory or viva voce or practical, as prescribed by the respective Board Studies and mentioned in the assessment scheme of the course content/syllabus. This system involves the Continuous Evaluation of students' progress Semester wise. The number of credits assigned with a course is based on the number of contact hours of instruction per week for the course. The credit allocation is available in the syllabus scheme of each semester.

The performance of a learner in a semester is indicated by a number called Semester Grade Performance Index (SGPI). The SGPI is the weighted average of the grade points obtained in all the courses by the learner during the semester. For example, if a learner passes five courses (Theory/labs./Projects/ Seminar etc.) in a semester with credits C_1 , C_2 , C_3 , C_4 and C_5 and learners grade points in these courses are G_1 , G_2 , G_3 , G_4 and G_5 respectively, then learners SGPI is equal to:

$$SGPI = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The learner's up to date assessment of the overall performance from the time s/he entered for the programme is obtained by calculating a number called the Cumulative Grade Performance Index (CGPI), in a manner similar to the calculation of SGPI. The CGPI therefore considers all the courses mentioned in the scheme of instructions and examinations, towards the minimum requirement of the degree learners have enrolled for. The CGPI at the end of this semester is calculated as,

$$CGPI = \frac{C_1G_1 + C_2G_2 + C_3G_3 + \dots + C_i * G_i + \dots + C_nG_n}{C_1 + C_2 + C_3 + \dots + C_i + \dots + C_n}$$

The Department of Computer Engineering offers a B. Tech. programme in Computer Engineering. This is an eight-semester course. The complete course is a **173 credit** course which comprises core courses and elective courses. The **department level elective courses/Program Elective courses** are distributed over 4 specializations. The specializations are:

1. Artificial Intelligence and Data Science
2. Cloud and Cyber Security
3. Computational Intelligence and Automation.
4. Human Computer Interaction.

The students also have a choice of opting for **Institute level specializations/Open electives** . These are

- 1 Entrepreneurship Development and Management
- 2 Business Management
- 3 IP Management
- 4 Bioengineering
- 5 Bio Instrumentation
- 6 Engineering Design
- 7 Sustainable Technologies
- 8 Contemporary Studies
- 9 Art and Journalism
- 10 Applied Science
- 11 Green Technologies
- 12 Maintenance Engineering
- 13 Life Skills
- 14 Environment & Safety

The credit requirement for the B.Tech. in Computer Engineering course is tabulated in Table 1.

Table 1. Credit Requirement for B.Tech in Computer Engineering

Course Type		Total Credits
BSC/ESC	Basic Science Course	18
	Engineering Science Course	18
Program Courses	Program Core Course (PCC)	53
	Program Elective Course (PEC)	20
Multidisciplinary Courses	Multidisciplinary Minor (MDM)	13
	Open Electives (OE) Other than a particular program	6
Skill Courses	Vocational and Skill Enhancement Course (VSEC)	8
Humanities Social Science and Management (HSSM)	Ability Enhancement Course (AEC-01, AEC-02)	4
	Entrepreneurship/Economics/Management Courses	4
	Indian Knowledge System (IKS)	2
	Value Education Course (VEC)	2
Experiential Learning Courses	Research Methodology	3
	Communication Engineering Project (CEP)/Field Project (FP)	3
	Project	7
	Internship/ On Job Training (OJT)	8
Liberal Learning Courses	Co-curricular Courses (CC)	4
Suggested Total Credits		173

Preface by Board of Studies in Computer Engineering

Dear Students and Teachers, we, the members of Board of Studies Computer Engineering, are very happy to present the B.Tech Computer Engineering syllabus effective from the Academic Year 2021-22 . We are sure you will find this syllabus interesting, challenging, and fulfill certain needs and expectations.

Computer Engineering is one of the most sought-after courses amongst engineering students. The syllabus needs revision in terms of preparing the student for the professional scenario relevant and suitable to cater the needs of industry in the present-day context. The syllabus focuses on providing a sound theoretical background as well as good practical exposure to students in the relevant areas. It is intended to provide a modern, industry-oriented education in Computer Engineering. It aims at producing trained professionals who can successfully become acquainted with the demands of the industry worldwide. They obtain skills and experience in up-to-date knowledge to analysis design, implementation, validation, and documentation of computer software and systems.

This syllabus is finalized through a brainstorming session attended by Heads of Department and senior faculty members of Department of Computer Engineering. The syllabus falls in line with the vision and mission of the Computer Engineering Department and various accreditation agencies by keeping an eye on the technological developments, innovations, and industry requirements.

We would like to place on record our gratitude to the faculty, students, industry experts and stakeholders for having helped us in the formulation of this syllabus.

Board of Studies in Computer Engineering

- | | |
|--|---------------------------|
| 1. Dr. Sharvari S. Govilkar | Coordinator (Chairman) |
| 2. Dr.Nilesh Marathe | Vice Chancellor's Nominee |
| 3. Dr. Dipti Durgesh Patil | AC Nominee |
| 4. Dr. Geetanjali Kale | AC Nominee |
| 5. Mr.Nikhil Mahadeshwar | Industry Expert |
| 6. Mr. Akash Deshmukh | Alumnus Nominee |
| 7. Mrs. Chaitali Metha | Subject Expert |
| 8. All faculty members of the department | Teacher |

Program Structure for First Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2024-25
Semester I

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned				
			Theory	Pract.	Theory	Pract.	Total		
MATH 101	Engineering Mathematics I	BSC	3	2	3	1	4		
PHY 101	Engineering Physics I	BSC	2	1	2	0.5	2.5		
CHEM 101	Engineering Chemistry I	BSC	2	1	2	0.5	2.5		
CE 101	C Programming	ESC	3	2	3	1	4		
ENGG 102	Basic Electrical Engineering*	ESC	3	-	3	-	3		
ENGG 103	Basic Electrical Engineering Lab*	VSEC	-	2	-	1	1		
HUM 103	Basic Workshop I	VSEC	-	2	-	1	1		
ENGG 106	Ancient Indian Engineering (IKS)	HSSM	1	2	1	1	2		
ENGG 108	Co-curricular Course I	Liberal learning	1	2	1	1	2		
Total			15	14	15	7	22		
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
MATH 101	Engineering Mathematics I	40	40	40	60	2	25	-	125
PHY 101	Engineering Physics I	30	30	30	45	2	25	-	100
CHEM 101	Engineering Chemistry I	30	30	30	45	2	25	-	100
CE 101	C Programming	40	40	40	60	2	25	25	150
ENGG 102	Basic Electrical Engineering*	40	40	40	60	2	-	-	100
ENGG 103	Basic Electrical Engineering Lab*	-	-	-	-	-	25	25	50
HUM 103	Basic Workshop I	-	-	-	-	-	50	-	50
ENGG 106	Ancient Indian Engineering (IKS)	-	-	-	20	-	-	30	50
ENGG 108	Co-curricular Course I	-	-	-	-	-	50	-	50
Total									775

*- The course can be offered in either SEM I or SEM II

Program Structure for First Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2024-25
Semester II

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned				
			Theory	Pract.	Theory	Pract.	Total		
MATH 102	Engineering Mathematics II	BSC	3	2	3	1	4		
PHY 102	Engineering Physics II	BSC	2	1	2	0.5	2.5		
CHEM 102	Engineering Chemistry II	BSC	2	1	2	0.5	2.5		
MECH 103	Engineering Mechanics and Graphics*	ESC	3	-	3	-	3		
CE 104	JAVA Programming	ESC	3	2	3	1	4		
COMM 104	Professional Communication and Ethics I	AEC	1	2	1	1	2		
ENGG 107	Basic Workshop II	VSEC	-	2	-	1	1		
MECH 104	Engineering Mechanics and Graphics Lab*	VSEC	-	2	-	1	1		
ENGG 109	Co-curricular Course II	Liberal learning	1	2	1	1	2		
Total			15	14	15	7	22		
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
MATH 102	Engineering Mathematics II	40	40	40	60	2	25	-	125
PHY 102	Engineering Physics II	30	30	30	45	2	25	-	100
CHEM 102	Engineering Chemistry II	30	30	30	45	2	25	-	100
MECH 103	Engineering Mechanics and Graphics*	40	40	40	60	2	-	-	100
CE 104	JAVA Programming	40	40	40	60	2	25	25	150
COMM 104	Professional Communication and Ethics I	20	20	20	30	1	25	-	75
ENGG 107	Basic Workshop II	-	-	-	-	-	25	25	50
MECH 104	Engineering Mechanics and Graphics Lab*	-	-	-	-	-	50	-	50
ENGG 109	Co-curricular Course II	-		-	-	-	-	50	50
Total									800

*- The course can be offered in either SEM I or SEM II

Program Structure for Second Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2025-26
Semester III

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CE 201	Engineering Mathematics III	ESC	3	-	1*	3	-	1	4
CE 202	Data structure	PCC	3	2	-	3	1	-	4
CE 203	Database Management Systems	PCC	3	2	-	3	1	-	4
CE 204	Digital Electronics	MDM	3	-	-	3	-	-	3
CE 205	Computer organization and Architecture	MDM	3	-	-	3	-	-	3
HUM201	Human Values and Social Ethics	VEC	2	-	-	2	-	-	2
CE 207	Python Programming Lab	VSEC	-	2+2#	-	-	2	-	2
Total									22
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment		Average	End Sem Exam	Exam Duration (Hrs)			
		1	2						
CE 201	Engineering Mathematics III	40	40	40	60	2	25	-	125
CE 202	Data structure	40	40	40	60	2	25	25	150
CE 203	Database Management Systems	40	40	40	60	2	25	25	150
CE 204	Digital Electronics	40	40	40	60	2	-	-	100
CE 205	Computer organization and Architecture	40	40	40	60	2	-	-	100
HUM 201	Human Values and Social Ethic	-		-	-	-	50	-	50
CE 207	Python Programming Lab	-		-	-	-	50	25	75
Total			-	200	300	-	175	75	750

* Batchwise tutorial of One hour to be conducted.

Theory class to be conducted for full class .

Program Structure for Second Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2025-26
Semester IV

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CE 208	Engineering Mathematics IV	ESC	3	-	1*	3	-	1	4
CE 209	Design and Analysis of Algorithms	PCC	3	2	-	3	1	-	4
CE 210	Operating Systems	PCC	3	2	-	3	1	-	4
CE 211	Computer Graphics and virtual reality	PCC	3	-	-	3	-	-	3
ENGG201	Entrepreneurship	HSSM	2	-	-	2	-	-	2
CE 213	Web Programming	VSEC	-	2+2#	-	-	2	-	2
MGMT290	Personal Finance Management	HSSM	2	-	-	2	-	-	2
Total									21

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
CE 208	Engineering Mathematics IV	40	40	40	60	2	25	-	125
CE 209	Design and Analysis of Algorithms	40	40	40	60	2	25	25	150
CE 210	Operating Systems	40	40	40	60	2	25	25	150
CE 211	Computer Graphics and virtual reality	40	40	40	60	2	-	-	100
ENGG201	Entrepreneurship	20	20	20	40	2	-	-	60
CE 213	Web Programming	-	-	-	-	-	50	25	75
MGMT290	Personal Finance Management	20	20	20	40	2	-	-	60
Total				200	320	-	125	75	720

* Batchwise tutorial of One hour to be conducted.

Theory class to be conducted for full class .

Program Structure for Third Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2026-27
Semester V

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CE 301	Theory of Computation	PCC	3	–	–	3	–	–	3
CE 302	Machine Learning	PCC	3	2	–	3	1	–	4
CE 303	Microprocessor	MDM	3	–	–	3	–	–	3
CE 304	Computer Network	PCC	3	2	–	3	1	–	4
COMM202	Professional Communication Skills II	AEC	2+2#		-		2	-	2
CE 3xx	Department Level Optional Course I	PEC	3	2	–	3	1	–	4
IL 3XX	ILOC-I	OE	3	–	–	3	–	–	3
Total									23
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
CE 301	Theory of Computation	40	40	40	60	2	–	–	100
CE 302	Machine Learning	40	40	40	60	2	25	25	150
CE 303	Microprocessor	40	40	40	60	2	–	–	100
CE 304	Computer Network	40	40	40	60	2	25	25	150
COMM202	Professional Communication Skills II	-	-	-	-	-	50	-	50
CE 3xx	Department Level Optional Course I	40	40	40	60	2	25	25	150
IL 3XX	ILOC-I	40	40	40	60	2	–	–	100
Total				240	360		125	75	800

* Batchwise tutorial of One hour to be conducted.

Theory class to be conducted for full class .

Specializations→	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 306	CE 307	CE 308	CE 309
Department Level Optional Course I (DLOC I)	Data Warehouse and Data Mining	Cryptography and System Security	IoT Systems and Applications	Augmented Reality and Virtual Reality

SEM V - ILOC I

SN	Specialization	Course 1 (Semester V)	
1	IP Management and Digital Business	ENGG 380	IPR and Patenting
2	Business Management	MGMT 380	E- Commerce and E-Business
3	Bio Engineering	ENGG 381	Introduction to Bioengineering
4	Bio Instrumentation	ENGG 382	Biomedical Instrumentation
5	Engineering Design	DES 380	Design of Experiments
6	Sustainable Technologies	DES 381	Design for Sustainability
7	Contemporary Studies	ECON 380	Political Science
8	Art and Journalism	VART 380	Visual Arts
9	Applied Science	PHY 380	Modern Day Sensor Physics
10	Green Technologies	ENGG 383	Energy Audit and Management
11	Maintenance Engineering	ENGG 384	Maintenance of Electronics Equipment
12	Life Skills	HMC 380	Cooking and Nutrition
13	Environment and Safety	EVS 380	Environmental Management
14	IP Management and Digital Business	ENGG 380	IPR and Patenting

Program Structure for Third Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2026-27
Semester VI

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned				
			Theory	Pract.	Theory	Pract.	Total		
CE 310	System Programming Compiler Construction	PCC	3	2	3	1	4		
CE 311	Artificial Intelligence	PCC	3	2	3	1	4		
CE 3xx	Department Level Optional Course- II	PEC	3	2	3	1	4		
CE 3xx	Department Level Optional Course- III	PEC	3	2	3	1	4		
IL 36X	Institute Level Optional Course- II	OE	2	1	3	-	3		
CE 391	Project A	ELC		6	–	3	3		
Total							22		
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
CE 310	System Programming Compiler Construction	40	40	40	60	2	25	25	150
CE 311	Artificial Intelligence	40	40	40	60	2	25	25	150
CE 3xx	Department Level Optional Course II	40	40	40	60	2	25	25	150
CE 3xx	Department Level Optional Course III	40	40	40	60	2	25	25	150
IL 36X	Institute Level Optional Course II	40	40	40	60	2	–	–	100
CE 391	Project A						25	25	50
Total				200	300		125	150	750

Specializations→	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 312	CE 313	CE 314	CE 315
Department Level Optional Course II (DLOC II)	Big Data Analysis	Network & Cloud Security	Internet of Everything	User Experience Design

Specializations→	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 316	CE 317	CE 318	CE 319
Department Level Optional Course III (DLOC III)	Natural Language Processing	Ethical Hacking and Cyber Laws	Robotics and its Applications	Human Computer Interaction

ILOC II - SEM VI

SN	Specialization	Course 2 (Semester VI)	
1	IP Management and Digital Business	MKT 380	Digital Business Management and Digital Marketing
2	Business Management	ENGG 386	Business Analytics
3	Bio Engineering	ENGG 387	Bio Mechanics
4	Bio Instrumentation	ENGG 388	Medical Image Processing
5	Engineering Design	DES 382	Product Design
6	Sustainable Technologies	DES 383	Technologies for Rural Development
7	Contemporary Studies	ECON 381	Economics
8	Art and Journalism	MMC 380	Journalism, Media and Communication studies
9	Applied Science	ENGG 389	Operation Research
10	Green Technologies	ENGG 390	Climate Informatics
11	Maintenance Engineering	ENGG 391	Maintenance of Mechanical Equipment
12	Life Skills	PE 380	Physical Education
13	Environment and Safety	ENGG 393	Vehicle Safety
14	IP Management and Digital Business	ENGG 392	Industrial Regulations and Laws

* : Learner will select one course from any of these ILOC verticals.

Program Structure for Fourth Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2027-28

Semester VII

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned				
			Theory	Pract.	Theory	Pract.	Total		
CE 401	Deep Learning	PCC	3	2	3	1	4		
CE 402	Software Engineering and Project Management	PCC	3	-	3	-	3		
CE 403	Digital Image Processing	MDM	3	2	3	1	4		
CE 4xx	Department Level Optional Course IV	PEC	3	2	3	1	4		
CE 4xx	Department Level Optional Course V	PEC	3	2	3	1	4		
CE 491	Project B	ELC	-	6	-	3	3		
Total							22		
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral / Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
CE 401	Deep Learning	40	40	40	60	2	25	25	150
CE 402	Software Engineering and Project Management	40	40	40	60	2	-	-	100
CE 403	Digital Image Processing	40	40	40	60	2	25	-	125
CE 4xx	Department Level Optional Course IV	40	40	40	60	2	25	25	150
CE 4xx	Department Level Optional Course V	40	40	40	60	2	25	25	150
CE 491	Project B						25	25	50
Total				200	300		125	100	725

Specializations→	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 404	CE 405	CE 406	CE 407
Department Level Optional Course IV (DLOC IV)	Data Science	Penetration testing and vulnerability Assessment	Embedded Systems	Mobile and Ubiquitous Computing

Specializations→	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 408	CE 409	CE 410	CE 411
Department Level Optional Course V (DLOC V)	Social Media Analytics	Digital Forensics	Computer Vision	Usability Engineering

Program Structure for Fourth Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2027-28

Semester VIII

Course Code	Course Name	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned				
			Theory	Pract.	Theory	Pract.	Total		
CE 412	Parallel and Distributed Systems	PCC	3	2	3	1	4		
ENGG 401	Research Methodology	ELC	2	2	2	1	3		
CE 493	Internship/ OJT	Experiential Learning Courses	-	16		8	8		
CE 494	Project C		-	8		4	4		
Total			6	28	6	14	19		
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
CE 412	Parallel and Distributed Systems	40	40	40	60	2	25	25	150
ENGG 401	Research Methodology	40	40	40	60	2	25	25	150
CE 493	Internship/ OJT	-	-	-	-	-	100	100	200
CE 494	Project C						50	50	100
Total				80	120		200	200	600

SEM I

Course Code	Course Name	Credits
MATH101	Engineering Mathematics I	3+1

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical/ Oral	Tutorial	Total credits
MATH 101	Engineering Mathematics - I	3	2	-	05	3	1	-	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg.					
MATH101	Engineering Mathematics- I	40	40	40	60	25	-	-	125

Course Objectives:

1. To develop the basic Mathematical skills of engineering students that are imperative for effective understanding of complex numbers, hyperbolic, and logarithmic functions in engineering subjects.
2. To understand differentiation and expansions of functions. which will serve as basic tools for specialised studies in many fields of engineering and technology.
3. To learn the partial differentiation techniques and its applications used in engineering problems.
4. To learn the applications of Matrices useful in engineering.
5. To understand the concept of complex variables, C-R equations with applications.
6. To provide hands-on experience using Matlab Software to handle Mathematical modeling.

Course Outcomes:

On successful completion of course learner/student will be able to:

1. Apply the basic concept of complex numbers and use it to solve problems in engineering.
2. Apply the concept of expansion of functions and successive differentiation in optimization problems.
3. Use the basic concepts of partial differentiation in finding the Maxima and Minima required in engineering problems.
4. Use the concept of matrices in solving the system of equations used in mathematical modeling.
5. Apply the concept of complex variables and C-R equations in many areas of research.

6. Apply the concept of numerical Methods for solving the engineering problems with the help of Matlab software.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1			1	1		1	1
CO2	3	2	1	1				1	1		1	1
CO3	3	2	1	1				1	1		1	1
CO4	3	2	1	1	1			1	1		1	1
CO5	3	2	1	1	2			1	1		1	1
CO6	3	2	1	1	2			1	1		1	1

Syllabus :

Module	Detailed Contents	Hrs	CO
1	Complex Numbers Pre-requisite: Review of Complex Numbers-Algebra of Complex Number, Cartesian, polar and exponential form of complex number.De Moivre's Theorem. 1.1. Roots of complex number 1.2. Introduction to Hyperbolic functions, Inverse Hyperbolic Functions. 1.3.. Logarithmic of Complex Number, Separation of real and Imaginary parts.	6	CO1
2	Successive Differentiation and Expansion of Function Pre-requisite :- Derivative of standard functions and Rules of derivative. 2.1 Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and problems 2.2 Taylor's Theorem (Statement only) and Taylor's series, Maclaurin's series (Statement only). Expansion of e^x , $\sin(x)$, $\cos(x)$, $\tan(x)$, $\sinh(x)$, $\cosh(x)$, $\tanh(x)$, $\log(1+x)$, $\sin^{-1}(x)$, $\cos^{-1}(x)$, $\tan^{-1}(x)$.	5	CO2
3	Partial Differentiation and Applications of Partial Differentiation. 3.1 Partial Differentiation: Function of several variables, Partial derivatives of first and higher order. Differentiation of composite function. 3.2.Euler's Theorem on Homogeneous functions with two independent variables (without proof). Deductions from Euler's Theorem. 3.3 Maxima and Minima of a function of two independent variables, Lagrange's method of undetermined multipliers with one constraint. Jacobian of two independent variables.	7	CO3

4	Matrices :- Pre-requisite: Inverse of a matrix, addition, multiplication and transpose of a matrix ,Elementary row and column transformation 5.1. Symmetric, Skew- Symmetric, Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices and properties of Matrices (Without Proof). 5.2 Rank of a Matrix using Echelon forms, reduction to normal form and PAQ form. 5.3. System of homogeneous and non –homogeneous equations, their consistency and solutions.	6	CO4
5	Complex Variables 4.1 Function $f(z)$ of complex variable, Analytic function: Necessary and sufficient conditions for $f(z)$ to be analytic, Cauchy-Riemann equations in Cartesian and Polar coordinates. 4.2 Milne-Thomson method: Determine analytic function $f(z)$ when real part(u), imaginary part(v) is given. 4.3 Introduction to Conformal mapping, Linear and Bilinear mappings, cross ratio.	7	CO5
6	Numerical Methods 6.1 Solution of system of linear algebraic equations , (1) Gauss Jacobi Iteration Method (2) Gauss Seidel Iteration Method, 6.2 Solutions of Transcendental equations (1) Bisection Method (2) Secant Method (3) Newton Raphson Method.	5	CO6

Assessment

I. Internal Assessment Test:

Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be 90 minutes.

II. End Semester Theory Examination:

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.
3. Question No: 01 will be compulsory and based on the entire syllabus wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of each module will be proportional to number of respective lecture mentioned in the syllabus.

References:

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication,
4. Matrices, Shanti Narayan, S. Chand publication.
5. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill .

Engineering Mathematics I Laboratory

General Instructions: Each student has to perform at least 6 MATLAB practical's and at least 6 assignments on the entire syllabus.

List of Matlab Programing

1. Complex Number
2. Gauss Seidel Iteration method
3. Gauss Jacobi Iteration Method
4. Bisection method
5. Secant Method
6. Newton Raphson
7. Matrices
8. Maxima and Minima
9. Taylor's series
10. Differentiation

Term Work:

The distribution of Term Work marks–

- | | | |
|------------------------------------|---|----------|
| 1. Attendance (Theory, Practicals) | : | 05 marks |
| 2. Assignments on entire syllabus | : | 10 marks |
| 3. MATLAB Practicals | : | |

Course Code	Course Name	Credits
PHY102	Engineering Physics-I	2 + 0.5

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
PHY 102	Engineering Physics-I	2	1	-	03	2	1	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
PHY 102	Engineering Physics-I	30	30	30	45	25	-	-	100

Course Objectives:

1. To impart knowledge of basic concepts in applied physics and founding principles of technology..
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.
3. To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.

Course Outcomes:

Upon successful completion of this course, the learner will be able to:

1. Explain the functioning of lasers and their various applications.
2. Explain the working principle of optical fibres and their applications especially in the field of communication
3. Understand fundamental concepts of classical optics to study Interference of light in thin films
4. Apply the knowledge of Interference of light in various applications.
5. Explain the limits of Classical Physics and apply the fundamentals of quantum mechanics to study the one dimensional motion of microscopic particles.
6. Apply the knowledge of superconductivity to Magnetic levitation.

CO/PO Mapping

CO/PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2						3		1		1
CO2	3	2	2	1				3		1		1
CO3	2	2						3		1		1
CO4	2	2						3		1		1
CO5	2	2			1			3		1		1
CO6	2	2						3		1		1

Syllabus:

Module	Details	Hours	CO
1.	Lasers: 1.1 Basic Definitions and explanation of terms: Spontaneous emission and stimulated emission; metastable state, population inversion, types of pumping, resonant cavity, Einstein's Coefficients and their derivation. 1.2. 3-level and 4-level lasing system and need for at least a 3-level system for lasing action. 1.3. Helium Neon laser: Construction, working and Energy level Diagram. 1.4. Nd: YAG laser: Construction, working and Energy level Diagram. 1.5. Various applications of Lasers	4	CO1
2.	Optical Fibres: 2.1. Working Principle and Structure 2.2. Derivation of expression for Numerical Aperture for step index fibre. Expression for Critical angle; angle of acceptance for a step Index Fibre, Fractional Index difference. 2.3. Classification of optical fibres.(SMF and MMF, SIF and GIF) 2.4. Expression for V-number and modes of propagation for a step index fibre. 2.5. Applications : Fibre optic communication system	3	CO2
3.	Interference in Thin Films: 3.1. Interference by division of amplitude and by division of wave front. 3.2. Interference in thin films of constant thickness due to reflected light: Conditions for maxima and minima	4	CO3

	3.3. Study of Wedge Shaped Film: No derivations. Only conditions for maxima and minima. 3.5. Newton's Rings: Diameter of dark and bright rings		
4.	Applications of Interference of light: 4.1: Thin Films of constant thickness: Origin of colours and estimation of absent colours in interference pattern, Conditions for refractive index and thickness for Highly reflecting and Anti-reflecting thin films on glass. 4.2: Wedge Shaped Thin Film: Relation between fringe width and wedge angle, Estimation of film thickness of a thin foil or wire. 4.8: Newton's Rings: Testing of Surface smoothness and finding wavelength of monochromatic liquid.	3	CO4
5.	Quantum Mechanics: 5.1. De Broglie wave hypothesis, properties of matter waves: wave packet, Concept of phase velocity and group velocity and their relationship. 5.2. Wave Function, its physical interpretation and salient features. 5.3. Heisenberg's Uncertainty principle and its significance (statements only) and their interpretation: momentum and position/ Numerical. 5.4. Derivation of Schrodinger's Time Dependent Wave equation and Schrodinger's Time Independent Wave Equation 5.5. Particle in a 1-D box (Expression for Energy EigenValues)	7	CO5
6.	Superconductivity: 6.1. Critical temperature, critical magnetic field of a superconductor. 6.2. Meissner Effect, Type I and Type II and high T _c superconductors 6.3. Applications of superconductors: MAGLEV	3	CO6

Assessment

I. Internal Assessment Test

Assessment consists of two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

II. End Semester Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

1. Question paper will comprises of 3 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module then part (b) will be from other than module (3))

4. Total three questions need to be solved.

References:

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
2. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
3. Fundamentals of optics by Jenkins and White, McGrawHill
4. Modern Engineering Physics – Vasudeva, S.Chand
5. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill
6. A TextBook of Engineering Physics, S. O. Pillai, New Age International Publishers.
7. Optics - Ajay Ghatak, Tata McGraw Hill
8. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication .
8. Physics for Engineers, M.R. Srinivasan, New Age International Publishers.

Engineering Physics-I Laboratory

List of Experiments:

1. Determination of angular divergence of laser beam.
2. Determination of wavelength of laser light using Diffraction grating. (Laser source)
3. Determination of Numerical Aperture of an optical fibre.
4. Study of a Fibre Optic Communication system (Demonstration only)
5. Determination of Thickness of thin paper sheet using Wedge Shaped film
6. Determination of wavelength of monochromatic source using Newton's Rings
7. Determination of Planck's constant 'h' using LEDs of different colours.
8. Determination of 'h' using KE vs. frequency plot (Simulation).
9. Determination of λ of laser light using diffraction grating (Simulation).
10. Determination of R of a plano-convex lens using Newton's rings method (Simulation).
11. Determination of thickness of a thin foil using interference in a wedge shaped film (Simulation).

Term work:

Term Work shall consist of a minimum eight experiments. The distribution of marks rubric for term work shall be as follows:

1. Laboratory work (Experiments and Journal): 10/20 marks
2. Group Project or Topic Presentation (Optional): 10 marks
3. Attendance (Theory and Practical): 05 marks

The final certification and acceptance of Term Work ensures the satisfactory performance of laboratory work and minimum passing in the Term Work.

Course Code	Course Name	Credits
CHEM103	Engineering Chemistry I	2+0.5

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
CHEM 103	Engineering Chemistry I	2	1	-	03	2	1	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
CHEM 103	Engineering Chemistry I	30	30	30	45	25	-	-	100

Course objectives

1. To appreciate the need and importance of engineering chemistry in the industry and Engineering field.
2. To include the importance of water in industrial usage.
3. To provide the knowledge of lubrication aspects of machine components.
4. To enable the understanding of the role of engineering polymeric materials.
5. To introduce advanced engineering materials and their applications.
6. To provide an understanding of the fundamental chemical processes that cause environmental problems.

Course outcomes:

Students will be able to:

1. To analyse the quality of water for application in industries and to suggest methods to improve it.

2. To acquire knowledge on physical / chemical / biological characteristics of water and the treatment technique for sewage.
3. To select various lubricants for different industrial applications.
4. To identify various polymeric materials and understand their properties and applications in engineering.
5. To introduce and understand the basics of advanced engineering materials and their applications.
6. To develop an understanding of the environmental challenges and suggest methods for their minimisation based on green chemistry principles.

CO-PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2						1	1	2		
CO2	2	2						3	2			
CO3	3	1						2		2		1
CO4	2	1	2	1	2			1			2	1
CO5	1	2	2	2	1						2	2
CO6	1	1	2	1	2			2			3	2

Syllabus:

Module	Detailed Contents	Hrs.	CO
1	Module 1 - Hardness of water Pre - requisites : Knowledge of sources of water, Possible impurities in water, Characteristics imparted by impurities in water. Hardness in water – Types & its units, Determination of hardness by EDTA method, numerical problems. Effects of Hard water in Industries - Boiler corrosion, Scales and Sludges, (Causes, methods of prevention) Softening of water- Ion exchange process.	5	CO1
2	Module 2 - Water Treatment Specifications for drinking water, BIS standards Domestic water treatment : Steps involved in domestic water treatment - screening, sedimentation, filtration, disinfection - chlorination, treatment with ozone. Membrane Technology for water treatment - Reverse Osmosis, Electro dialysis	3	CO2

	Sewage water treatment : BOD and COD, determination and numerical problems, Activated sludge process		
3	Module 3 - Lubricants Pre - requisites : Definition of Lubricants and Lubrication, Functions of lubricants, Mechanisms of lubrication – Thick film, Thin film and Extreme pressure Classification of lubricants - Solid (MoS_2, graphite), Semi solid (greases), Liquid (animal/vegetable oils, mineral oils, Blended oils) Lubricants for special applications- Synthetic oils Properties of lubricants and their significance - Viscosity and Viscosity Index, Flash and Fire Points, Cloud and Pour Points, Acid Number, Saponification Number, and related numerical problems.	3	CO3
4	Module 4 - Engineering Polymeric materials Prerequisite : Polymer, Monomer, Polymerization, Degree of polymerisation, Classification of polymers, Mechanism of polymerisation. Molecular weight of polymers: Average molecular weight (weight average and number average) of a polymer, Polydispersity Index, Numerical problems. Polymer crystallinity - Glass transition temperature and factors affecting T_g, Viscoelasticity. Properties of Polymers (Mechanical, Electrical and Optical) Commercially important polymers - Polyethylene, Polyvinyl acetate, Polydimethyl Siloxane , Polylactic acid Conducting polymers - Mechanism of conduction in polymers, Examples and applications.	6	CO4
5	Module 5: Advanced Engineering Materials Prerequisite : Definition and basic understanding of composite materials. Composite Materials Constitution of composite materials- Matrix and Dispersed phase Classification of composite materials - Particle reinforced composites, Fibre reinforced composites, structural composites .	4	CO5

	Advantages and Applications of composite materials Smart Materials Introduction to Smart Materials, Shape Memory Effect, Shape Memory Polymers.		
6	Module 6 - Environmental Chemistry Pre- requisites: Definition of Environment and Primary concept of environmental pollution. Pollution Management:- Causes, Effects and control measures on: Space Pollution, E-Pollution and Nuclear Pollution . Solid Waste Management. Concept of 12 principles of Green chemistry, discussion with examples (synthesis of indigo, adipic acid), numericals on atom economy.	3	CO6

Assessment

I.Internal Assessment Test

Assessment consists of two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 35% syllabus is completed. Duration of each test shall be 75 minutes.

II.End Semester Examination

In the question paper, the weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will comprise 4 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be random in nature (for example, if Q.2 has part (a) from module 3, then part (b) will be from other than module)
4. Total three questions need to be solved.

References:

1. Engineering Chemistry – P.C.Jain and Monika Jain, Dhanpat Rai Publications
2. A Textbook of Engineering Chemistry, - Shashi Chawla (DhanpatRai publications)
3. A textbook of Engineering Chemistry - S.S. Dara, S. Chand Publishing House
4. Environmental Pollution Control Engineering - C.S.Rao (New Age International)
5. Environmental Chemistry – A.K.De, New Age International

Engineering Chemistry-I Laboratory

List of Experiments:

1. Determination of Hardness in water by complexometric titration.
2. Determination of Chloride content in water Argentometric titration.
3. Determination of Acid value of lubricating oil by Acid-Base titration.
4. Determination of Viscosity Index by Redwood Viscometer.
5. Determination of Dissolved oxygen in water by Winkler's method.
6. Determination of Chemical Oxygen Demand by simulation.
7. To determine the Viscoelasticity of Silly putty by creep test.
8. Synthesis of conducting polyaniline from aniline by chemical oxidative polymerization.

Term work:

Each student has to perform a minimum of five experiments and four assignments based on the entire syllabus.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 10 marks

Assignments and Viva on modules : 10 marks

Attendance (Theory and Practical) : 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW

AY 2024-25

Course Code	Course Name	Credits
CE104	C Programming	3+1

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE104	C Programming	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE104	C Programming	40	40	40	60	25	25	-	150

Course Objectives:

The course is aimed to:

- 1.To provide exposure to problem-solving by developing algorithms and designing flowchart.
- 2.Implement the logic to solve real world problems using the C programming language.
- 3.To develop solutions using different programming concepts.
- 4.To decompose solutions into smaller units using functions.
- 5.To create different types of data-structure using structure and arrays.
- 6.Describe the dynamics of memory using a pointer.

Course Outcomes:

On successful completion of course learner/student will be able to:

- 1.Understand the basic terminology and use different data types, operators and keywords in computer programming.
- 2.Able to logically code using control statements and loops.
- 3.Design programs involving functions and recursive function.
- 4.Utilize the concept of arrays and strings to develop computer programs.
- 5.Use the concepts Structures and nested structure to design complex programs.
- 6.Use of pointers to access different user defined data types like arrays, Strings and Structures

CO-PO Mapping (3 High , 2 Medium , 1 Low												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1			2			1	1	2		2
CO2	3	2			2			1	1	2		2
CO3	3	3			2	1		1	1	2		2
CO4	3	3		1	2			1	1	2		2
CO5	3	3	2	1	2			1	1	2		2
CO6	3	3	2	1	2	1		1	1	2	-	2

Syllabus:

Module	Module	Detailed Content	Hrs.	CO
1	Fundamentals of C Programming	History of C programming language and its features 1.1 Algorithm & Flowchart : Three construct of Algorithm and flowchart: Sequence, Decision (Selection) and Repetition 1.2 Character Set, Identifiers and keywords, Data types, Constants, Variables. 1.3 Operators-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators. Expression, statements, Preprocessor, Structure of basic C program.	4	CO 1
2	Control Flow Statements	2.1 Decision making statements- if statement, if-else statement , if-else-if ladder, nested if-else, switch statement 2.2 Looping – while , do-while, for 2.3 Jump Statements- break, continue, goto, return, exit	10	CO 2
3	Functions	3.1 Introduction to Functions, declaring and defining function, calling function, passing arguments to a function, recursion and its application. 3.2 Library functions – getchar(), putchar(), gets(), puts(), Math function, Ctype functions 3.3 Storage classes in C-auto, extern, static, register.	5	CO 3
4	Arrays and Strings	4.1 Array Introduction, Declaration, Initialization, Accessing array element, One and Two-dimensional array. 4.2 Strings Introduction, String using char array, String handling functions	7	CO 4

5	Structures	5.1 Structure Introduction, Declaration, Initialization, operations on structure. 5.2 Nested structure, Array of Structure.	3	CO 5
6	Pointers	6.1 Pointer :Introduction, Definition, Pointer Variables, Referencing and Dereferencing operator, Pointer Arithmetic, Pointers to Pointers, void Pointer, 6.2 Pointers to Array and Strings, Passing Arrays to Function, Accessing structure using pointers, Array of Pointers, call by value and call by reference. 6.3 Dynamic Memory Allocation using malloc, calloc, realloc, free	7	CO 6

Assessment:

I.Internal Assessment :

Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and half hour.

II.End Semester Theory Examination:

In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

- 1.Question paper will consist of 3 questions, each carrying 20 marks.
- 2.Question number 1 will be compulsory and based on maximum contents of the syllabus
- 3.Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
- 4.Total three questions need to be solved.

References:

1. "Programming in ANSI C", by E. Balaguruswamy, Tata McGraw-Hill Education
2. "A Computer Science –Structure Programming Approaches using C ", by BehrouzForouzan , Cengage Learning
3. "Let Us C", by Yashwant Kanetkar, BPB Publication
4. "MASTERING C" by K.R.Venugopal and SudeepR.Prasad , Tata McGraw-Hill Publications.
5. "Programming Techniques through C", by M. G. Venkateshmurthy, Pearson Publication.
6. "Programming in C", by Pradeep Dey and Manas Gosh, Oxford University Press.
7. Schaum's outlines "Programming with C", by Byron S. Gottfried, Tata McGraw-Hill Publications.
8. "Basics of Computer Science", by BehrouzForouzan , Cengage Learning .

C Programming-Laboratory

List of Experiments:

1. Write a program to Input Radius and Height of Cylinder and output Volume.
2. Write a program to find the greatest among three integers using ternary operator.
3. An electric power distribution company charges its domestic customer as follows :
Consumption Units Rate of charge:

Consumption Units	Rate of charge
0 - 200	0.50 per unit
201 - 400	Rs. 100 plus 0.65 per unit excess of 200 units.
401 - 600	Rs. 230 plus 0.85 per unit excess of 400 units.
601 above	Rs. 390 plus 1.00 per unit excess of 600 units.

Program should read units consumed for a customer and calculate the total bill

4. Write a program to print $S = 1/1! - 1/3! + 1/5! - 1/7! + \dots + n$ terms
5. Write a program to print the following pattern : (Take input for the no. of lines 'N').

* * * * *	A
* * * *	A B
* * * *	A B C
* * * * *	A B C D
6. Write a Menu Driven Program to Perform Addition, Subtraction, Multiplication, and Division of any two numbers.
7. Write a program to check whether a number is an Armstrong number or not.
8. Write a Program to find factorial of number using Recursive Function.
9. Write a program to shift each element of an array to left or right as per user's choice (Known as cyclic rotation of array elements)
e.g.: Given array: 10 20 30 40 50
After rotating left: 20 30 40 50 10
After rotating right: 50 10 20 30 40"
10. WAP to find the transpose of a given square matrix of order n without using an additional matrix.
NOTE: swap $a[i][j]$ and $a[j][i]$

11. Write a program to find the reverse of a string using another string (Define a user defined function to find the length of the string).

12. Write a program using Structure to accept employee name, emp_id, date_of_joining and salary. Display the result in descending order of salary. Store data for 'N' employees.

13. Write a Program to swap two integers using call by value and call by reference method.

14. Write a program to dynamically allocate memory for the user entered size 'N' of an array, accept 'N' integers from user and find the average of these integers using function and pointer (Pass array to the function using pointer).

Practical Assessment:

A Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A.Term Work: Term Work shall consist of practical's based on the above list. Also, Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B.Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiments) + 5 Marks (Assignments) + 5 Marks (Attendance)

Course Code	Course Name	Credits
ENGG105/ENGG109	Basic Electrical Engineering/Basic Electrical Engineering Lab	3+1

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
ENGG 105	Basic Electrical Engineering	3	2	-	5	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
ENGG 105	Basic Electrical Engineering	40	40	40	60	25	-	25	150

Prerequisite: Resistance, inductance, capacitance, series and parallel connection of resistance, concept of voltage, current, power and energy and its units.

Course Objectives:

1. To provide knowledge on fundamentals of D.C. circuits.
2. To provide knowledge of D.C network theorems and its applications.
3. To impart knowledge on fundamentals of A.C. circuits
4. To impart knowledge on fundamentals of single phase A.C circuits and its applications.
5. To impart knowledge on fundamentals of 3- Φ A.C. circuits and its applications.
6. To impart knowledge on basic operation and applications of electrical machines.

Course Outcomes:

On successful completion of course learner/student will be able to

1. Apply basic concepts to analyse D.C circuits.
2. Apply various D.C network theorems to determine the circuit response/ behavior.
3. Apply basic concepts to analyse A.C waveforms.
4. Evaluate and analyse single phase A.C circuits.
5. Evaluate and analyse three phase A.C circuits.
6. Understand the constructional features and operation of electrical machines.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	1	-	1	1	1	-	1
CO2	3	2	1	1	2	1	-	1	1	1	-	1
CO3	3	2	1	1	2	1	-	1	1	1	-	1
CO4	3	2	1	1	2	1	-	1	1	1	-	1
CO5	3	1	1	1	2	1	-	1	1	1	-	1
CO6	3	1	1	1	1	1	-	1	1	1	-	1

Syllabus

Module	Detailed Contents	Hrs	CO
1	DC Circuits Series and Parallel circuits, Concept of short and open circuits, Star-delta transformation, Ideal and practical voltage and current source, Kirchhoff's laws, Mesh and Nodal analysis (super node and super mesh included), Source transformation.	6	CO 1
2	DC Theorems Linear and Nonlinear Circuit, Active and passive network, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, (Source transformation not allowed for Superposition theorem).	8	CO 2
3	AC fundamentals Generation of alternating voltages, A.C terminology, RMS and Average value, form factor, crest factor, Phasor representation of alternating quantities, addition and subtraction of alternating quantities using phasors.	3	CO 3
4	Single Phase AC Circuits AC through pure resistor, inductor and capacitor. AC through R-L , R-C and R-L-C series and parallel circuits, phasor diagrams, power and power factor, series and parallel resonance, Q-factor .	10	CO 4
5	Three Phase AC Circuits Three phase voltage and current generation, star and delta connections (balanced load only), relationship between phase and line currents and voltages, Phasor diagrams, Basic principle of wattmeter, measurement of power by two wattmeter method .	6	CO 5
6	Electrical Machines Working principle of single-phase transformer, EMF equation of a transformer, Transformation Ratio, Transformer Rating. Losses in transformer.	3	CO 6

Assessment:

I. Internal Assessment Test:

Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.

II. End Semester Examination:

1. Question paper will consist of 5 questions, each carrying 20 marks.
2. Total 3 questions need to be solved.
3. Q.1 will be compulsory, based on the entire syllabus.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module

References:

1. "Basic Electrical Engineering", by Prof. B. R. Patil, Oxford Higher Education
2. "Basic Electrical Engineering (BEE)", by Prof. Ravish Singh", McGraw Hill Education
3. B.L. Theraja "Electrical Technology" Vol-I and II, S. Chand Publications, 23 rd ed. 2003.
4. Joseph A Edminister, "Schaum"s outline of theory and problems of electric circuits" Tata McGraw Hill, 2 nd edition
5. D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.

Basic Electrical Engineering Laboratory

Hardware/Software Requirements: Hardware kits, MATLAB Simulink, TINA software and V-Lab.

List of Experiments:

1. To learn and verify Mesh analysis using hardware kits.
2. To understand and verify Nodal analysis using hardware kits.
3. To study Superposition theorem and its Implementation using MATLAB Simulink.
4. To verify Thevenin's theorem by using TINA software.
5. To verify Norton's theorem by using TINA software.
6. To understand the operation of Series R-L circuit using TINA software
7. To understand the operation of a series R-L-C resonant circuit using TINA software.
8. Power measurement in three phase system by two wattmeter method using V-Labs

Lab Assessment:

I. Term work Assessment:

Term work consists of performing minimum 08 practical's. Final certification and acceptance of the term work ensures satisfactory performance of laboratory work.

The distribution of Term Work marks will be as follows:

Attendance (Theory, Practicals) : 5 marks

Assignment on entire syllabus : 10 marks

Practicals : 10 marks

II. Oral/Viva Assessment:

The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work. Practical and Oral exam will be based on the entire syllabus

Course Code	Course Name	Credits
ENGG111	Basic Workshop Practice I	1

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned				
		Theor y	Pract.	Tut.	Theory	Tu t.	Pract.	Total	
ENGG111	Basic Workshop -I	- -	2	- -	- -	--	1	1	
Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract./o ral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test 1	Test 2	Avg.					
ENGG111	Basic Workshop -I	--	--	- -	--	--	5 0	--	50

Course Objectives:

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labor.
3. To get exposure to interdisciplinary engineering domain.

Course Outcomes: Learners will be able to...

1. Develop the necessary skill required to handle/use different fitting tools.
2. Develop skills required for hardware maintenance.
3. Able to install an operating system and system drives.
4. Able to identify the network components and perform basic networking and crimping.
5. Able to prepare the edges of jobs and do simple arc welding.
6. Develop the necessary skill required to handle/use different plumbing tools.
7. Demonstrate the turning operation with the help of a simple job.

Trade	Detailed Content	H rs.
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Note: Trade 1 and 2 are compulsory. Select any one trade topic out of the topic at trade 3 to 5. Demonstrations and hands on experience to be provided during the periods allotted for the same. Report on the demonstration including suitable sketches is also to be included in the term work. CO-1 is related to Trade-1. CO-2 to CO-4 is related to Trade-2. CO-5 is related to Trade-3. CO-6 is related to Trade-4. CO-7 is related to Trade-5. CO evaluation is to be done according to the opted Trades in addition to Compulsory Trades. Students Can select any one trade topics out of the topic at trade 3 to 5. Demonstrations and hands on experience to be provided during the periods allotted for the same.			CO
Trade-1	Fitting (Compulsory): Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling. Term work to include one job involving following operations : filing to size, one simple male- female joint & drilling.	08	CO 1
Trade-2	Hardware and Networking: (Compulsory) Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc. · Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one) · Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping. NOTE: Hands on experience to be given in a group of not more than four students.	08	CO 2,3, 4
Trade-3	*Welding: Edge preparation for welding jobs. Arc welding for different jobs like, Lap welding of two plates, butt welding of plates with simple cover, arc welding to join plates at right angles.	04	CO 5
Trade- 4	*Plumbing: Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic line involving fixing of a water tap and use of coupling, elbow, tee, and union etc.	04	CO 6
Trade-5	*Machine Shop: At least one turning job is to be demonstrated and a simple job to be made for Term Work in a group of 4 students.	04	CO 7

Total Hours = 8+8+4=20.* One Optional trade can be chosen out of 3,4 and 5

Workshop Assessment

Internal Assessment: 50

Marks Term Work:

1. All the jobs mentioned above.
2. Complete Work-Shop Book giving details of drawing of the job and time sheet. The distribution of marks for Term work shall be as follows:

Job Work: 30 Marks

Workshop book: 10
marks

Attendance: 10 marks

Course Code	Course Name	Credits
HUM113	Indian Knowledge System	2

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical/ Oral	Tutorial	Total credits
HUM113	Indian Knowledge System	01	02	-	03	01	01	-	02

Course Code	Course Name	Examination Scheme				
		Theory Marks	Term Work	Practical	Oral	Total
		End Semester . Exam				
HUM113	Ancient Indian Engineering	20	-	30	-	50

Course Objectives:

1. Creating awareness amongst the youths about the true history and rich culture of the country;
2. Understanding the scientific value of the traditional knowledge of Bhārata;
3. Promoting the youths to do research in the various fields of the Bhāratīya knowledge system;
4. Converting the Bhāratīya wisdom into the applied aspect of the modern scientific paradigm;
5. Adding career, professional, and business opportunities to the youths.

Course Outcomes: Having completed this course, the learner will be able to

1. Understand the importance of ancient Indian knowledge and its historical background.
2. Become familiar with Yoga and Ayurveda as a pathway to self-knowledge and transformation
3. Learn to appreciate the origin and development of science and technology and maths practices from ancient to current times
4. Awareness of the strong foundation of foreign policy, dharmashastra based on Arthashastra.
5. Enable the student to appreciate the ancient architecture and knowledge of construction

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1				1	2	2	1	2
CO2		1				1	1	2	2	2	1	2
CO3	1	1	1	1		1	1	1	2	2	1	1
CO4		1				1	1	1	2	2	1	2
CO5	1	1	1			1	1	1	2	2	1	2

Syllabus :

Module	Detailed Contents	Hrs.	CO
1	Indian Knowledge Systems: An Overview 1.1 Introduction to IKS: Characteristic Features of Indian Knowledge System 1.2 The Purpose of IKS: Macaulay's Education Policy and its impact, Need of revisiting Ancient Indian traditions 1.3 Scope of IKS: Development from Earliest times to 18th Century CE 1.4 Tradition of IKS - Ancient Indian Education System: Home, Gurukul, Pathashala and ancient Education centres	4	CO1

2	Indian Health Science 2.1 Basic Concepts of Ayurveda and holistic health care: Concept of ayurveda, six pillars of ayurveda, food system and ayurveda 2.2 Definition, origin and types of yoga	2+2	CO2
3	Science and Technology, Mathematics 3.1 Vedic references to different branches of science, metallurgy in ancient India, role of science and technology for development of a country 3.2 Ancient practices for sustainable development 3.3 Indian Astronomy and Weather Science 3.4 Indian Mathematics: Introduction and Overview, Mathematics in Vedas, Sulva Sutras and Jain texts	6	CO3
4.	Art of Governance (Arthashastra)- Administration, Foreign Policy, Finance /Tax, King's Qualities	02+ 02+ 02	CO4
5	Indian architecture and Town planning 5.1 The importance of Sthapatya-Veda 5.2 The ancient cities of the Indus -Saraswati region 5.3 Architecture: Town Planning and drainage systems, Temple Architecture	4	CO5

Assessment

End Semester Examination:

1. Written Examination for 20 marks
2. Weightage of each module will be proportional to the number of respective lectures mentioned in the syllabus.

Practical:

Project and Presentation for 30 marks based on the syllabus

References:

1. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).
2. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).
3. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).
4. An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India).
5. Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A K Singh; 2005 (D.K. Print World Ltd).

Course Code	Course Name	Credits
ENGG114	Co-curricular Course-I	2

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical/Oral	Tutorial	Total credits
ENGG114	Co-curricular Course-I	01	02	-	03	01	01	-	02

Course Code	Course Name	Examination Scheme				
		Theory Marks	Term Work	Practical	Oral	Total
		End Semester . Exam				
ENGG114	Co-curricular Course-I		50	-	-	50

Sr No.	Name of Activity	Number of Hours
1	Meditation	3
2	Makers Day	4
3	Pre-Placement Talk	2

4	NPTEL Course	5
5	Any other Activity (Value Added course, Internship etc.)	12

Activity 1 - Meditation

Every student has to attend 3 sessions of Meditation activity. Each session will fetch 1 point. A student can score a maximum of 3 points. Their presence and participation in the activity will be certified by the faculty in charge.

Activity 2 - Makers Day

MAKERS DAY gives the spirit of hands-on learning by providing opportunities to explore various engineering-oriented projects from various domains of engineering. This will provide a chance to create new ideas and gain practical experience that goes beyond traditional classroom learning.

A visit to all the assigned laboratories, the students can score a maximum of 2 points. Their presence and participation in the activity will be certified by the faculty in charge.

Activity 3- Pre placement talk

Pre placement talk is scheduled for all the students, branch wise, where the students will be able to understand the aspects that they need to improve, criteria for the placement etc.

All the students have to attend the pre placement talk and will gain 2 points. Their presence and participation in the activity will be certified by the faculty in charge.

Activity 4 - NPTEL course

The students have to get enrolled in one NPTEL course related to their subjects.

On completing and submitting all the assignments, the students will get 2 points (they need to attach the summary of assignment to gain these points).

If the student has attended the examination, he /she will be given 5 points. Extra 3 points are also allotted on passing the course . If the student gets an ELITE grade, he/she will be given 5 extra points (They need to attach the certificate)

Activity 5 - Value added Course, Internship etc

The student can complete one value added course and can gain maximum 10 points , depending on the course duration.

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SEMESTER II

Course Code	Course Name	Credits
MATH115	Engineering Mathematics II	3+1

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
MATH 115	Engineering Mathematics - II	3	2	-	05	3	1	-	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
MATH 115	Engineering Mathematics- II	40	40	40	60	25	-	-	125

Course Objectives:

1. To develop the basic mathematical skills of differential equations of engineering students.
2. To understand the linear differential equation with constant coefficients used in mathematical modeling.
3. To acquaint the students with the Beta and Gamma functions
4. To learn different techniques to solve double integrations.
5. To learn the applications of integration in solving complex engineering problems.
6. To provide knowledge of numerical techniques using MATLAB software to handle Mathematical modeling.

Course Outcomes:-

On successful completion of course learner/student will be able to:

1. Apply the basic concept of linear differential equations to solve problems in engineering.
2. Apply the basic concept of applications of LDE with constant coefficient in mathematical modeling to solve real life problems.
3. Apply the basic concepts of beta and gamma functions to solve engineering problems.
4. Apply the concept of double integration in solving problems of engineering and technology.
5. Apply the concept of double integrations to find areas.
6. Apply the concept of differentiation and integration numerically for solving the engineering problems with the help of MATLAB software.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2			1	1		1	1
CO2	3	2	1	1	2			1	1		1	1
CO3	3	2	1	1				1	1		1	1
CO4	3	2	1	1				1	1		1	1
CO5	3	2	1	1	1			1	1		1	1
CO6	3	2	1	1	2			1	1		1	1

Syllabus:

Module	Detailed Contents	Hrs	CO
1	Differential Equations of First Order and First Degree: 1.1 Exact Differential Equations, Equations reducible to exact form by using integrating factors. 1.2 Linear differential equations, Equations reducible to linear form.	6	CO1
2	Linear Differential Equations With Constant Coefficients and Variable coefficients of higher order: 2.1. Linear Differential Equation with constant coefficient-complementary function, particular integrals of differential equation of the type $f(D)y = X$ where X is e^{ax} , $\sin(ax + b)$, $\cos(ax + b)$, x^n , $e^{ax}V$. 2.2. Cauchy Differential equation, 2.3 Method of variation of parameters two variables	8	CO2
3	Beta and Gamma Function, 3.1 Gamma Functions and its properties. 3.2 Beta Functions and its properties.	4	CO3
4	Double Integration: 4.1. Tracing of curves, Double integration- Evaluation of Double Integrals.(Cartesian & Polar),Change of order of Integration and evaluation 4.2. Evaluation of integrals over the given region.(Cartesian & Polar) 4.3. Evaluation of double integrals by changing to polar coordinates.	8	CO4
5	Applications of integration :- 5.1. Application of double integrals to compute Area 5.2. Triple integration: Evaluation only (Cartesian, cylindrical and spherical polar coordinates)	4	CO5

6	Numerical Techniques:- 6.1. Numerical solution of ordinary differential equation (a) Euler's method (b) Modified Euler method, (c) Runge-Kutta fourth order method 6.2. Numerical integration- (a) Trapezoidal (b) Simpson's 1/3rd (c) Simpson's 3/8th rule	6	CO6
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Assessment

I. Internal Assessment Test:

Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be 90 minutes.

II. End Semester Theory Examination:

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.
3. Question No: 01 will be compulsory and based on the entire syllabus wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of each module will be proportional to number of respective lecture mentioned in the syllabus.

References:

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication,
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill .

Engineering Mathematics II Laboratory

General Instructions: Each student has to perform at least 6 MATLAB practical's and at least 6 assignments on the entire syllabus.

List of Matlab Programing

1. Euler's Method
2. Euler's Modified Method
3. Runge Kutta Fourth Order
4. Trapezoidal Rule
5. Simpson's 1/3rd Rule
6. Simpson's 3/8th Rule
7. Differential Equations
8. Integration.
9. Graphical representation of Functions
10. Graphical representation of intersection of two curves

Term Work:

The distribution of Term Work marks—

- | | | |
|------------------------------------|---|----------|
| 1. Attendance (Theory, Practicals) | : | 05 marks |
| 2. Assignments on entire syllabus | : | 10 marks |
| 3. MATLAB Practicals | : | 10 marks |

Course Code	Course Name	Credits
PHY116	Engineering Physics-II	2+0.5

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
PHY 116	Engineering Physics-II	2	1	-	03	2	0.5	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
PHY 116	Engineering Physics-II	30	30	30	45	25	-	-	100

Course Objectives:

1. To impart knowledge of basic concepts in applied physics and founding principles of technology.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.
3. To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.

Course Outcomes:

Upon successful completion of this course, the learner will be able to:

1. Comprehend the basic concepts of semiconductor physics.
2. Apply the knowledge of semiconductor concepts towards the study of electronic semiconductor devices.
3. Interpret and explore basic sensing techniques for physical measurements in modern instrumentations.
4. Comprehend the concepts of electrodynamics and Maxwell's equations and their use in telecommunication systems.
5. Comprehend the various material characterisation techniques.

6. Comprehend the knowledge of Piezoelectric and Magnetostriction effect for production of ultrasonic waves and its application in various fields.

CO/PO Mapping

CO/PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2						1		1		1
CO2	3	2	2	1			1	1		1		1
CO3	2	2				1		1	1	1		1
CO4	2	2						1		1		1
CO5	2	2			1	1		1	1	1		1
CO6	2	2				1	1	1	1	1		1

Syllabus:

Module	Details	Hou rs.	CO
1.	1.Semiconductors: 1.1 Relation between Conductivity, Mobility, Current density; relation between conductivity, charge concentration, and mobility for metals and semiconductors 1.2 Splitting of energy levels for band formation in semiconductors; classification of semiconductors(doping): Intrinsic and Extrinsic; classification of semiconductors(band gap): Direct and Indirect band gap, Classification of semiconductors (composition):elemental and compound 1.3 Fermi Dirac distribution function: Calculation of energy from probability of occupancy, Fermi level in intrinsic and extrinsic semiconductors; Qualitative discussion on effect of temperature and charge concentration on the fermi levels of n-type and p-type semiconductors, Proof of position of Fermi level in midway of bandgap for an intrinsic semiconductors.	5	CO1
2.	Semiconductor Devices and Applications 2.1 Hall Effect: Derivation of expression for Hall Voltage, Hall coefficient and Hall Angle. 2.2 Applications of Hall effect. 2.3 Semiconductor Devices: I-V curves and mechanism of operation for Solar Cell, LED and Zener Diode	3	CO2

3.	Physics of Sensors: 3.1.Temperature Sensor 3.2.Pressure Transducer: Capacitive and Inductive types 3.3.Photodiode: IV characteristics and use in measurement of light intensity 3.4.Moisture sensor	4	CO3
4.	Electrodynamics: 4.1.Scalar and Vector fields, gradient, curl and divergence 4.2.Determination of Maxwell's equations for static and varying fields 4.3.Significance of Maxwell's equations and their application in Antenna design and waveguide. 4.4.Numerical Problems	5	CO4
5.	Material Characterisation Techniques 5.1 X-Ray Diffraction: Bragg's law and its application in measuring crystal lattice parameter. 5.2 SEM and TEM: Principle of operation and working using schematic diagram.	4	CO5
6.	Ultrasonics : 6.1. Ultrasonic Wave generation; Magnetostriction Oscillator; Piezoelectric Oscillator; 6.2. Applications of ultrasonic: Echo sounding; NDT; ultrasonic cleaning(cavitation); ultrasonic sensors;	3	CO6

	6.3.Industrial applications of ultrasonic(soldering, welding, cutting, drilling)		
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Assessment

I. Internal Assessment Test

Assessment consists of two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

II. End Semester Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

1. Question paper will comprises of 3 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module then part (b) will be from other than module (3)
4. Total three questions need to be solved.

References:

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
2. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
3. Fundamentals of optics by Jenkins and White, McGrawHill
4. Modern Engineering Physics – Vasudeva, S.Chand
5. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill
6. A TextBook of Engineering Physics, S. O. Pillai, New Age International Publishers.
7. Optics - Ajay Ghatak, Tata McGraw Hill8. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication.
8. Physics for Engineers, M.R. Srinivasan, New Age International Publishers.

Engineering Physics-II Laboratory

List of Experiments:

1. I-V characteristics of a solar cell and calculation of efficiency.
2. I-V characteristics of a Zener diode and its use as a voltage regulator
3. Demonstration of Hall Apparatus.
4. Use of CRO to determine: DC voltage, frequency and amplitude of AC signals.
5. I-V curves of a photodiode at various light intensities and verification of Inverse Square Law for Light Intensity.
6. Voltage vs. Temperature characteristics of a Temperature Sensor.
7. Use of Ultrasonic distance meter for determination of distance.
8. Study of characteristics of solar cell (simulation).

9. Determination of Hall Voltage and Hall Coefficient in Hall Effect (Simulation).
10. Non-destructive testing using Ultrasonic.
11. To find Fermi level of a metal (copper) and a semiconductor(thermistor)
12. To study the I-V characteristics of a solar cell and obtain the efficiency.

Term work:

Term Work shall consist of a minimum of eight experiments.

Overall Rubric for the distribution of term work marks:

1. Laboratory work (Experiments and Journal): 10/20 marks
2. Group Project or Topic Presentation (Optional): 10 marks
3. Attendance (Theory and Practical): 05 marks

The final certification and acceptance of Term Work includes the satisfactory performance of laboratory work and minimum passing marks in the Term Work.

Course Code	Course Name	Credits
CHEM117	Engineering Chemistry II	2+0.5

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
CHEM 117	Engineering Chemistry II	2	1	-	03	2	0.5	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
CHEM 117	Engineering Chemistry II	30	30	30	45	25	-	-	100

Course objectives:

1. To familiarize the students with the basic concepts of chemistry in the industry and Engineering field.
2. To understand the chemistry of various fuels and their combustion mechanism.
3. To acquire knowledge of electrochemical energy systems.
4. To introduce the underlying science of corrosion and the significance of corrosion control to protect the structures.
5. To educate the theory and applications of spectroscopic techniques.
6. To provide an introduction to and an overview over nanomaterials.

Course outcomes

Students will be able to:

1. To understand and analyze the combustion mechanisms of various fuels and introduce alternate fuels.
2. To develop knowledge on electrochemical energy systems considering the operation.
3. To acquire knowledge of the different battery technologies and understanding the basic mechanisms allowing electrochemical energy storage in batteries
4. To become familiarized with corrosion forms and their effects and to recognize and use the method of corrosion protection.
5. To describe the theoretical background of spectroscopic techniques such as NMR, IR, spectroscopy to apply them for the various fields.
6. To acquire basic knowledge of types of nanomaterials and their synthesis and specific applications.

CO-PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
CO1	1	1	3	2	1	1	2	1	2	2		2
CO2			2	1								1
CO3	1	2	2	2		1		2				2
CO4	1	1	2	2				1		2		2
CO5	1	2				1	1	1				1
CO6	2	1				2	1	2	1		1	1

Syllabus:

Module	Detailed Contents	Hrs	CO
1	Module -1 - Fuels and combustion Pre- requisites : What are fuels, Types of fuels, Characteristics of fuels. Calorific value of a fuel - HCV and LCV, Units of Calorific value, Theoretical determination of calorific value of fuel by Dulong's formula, Numerical problems Coal - Definition and Ranking, Analysis of coal - Proximate and Ultimate analysis, Numerical problem Crude oil - Classification, Fuels for Internal Combustion Engines - Knocking, Octane number, Anti Knocking agents, Cetane number.	6	CO 1

	Alternative Fuels: Biodiesel and Power Alcohol Combustion of fuels – Numerical problems for calculating the amount of air needed for the complete combustion of solid and gaseous fuels. Propellants.		
2	Module 2- Engineering Electrochemistry Prerequisite : redox reaction, cell reaction, electrode and its type, salt bridge Electrode potential, electrode reactions. Electrochemical cells, derivation of Nernst equation for cell potential, numerical problems. Reference electrodes -Types of reference electrodes, Construction, working of Glass electrode and Calomel electrode.	3	CO 2
3	Module 3- Battery Technology Battery- classification – primary, secondary and reserve batteries. Characteristics – Capacity, Electricity storage density, energy efficiency, cycle life and shelf life. Construction, working, applications and limitations of Lead acid storage battery, Modern Batteries - Lithium and Lithium ion batteries and its applications. Fuel Cells: Introduction, classification of fuel cells, limitations & advantages of fuel cells, Construction of Hydrogen oxygen alkaline fuel cells.	3	CO 3
4	Module -4- Corrosion and its Control Pre- requisites : corrosion , corrosion product, corrosive and non corrosive metals. Galvanic series and electrochemical series. Mechanism of corrosion - Chemical and Electrochemical corrosion. Types of corrosion : Galvanic corrosion, Differential aeration corrosion, Pitting corrosion, Intergranular corrosion, Waterline corrosion, Stress corrosion. Factors Affecting Corrosion Rate : - (i) Nature of metal (ii) Nature of environment. Methods of Corrosion Control : Material selection, Design, Cathodic protection	6	CO 4

	Corrosion Inhibitors Protective Coatings: Metallic coatings - anodic coating (galvanizing) and cathodic coating (Tinning) Methods of Applying Metallic Coatings - Hot dipping, Metal Spraying, Electroplating and Diffusion coating		
5	Module 5- Spectroscopic techniques Pre-requisites : Electromagnetic radiation, characteristics of electromagnetic radiation, electromagnetic spectrum. Spectroscopy - Principle, Interaction of radiation with matter, Selection rules. Classification of spectroscopy - Based on atomic or molecular level, absorption or emission, electronic or magnetic level Types of spectroscopy - IR and NMR Spectroscopy and its applications.	3	CO 5
6	Module 6 -Nanomaterials Prerequisites: Concept of nano scale, definition of nanoparticles Types of nanomaterials - Fullerenes, Carbon Nanotubes Properties of nanomaterials – Optical properties, magnetic properties, electrical properties Preparation of Nanomaterials - Top down and Bottom up approach Synthesis of Nanomaterials -Chemical vapour deposition (CVD) method and Laser Ablation Method Examples and applications of nanomaterials(Electronics, Energy, Biomedicine,Environment ,Food , Textile).	3	CO 6

Assessment

I.Internal Assessment Test

Assessment consists of two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 35% syllabus is completed. Duration of each test shall be 75 minutes.

II.End Semester Examination

In the question paper, the weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will comprise 4 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be random in nature (for example, if Q.2 has part (a) from module 3, then part (b) will be from other than module)
4. Total three questions need to be solved

References:

1. Engineering Chemistry – P.C.Jain and Monika Jain, Dhanpat Rai Publications
2. A Textbook of Engineering Chemistry, - Shashi Chawla (DhanpatRai publications)
3. A textbook of Engineering Chemistry - S.S. Dara, S. Chand Publishing House
4. Instrumental methods of Chemical Analysis - B.K.Sharma, Goel Publishing House
5. Fundamentals of Molecular Spectroscopy - C.N. Banwell, Tata Mc Graw Hill.

Engineering Chemistry-II Laboratory**List of Experiments:**

1. Determination of moisture content and ash content in coal sample by proximate analysis.
2. Preparation of bio- diesel by trans-esterification process.
3. Preparation of Fe₂O₃ nanoparticles.
4. Cu-Zn electrochemical cell- Effect of conc.on cell potential.
5. Determination of strength of a strong acid by pH meter
6. Determination of strength of a strong acid by conductivity meter
7. EMF measurement (Simulation Expt)
8. To study the rate of corrosion of metal in acidic and basic medium.

Term work:

Each student has to perform a minimum of five experiments and four assignments based on the entire syllabus.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 10 marks

Assignments and Viva on modules : 10 marks

Attendance (Theory and Practical) : 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Course Code	Course Name	Credits
MECH107/MECH110	Engineering Mechanics and Graphics/Engineering Mechanics and Graphics Lab	3+1

Course Code	Course Name	Theory	Practical	Tutorial	Total Contact Hours	Theory	Practical/ Oral	Tutorial	Total Credit
MECH 107	Engineering Mechanics and Graphics	3	2	-	5	3	1	-	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
MECH107	Engineering Mechanics and Graphics	40	40	40	60	25	25	-	150

Course Objectives:

The course is aimed

1. To develop the capacity to predict the effects of force and motion and to acquaint the concept of static and dynamic equilibrium.
2. Ability to visualise physical configurations in terms of actual systems and its constraints, and able to formulate the mathematical function of the system.
3. To study, analyse and formulate the motion of moving particles/bodies.
4. To impart and inculcate proper understanding of the theory of projection.
5. To impart the knowledge of reading a drawing and to improve the visualisation skill.
6. To teach basic utility of computer aided drafting (CAD) tools.

Course Outcomes:

On successful completion of course learner/student will be able to:

1. Illustrate the concept and M-Lab program of force, moment and apply for two dimensional systems with the help of FBD.
2. Illustrate the concept and M-Lab program of concept of equilibrium in two and three dimensional systems with the help of FBD.

3. Illustrate and M-Lab program of different types of motions and establish Kinematic relations for a particle & rigid body.
4. Analyse particles in motion using force-acceleration, work-energy and impulse momentum principles.
5. Apply the basic principles of projections in reading, visualising and converting 3D view to 2D drawing and vice versa.
6. Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.

CO PO Mapping:

CO-PO Mapping (3 High , 2 Medium , 1 Low)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1	1			1	1			1
CO2	3	3		1	1			1	1			1
CO3	3	3		1	1			1	1			1
CO4	3	3		1				1	1			1
CO5	3	3	2	1				1	1	1		1
CO6	3	3	2	1				1	1	1		1

Syllabus:

Module	Detailed Contents	Hrs.	CO
1	Basics of Calculus, Basic Trigonometric Functions and Units of physical entities. Properties of Triangle. Newton's Law of Motions, Equations of Motions and its applications. Coplanar and Non-Coplanar Force System and Resultant: 1.1 System of Coplanar Forces: Classification of force systems, Principle of transmissibility, composition and resolution of forces. 1.2 Resultant: Resultant of coplanar and non-coplanar force system (Concurrent forces, parallel forces and non-concurrent non-parallel system of forces). Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane.	06	CO1
2	2.1 Equilibrium of System of Coplanar Forces: Conditions of equilibrium for concurrent forces, parallel forces and non-concurrent non-parallel general forces and Couples. Equilibrium of rigid bodies' free body diagrams. 2.2 Equilibrium of Beams: Types of beams, simple and compound beams, type of supports and reaction. Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)	06	CO2
3	Basics of Calculus, Basic Trigonometric Functions and Units of physical entities. Area of Geometries. Newton's Law of Motions, Equations of Motions and its applications. Kinematics of Particle and Rigid Body:	06	CO3

	3.1 Kinematics of Particles: Motion of particles with variable acceleration. General curvilinear motion. Tangential and Normal component of acceleration, Motion curves (a-t, v-t, s-t curves). 3.2 Kinematics of Rigid Body: Translation, Rotation & General Plane motion of Rigid body. The concept of Instantaneous center of rotation (ICR). Location of ICR of mechanism. Velocity analysis of rigid bodies using ICR.		
4	Kinetics of a Particle: 4.1 Force and Acceleration: - Introduction to basic concepts, D'Alemberts Principle, concept of Inertia force, Equations of dynamic equilibrium, Newton's second law of motion. (Analysis limited to simple systems only.) 4.2 Work and Energy: Work Energy principle for a particle in motion. Application of Work-Energy principle to a system consists of connected masses and Springs. 4.3 Impulse and Momentum: Principle of linear impulse and momentum. Impact and collision: Law of conservation of momentum, Coefficient of Restitution. Direct Central Impact and Oblique Central Impact. Loss of Kinetic Energy in collision of inelastic bodies.	06	CO4
5	5.1 *Introduction to Engineering Graphics Principles of Engineering Graphics and their significance, usage of Drawing instruments, Types of Lines, Dimensioning Systems as per IS conventions. Introduction to plain and diagonal scales. 5.2 @Introduction to Auto CAD:- Basic Drawing and Editing Commands. Knowledge of setting up layers, Dimensioning, Hatching, plotting and Printing. 5.3 *Orthographic and Sectional Orthographic Projections: - Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S. Full or Half Sectional views of the Simple Machine parts. 5.4 @Drawing of orthographic projections using Autocad.	06	CO5
6	6.1 *Isometric Projection: Principles of Isometric projection – Isometric Scale, Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere). 6.2 @ Drawing of Isometric projections using Autocad.	06	CO6

*Will be covered during practical hours. @ Will be covered during Autocad practical hours.

Assessment:

I.Internal Assessment Test (Entirely on Engineering Mechanics):

Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be 90 minutes.

II.End Semester Theory Examination (Entirely on Engineering Mechanics):

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.

3. Question No: 01 will be compulsory and based on the entire syllabus (**Module 1-4**) wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules (**Module 1-4**).
5. Weightage of each module will be proportional to the number of respective lectures mentioned in the syllabus.

References:

1. Engineering Mechanics by Beer & Johnston, Tata McGrawHill
2. Engineering Mechanics (Statics) by Meriam and Kraige, Wiley Books
3. Engineering Mechanics (Dynamics) by Meriam and Kraige, Wiley Books
4. Engineering Mechanics by F. L. Singer, Harper & Raw Publication
5. Engineering Mechanics by Shaum Series
6. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd.
7. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.
8. M.B Shah & B.C Rana, "Engineering Drawing", Pearson Publications.
9. P.J. Shah, "Engineering Graphics", S Chand Publications.
10. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill.
11. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies) : AutoCAD 2012 (For engineers and Designers)", Dreamtech Press New Delhi.

Engineering Mechanics & Graphics Laboratory

Term Work:

Component-1 Engineering Mechanics Practical (Any Four)

1. Verification of Polygon law of coplanar forces
2. Verification of Principle of Moments (Bell crank lever)
3. Determination of support reactions of a Simply Supported Beam
4. Kinematics of particles. (Projectile motion)
5. Matlab Programming – Coplanar Force System, Equilibrium and Motion Curves. (Total 6 Programme)

Component-2 AutoCAD Practical

Printouts of each from:

1. Orthographic Projections – 2 problems.
2. Orthographic Projections with Section – 2 problems.
3. Isometric projections – 2 problems.

Note:- 2 hrs /week Auto CAD Practical is essential for completing the Auto CAD Drawings and taking required printouts.

End Semester Practical Examination (Auto CAD) (2 hours/ 25 Marks.)

1. Isometric drawing. (1 problem) (10 Marks)
2. Orthographic Projection (With Section) (1 problem). (15 Marks)

Course Code	Course Name	Credits
CE118	Java Programming	4

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE118	Java Programming	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE118	Java Programming	40	40	40	60	25	25	-	150

Course Objectives:

The course is aimed to:

1. To learn the basic concepts of object-oriented programming
2. To understand the importance of Classes & objects along with constructors
3. To study and understand Arrays, Strings and vectors
4. To study various concepts of JAVA programming like multithreading, exception Handling, packages, etc.
5. To explain components of GUI based programming.

Course Outcomes:

On successful completion of course learner/student will be able to:

1. To apply fundamental programming constructs
2. To illustrate the concept of packages, classes and objects.
3. To elaborate the concept of strings, arrays and vectors
4. To implement the concept of inheritance and interfaces
5. To implement the concept of exception handling and multithreading
6. To develop GUI based applications.

CO-PO Mapping (3 High , 2 Medium , 1 Low												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1		2			1	1	2		2
CO2	3	2	2		2			1	1	2		2
CO3	3	3	2	1	2	1		1	1	2		2
CO4	3	3	2	1	2	1		1	1	2		3
CO5	3	3	2	2	2	1		1	1	2		3

CO6	3	3	3	2	2	1		1	2	2		3
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Syllabus:

Prerequisite: Basics of Computer Programming

Module No	Module	Detailed Contents of Module	Hrs	CO
1	Introduction to Object Oriented Programming	Overview of procedure and object oriented Programming, Introduction to the principles of object oriented programming: Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism, Message passing Features of Java Language , JDK, JRE , keywords, Data types, Variables, Operators, Expressions, Types of variables and methods. Control Statements: If Statement, If-else, Nested if, switch Statement, break, continue. Iteration Statements: for loop, while loop, and do- while loop	06	CO 1
2	Class, Object, Packages and Input/output	Classes & Objects: Reference Variables, Passing parameters to Methods and Returning parameters from the methods, Static members, Non-Static members, Method overloading, Recursive method Constructors: Types of Constructors, chaining of constructor, finalize() Method, Constructors Overloading. Packages in java, types, user defined packages Defining packages, creating packages and Importing and accessing packages Input and output functions in Java, Command Line Arguments, Scanner class	08	CO 2
3	Array, String and Vector	Array, Strings, String Buffer class, Wrapper classes, Vectors.	04	CO 3
4	Inheritance, Abstract Class and Interfaces	Inheritance: Inheritance Basics, Types of Inheritance in Java, member access, using Super- to call superclass Constructor, to access member of super class(variables and methods), creating multilevel hierarchy, Constructors in inheritance, method overriding, Abstract classes and methods,final keyword. Interfaces: Defining, implementing and extending interfaces, variables in interfaces, Default Method in Interface, Static Method in interface, Abstract Classes vs Interfaces.	08	CO 4
5	Exception handling and Multithreading	Exception Handling: Exception Handling Fundamentals, Exception Types, Exception class Hierarchy, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses Multithreaded Programming: The Java Thread Model and Thread Life Cycle, Thread Priorities, creating a	04	CO 5

		Thread, Implementing Runnable, Extending Thread, Creating Multiple Threads.		
6	GUI programming in JAVA	Designing Graphical User Interfaces in Java: Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Event-Handling, Introduction to Swings.	06	CO 6

Assessment:

I.Internal Assessment :

Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and a half hours.

II.End Semester Theory Examination:

In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

- 1.Question paper will consist of 3 questions, each carrying 20 marks.
- 2.Question number 1 will be compulsory and based on maximum contents of the syllabus
- 3.Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
- 4.Total three questions need to be solved.

References:

1. Herbert Schildt, "Java-The Complete Reference", Tenth Edition, Oracle Press, Tata McGraw Hill Education.
2. E. Balguruswamy, "Programming with Java A primer", Fifth edition, Tata McGraw Hill Publication
3. Anita Seth, B.L.Juneja, " Java One Step Ahead", Oxford university press.
4. D.T. Editorial Services, "Java 8 Programming Black Book", Dreamtech Press.
5. Learn to Master Java by Star EDU Solutions
6. Yashvant Kanetkar, "Let Us Java" ,4th Edition ,BPB Publication

Java Programming- Laboratory

List of Experiments:

Hardware & Software Requirements:

Hardware Requirements	Software Requirements	Other Requirements
PC With Following Configuration: 1. Intel PIV Processor 2. 2 GB RAM 3. 500 GB Hard disk 4. Network interface card	1. Windows or Linux Desktop OS 2. JDK 1.8 or higher 3. Notepad ++ 4.JAVA IDEs like Netbeans or Eclipse 5.VSCode	1. Internet Connection for installing additional packages if required

1. Write a program which will read a number and should implement the following methods.
 - 1.factorial()
 - 2.testArmstrong()
 - 3.testPalindrome()
 - 4.testPrime()

2. Implement java program to calculate gross salary and net salary taking the following data through command line arguments

Input: empno, empname, basic salary

Process:

DA=70% of basic

HRA=30% of basic

CCA=Rs240/-

PF=10% of basic

PT=Rs.100/-

3. Write a java program to demonstrate default constructors, Parameterized Constructors and Constructor Overloading.

4. Write a program using recursive function 'power' to compute x^n , $\text{power}(x,n) = 1$ if $n=0$, $\text{power}(x,n) = x$ if $n=1$, $\text{power}(x,n) = x * \text{power}(x, n-1)$ otherwise

5. Write a program to take input for 'N' integers in an array and display only those integers that are greater than the average of all integers.

6. Write a program to create Vector objects with Student names. Program should perform following operations based on choice:

- Add Student name - to add new student name in the Vector
- Remove Student Name - Removes student name if already exists else display appropriate message
- Search a student by index
- Display - Display contents of vector

7. Consider the class network given below for multilevel inheritance. Write a program to display 'Results' objects.

8. Write a java program to create a user defined package.

9. Define interface for Area and Volume, and implement the required interfaces in Circle class and Sphere class.

10. Write a program to accept and display the month number. Throw an exception if an improper month number is entered. Make your own exception class to handle this exception.

11. Create a threads such that one thread will print even number and another will print odd number in an ordered fashion.

12. Case Study on module six.

Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. Term Work: Term Work shall consist of practical's based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Course Code	Course Name	Credits
COMM121	Professional Communication and Ethics-I	2

Subject Code	Subject Name	Theor y (Hrs)	Practica l (Hrs)	Tutoria l (Hrs)	Theory (Credits)	Practical/Or al (Credits)	Tutorial (Credits)	Total (Credits)
COMM 121	Professional Communication and Ethics-I	1	02	--	1	01	--	2

Subject Code	Subject Name	Examination Scheme (tentative)							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
COMM 121	Professional Communication and Ethics-I	-20-	-20-	-20-	30--	25	--		75

Course Objectives:

The course is aimed

1. To understand, compare and demonstrate the importance and relevance of communication with specific emphasis on listening skill.
2. To promote practice in speaking skill and encourage learners to compose on the spot speeches for the purpose of developing and generating ideas.
3. To train learners in reading strategies that will enhance their global understanding of the text and help them to comprehend academic and business correspondence.
4. To illustrate effective writing skills in business, academic and technical areas.
5. To inculcate confident personality traits with grooming and social etiquette.
6. To train learners in producing words on the basis of contextual cues and reflect on errors in sentences.

Course Outcomes:

On successful completion of course learner/student will be able to:

1. Listen, comprehend and identify potential barriers in spoken discourse with ease and accuracy.
2. Develop confidence and fluency in speaking at social, academic and business situations as well as make effective professional presentations.
3. Implement reading strategies for systematic, logical understanding, that will enhance the skill of

comprehension, summarisation and evaluation of texts.

4. Understand and demonstrate effective writing skills in drafting academic, business and technical documents.

5. Communicate effectively in academic as well as business settings, displaying refined grooming and social skills.

6. Anticipate the meaning of unfamiliar words with the help of contextual cues and construct grammatically correct sentences.

Syllabus:

Module	Detailed Contents	Hrs.	CO
1	The Importance and Strategies of Effective Listening Prerequisite: Able to listen, read, speak, write and comprehend the target language Introduction to communication 1.1 Importance and relevance of communication 1.2 Listening skill -ability to discriminate stress and intonation -Comprehend meaning of audio text-graded on the basis of vocabulary, sentence construction and theme. -potential barriers	5 Hrs	CO1
2	Developing Speaking Skills 2.1 Intensive Speaking- on the spot topics 2.2 Responsive speaking-answering a question 2.3 Interactive speaking-conversations 2.4 Extensive speaking-speech, oral presentations-specific emphasis on plagiarism check and generating the report	6 Hrs	CO2
3	Strategies and Techniques to build Reading Skill 3.1 Develop the process of reading- a) predicting content from the given title, b) anticipating content from the given sentence, c) skimming for understanding the theme of the passage, d) scanning for specific information, e) guessing the meaning of unfamiliar words from the context, that is, the careful analysis of structural words f) inferring from the content- conclusion reached on the basis of evidence and reasoning g) deduction- logical conclusions based on the information given in a text Special emphasis on reading comprehension exercises and summarisation	5 Hrs	CO3

4	Developing Professional Writing Skills 4.1 Effective introduction with emphasis on general statement, opposing statement and thesis statement 4.2 Critical response to a text with special reference to purpose, evaluation of the content, theme and style of a text 4.3 Organization of ideas, sentence construction and word choice, grammar and usage 4.4 Explanation and support of ideas (special reference to writing paragraphs and business letters- Sales and Claim letters}	6 Hrs	CO4
5	Etiquette and Grooming for Personality Development 5.1 Social Etiquette 5.2 Corporate etiquette 5.3 Confidence building and Personality development	1 Hr	CO5
6	Vocabulary and Grammar 6.1 Contextual vocabulary Development- Word Maps 6.2 Identifying errors in a sentence.	1 Hr	CO6

Assessment:

I.Internal Assessment Test:

Assessment consists of two class tests of 20 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be 60 minutes .(Note: Summarization should be a compulsory question in Test II and not in the End Semester Theory Examination)

II. End Semester Theory Examination:

Total marks 30, duration 1 and half hours.

1. Question paper will consist of 5 questions, each carrying 10 marks.
2. Total 3 questions need to be solved.
3. Q.1 will be compulsory, based on the entire syllabus.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of marks should be proportional to the number of hours assigned to each module.

References:

- 1.Raman Meenakshi & Sharma Sangeeta, *Communication Skills*, Oxford University Press
- 2.Kumar Sanjay & Lata Pushp, *Communication Skills*, Oxford University Press
- 3.Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). *Business Communication: Building Critical Skills*. Place of publication not identified: Mcgraw-hill.
- 4.Murphy, H. (1999). *Effective Business Communication*. Place of publication not identified: Mcgraw-Hill.
- 5.Lewis, N. (2014). *Word power made easy*. Random House USA.

Professional Communication and Ethics-I Laboratory

Lab Prerequisite: Basic language skills

Syllabus:

Sr. No.	Level 1. Basic 2. Design 3. Advanced 4. Project/Case Study/Seminar	Detailed Lab/Tutorial Description	LO Mapping
1	Assignment 1	Written record of listening activities-Listening practice tasks of 3 types (through audio recordings of (1) Monologues (2) Dialogues (3) Formal/Expert Talk or Lecture)	LO1
2	Assignment 2	Transcription of the public speech along with a plagiarism report-Practice public speech	LO2
3	Assignment 3	Summarization through graphic organisers (1. Text to graphic organizer 2. Graphic organizer to text)	LO3
4	Assignment 4	1. Case studies on critical thinking 2. 2 business letters in complete block format.	LO4
5	Assignment 5	Documentation of case studies/Role play based on Module 5	LO5
6	Assignment 6	1. Contextual Vocabulary Development 2. Aptitude Test	LO6

Term work:

Term Work shall consist of 6 Assignments .

The distribution of marks for term work shall be as follows:

1.Assignments : **10 marks**

2.Oral Exam/ Public Speaking : **10 marks**

3.Attendance (Theory and Tutorial) : **05 marks**

Course Code	Course Name	Credits
ENGG123	Basic Workshop II	1

Course Code	Course Name	Teaching Scheme(Contact Hours)			CreditsAssigned				
		Theory	Pract.	Tut.	Theory	Tut.	Pract.	Total	
ENGG123	Basic Workshop -II	- -	2	--	- -	--	1	1	
Course Code	CourseName	ExaminationScheme							
		Theory				TermWork	Pract./oral	Total	
		InternalAssessment			End SemExam.				Exam.D duration(inHrs)
		Test 1	Test 2	Avg.					
ENGG123	BasicWorkshop -II	--	--	- -	- -	- -	50	- -	50

Course Objectives

1. To Impart Training Help the students develop engineering skills sets.
2. To inculcate respect for physical work and hard labor.
3. To Get Exposure To Interdisciplinary Engineering Domain.

Course Outcomes:

Learner will be able to...

1. Develop The Necessary Skill required to handle/use different carpentry tools.
2. Identify and understand the safe practices to adopt in the electrical environment.
3. Demonstrate The wiring practices for the connection of simple electrical load/equipment.
4. Design, fabricate and assemble PCB.
5. Develop The necessary skill Required to handle/use different measuring tools.
6. Develop The Necessary Skill required to use different sheet metal tools.
7. Able To demonstrate the operation, forging with the help of a simple job.

Trade	Detailed Content	Hrs	
		.	

Note: Trade 1 and 2 are compulsory. Select any ONE trade topics out of the topic trade 3 to 5. Demonstrations and hands on experience to be provided during the periods. Report on the demonstration including suitable sketches is also to be included in the term work Trade evaluation is to be done according to the opted Trades in addition to Compulsory Trades.			CO
Trade-1	Carpentry (Compulsory) 6. Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods. 7. Term work to include one carpentry job involving a joint and report on demonstration of a job involving wood turning	08	CO1
Trade-2	Basic Electrical workshop:(Compulsory): 8. Single phase and three phase wiring. Familiarization. of protection switch-gears and their ratings (fuse, MCB, ELCB). Wiring standards, Electrical safety in the workplace, safe work practices. Protective equipment. 9. Layout drawing, layout transfer to PCB, etching and drilling and soldering technique	08	CO2
Trade-3	Measurement* 10. Vernier Height gauge, wire gauge, Dial gauge. Use of the listed gauges and precaution.	04	CO3
Trade 4	Sheet metal working* 11. Use of sheet metal, working hand tools, cutting, bending, spot welding operation.	04	CO4
Trade-5	Forging (Smithy):* 12. At least one forging job to be demonstrated and a simple job to be made for Term Work in a group of 4 students.	04	CO5

* Students can choose one trade out of Trades 3,4 & 5.

Total hours= 8+8+4=20 hours

2. Complete Work-Shop Book giving details of drawing of the job and time sheet The distribution of marks for Term work shall be as follows:

1. Job Work: 30 Marks
2. Workshop book 10 marks
3. Attendance : 10 marks

References:

1. Workshop Technology by H K Hajara Choudhary
2. Manufacturing Technology by R C Jain
3. Workshop Technology by R S Khurmi and J S Gupta

Course Code	Course Name	Credits
ENGG125	Co-curricular Course-II	2

Course Code	Course Name	Theory	Practical	Tutorial	Total contact hours	Theory	Practical /Oral	Tutorial	Total credits
ENGG125	Co-curricular Course-II	01	02	-	03	01	01	-	02

Course Code	Course Name	Examination Scheme				
		Theory Marks	Term Work	Practical	Oral	Total
		End Semester . Exam				
ENGG125	Co-curricular Course-II	-	-	50	-	50

Sr No.	Name of Activity	Number of Hours
1	Yoga Day	4
2	F.E Sports Day	6
3	Mathematics Quiz	3
4	Treasure Hunt	3
5	Environmental Activity-I	4
6	Environmental Activity-II	4
7	NPTEL/Value Added Course	10

8	Cultural Activity(Algeria/ University level/ Inter college Level)	3
9	NSS/ NCC Attended camp	3
10	Any other Activity	To be graded by class coordinator on merit

Activity 1 - Yoga

Every student has to attend 2 sessions of Yoga activity, each of 2 hours. Each session will fetch 3 points. A student can score a maximum of 6 points. Their presence and participation in the activity will be certified by the faculty in charge.

Activity 2 - Sports Participation

It is mandatory for all the students to participate in the sports activities. They have to participate in individual or team events. Points are awarded depending on participation or winning in the events. The students can score a maximum of 6 points.

Activity 3- Mathematics Quiz

Quiz will be conducted in two rounds. Round 1 is the preliminary round which is mandatory for all the students and those who clear the preliminary round will participate in the final round. The students can score a maximum of 6 points.

Activity 4 - Treasure Hunt

Treasure Hunt will be conducted in two rounds. Round 1 is the preliminary round which is mandatory for all the students and those who clear the preliminary round will participate in the final round. The students can score a maximum of 6 points.

Activity 5-6 - Environmental Activity I and II

Two activities related to environmental awareness will be conducted. All the students are made to participate in the activities. They can earn a maximum of 5 points each in these activities. On completing and submitting all the assignments, the students will get 2 points (they need to attach the summary of assignment to gain these points).

Activity 7 –NPTEL / Value Added Course/ Internship

It shall be the choice of student to attend either NPTEL/ Value Added Course or Non- Technical / Technical Internship relevant to the domain of Engineering. If the student has attended the NPTEL examination, he /she will be awarded 5 points. Extra 3 points are also allotted on passing the course . If the student gets an ELITE grade, he/she will be given 5 extra points (They need to attach the certificate)

The student can complete one value added course and can gain maximum 10 points , depending on the course duration.

In addition, the students can attend NSS camp, cultural activities in College/University/National level. A committee of FY Academic Coordinator and 3 Senior faculty shall evaluate the effectiveness of activity and resolve the minimum cut-off of points required to be eligible and the point to mark conversion. The points shall be evaluated by Class Coordinator and suitably converted to marks out of 50.

**BACHELOR OF TECHNOLOGY
IN
COMPUTER ENGINEERING
SEM-III**

(Semester III)

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 201	Engineering Mathematics III	Contact Hours	3	2		4
		Credits	3	1		4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 201	Engineering Mathematics III	40	40	40	60	25	-	-	125

1. Course Objectives:

The course is aimed to:

1. Learn the Laplace Transform, Inverse Laplace Transform of various functions, its applications.
2. Understand the concept of Fourier Series, its complex form and enhance the problem-solving skills.
3. Understand Matrix algebra for engineering problems
4. Learn the concept of Number theory.
5. Understand the concept of Relation and function
6. Understand the concept of coding theory

2. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Apply the concept of Laplace transform and its application to solve the real integrals, understand the concept of inverse Laplace transform of various functions and its applications in engineering problems.
2. Expand the periodic function by using the Fourier series for real-life problems and complex engineering problems.
3. Apply the concepts of eigenvalues and eigenvectors in engineering problems.
4. Use the concept of Number theory to engineering problems.
5. Apply the concept of relation and function
6. Use groups and codes in Encoding-Decoding

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1		2			1	1		1
CO2	3	2	1		1			1	1		1
CO3	3	2	1		2			1	1		1
CO4	3	2	1		1			1	1		1
CO5	3	2	1		1			1	1		1
CO6	3	2	1					1	1		1

3. Detailed Theory Syllabus:

Prerequisite: Engineering Mathematics I, Engineering Mathematics-II

Sr. No .	Module	Detailed Contents of Module	Hrs.	CO
1	Laplace Transform	Definition of Laplace transform and Laplace transform of standard functions, Properties of Laplace Transform: Linearity, First Shifting Theorem, change of scale Property, multiplication by t (Properties without proof). Inverse of Laplace Transform by partial fraction and convolution theorem.	7	CO1
2	Fourier Series	Fourier series of periodic functions with period 2π , Fourier series for even and odd functions, Half range sine and cosine Fourier series, Orthogonal and Ortho-normal functions.	6	CO2
3	Linear Algebra, Matrix Theory	Eigenvalues and eigenvectors, Diagonalization of matrices; Cayley-Hamilton Theorem, Functions of square matrix, Singular Value Decomposition	7	CO3
4	Number Theory	Euclid's algorithm, Diophantine equation, Euler's Theorem, Fermat's Little Theorem, Congruences, Computing Inverse in Congruences, Chinese Remainder Theorem, solving quadratic congruence using Chinese Remainder Theorem	6	CO4
5	Relations and Functions	Partition of A Set, Relation, Diagram of A Relation, Matrix of A Relation, Digraph of A Relation, Types of Relation, Equivalence Relation, Relation of the Path, Operations on Relations, Closures, Warshall's Algorithm,	7	CO5
6	Algebraic Structures, coding theory	Properties of Binary Operations, Group, Group Code, Decoding and Error Correction, Maximum Likelihood Technique, parity-check matrix.	6	CO6

4. Theory Assessment:

- A. Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and a half hours.
- B. End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
1. Question paper will consist of 3 questions, each carrying 20 marks.
 2. Question number 1 will be compulsory and based on maximum contents of the syllabus
 3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
 4. Total three questions need to be solved.

5. Practical Assessment: The final certification and acceptance of TW ensures the satisfactory performance of assignments and practicals and minimum passing in the TW.

A. Term Work:

1. Batch wise practical's are to be conducted. The number of students per batch should be as per norms.
2. Students must be encouraged to write Matlab Programs . Each student has to perform at least 4 Matlab practical's and at least 6 assignments on the entire syllabus.
3. Matlab Practical's will be based on
 - (i) Laplace Transform.
 - (ii) Inverse Laplace Transform
 - (iii) Fourier series

- (iv) Eigen values and Eigen Vector.
- (v) Singular Value Decomposition
- (vi) Diagonalization of matrices
- (vii) Euclid's algorithm
- (viii) Warshall's Algorithm.
- (ix) Chinese Remainder Theorem

B. Term Work Marks: 25 Marks (Total marks) = 10 Marks (Matlab Practicals) + 10 Marks (Assignments on entire syllabus) + 5 Marks (Attendance)

6. Books and References:

A. Books:

1. Advanced Engineering Mathematics H.K. Das, S . Chand, Publications.
2. Higher Engineering Mathematics B. V. Ramana, Tata Mc-Graw Hill Publication
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication
4. Advanced Engineering Mathematics Wylie and Barret, Tata Mc-Graw Hill.
5. Beginning Linear Algebra Seymour Lipschutz Schaum's outline series, Mc-Graw Hill Publication

B. References:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons.
3. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramana, Pearson Education
4. Discrete Mathematical Structures D. S. Malik and M. K. Sen ,Course Technology Inc (19 June 2004)
5. Discrete Mathematics and its Applications Kenneth H. Rosen, "", Tata McGrawHill

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 202	Data Structures	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 202	Data Structures	40	40	40	60	25	25	--	150

1. Course Objectives:

The course is aimed to:

1. To understand the need and significance of Data structures as a computer Professional.
2. To teach the concept and implementation of linear data structures.
3. To understand and implement non linear data structures.
4. To analyse various data structures operations and select the appropriate one to solve a specific real-world problem.
5. To introduce various techniques for representation of the data in the real world.
6. To teach various searching techniques.

2. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Illustrate basic data structure and its operations.
2. Implement various operations like searching, deletion, insertion and traversal on stack and queue.
3. Apply various linked list operations.
4. Implement various tree operations.
5. Apply Graph Traversals.
6. Apply Searching & hashing techniques to solve problems.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3										1
CO2	2	3	2								1
CO3	2	3	2								1
CO4	2	2	2								1
CO5	2	2	2								1
CO6	2	2	1								1

3. Detailed Theory Syllabus:

Prerequisite: Knowledge of C programming language

Sr. No.	Module	Detailed Contents of Module	Hrs	CO
1	Introduction to Data Structures	Introduction to Data Structures, Concept of ADT, Types of Data Structures - Linear and Nonlinear, Operations on Data Structures.	3	CO1
2	Linear Data Structures - Stack, Queue	Introduction to Stack : LIFO structure, ADT of Stack , Operations on Stack : Create, POP, PUSH, delete stack, Array Implementation of Stack: Create, POP, PUSH, PEEK, Display, delete stack, Applications of Stack: Well form-ness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation, Recursion. Introduction to Queue : FIFO structure, ADT of Queue, Operations on Queue : Create, ENQUEUE, DEQUEUE, delete Queue, Array Implementation of Queue : Create, ENQUEUE, DEQUEUE, PEEK, Display, delete Queue, Types of Queue - Circular Queue, Priority Queue, Applications of Queue.	10	CO2
3	Linear Data Structures - Linked List	Introduction, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List, Circular Linked List, Doubly Linked List, Operations on Singly Linked List and Doubly Linked List: Create List, Insert Node (empty list, beginning, Middle, end), Delete node (First, general case), Search List, Retrieve Node, Print List, Stack and Queue using Singly Linked List, Singly Linked List Application - Polynomial Representation and Addition.	9	CO3
4	Non Linear Data Structures - Trees	Introduction, Tree Terminologies, Binary Tree, Binary Tree Representation, Types of Binary Tree, Binary Tree Traversals, Binary Search Trees, Operations on Binary Search Tree, AVL tree : inserting, Searching, traversing and rotation: RR, LL, RL, LR in AVL tree, Expression Trees : Construction, Infix, Prefix, Postfix Traversals, heaps : Structure, – Reheap Up, Reheap Down, Build heap, Insert, Delete	9	CO4
5	Non Linear Data Structures - Graphs	Introduction, Graph Terminologies, Representation of Graph : Adjacency Matrix, Adjacency List, Operations : Add vertex, Delete vertex, Add Edge, Delete Edge, Find vertex, Graph Traversals - Depth First Search (DFS) and Breadth First Search (BFS)	4	CO5
6	Searching Techniques and Hashing	Linear Search, Binary Search, random search, Hashing - Concept, Hash Functions, Address calculation techniques, Common hashing functions, Collision resolution Techniques: Separate Chaining, Open Addressing (Linear probing, Quadratic, Double hashing).	4	CO6

4. Suggested Experiments:

1. Implement basic array operations
2. Implement push,pop,peek operations on stack.
3. Convert an Infix expression to Postfix expression using stack ADT.
4. Evaluate Postfix Expression using Stack ADT.
5. Implement Linear Queue ADT using an array.
6. Implement Circular Queue ADT using an array.
7. Implement Singly Linked List ADT.
8. Implement Circular Linked List ADT.
9. Implement Stack / Linear Queue ADT using Linked List.

10. Implement Binary Search Tree ADT using Linked List.
11. Implement Graph Traversal techniques : a) Depth First Search b) Breadth First Search
12. Implement Binary search on array
13. Implement linear search on array

5. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and a half hours.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 4 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: A Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. Term Work: Term Work shall consist of 9 practical based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. Books:

1. Aaron M Tenenbaum, YedidyahLangsam, Moshe J Augenstein, "Data Structures Using C", Pearson Publication.
2. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd Edition, CENGAGE Learning.
3. Jean Paul Tremblay, P. G. Sorenson, "Introduction to Data Structure and Its Applications", McGraw-Hill Higher Education
4. Data Structures Using C, ISRD Group, 2nd Edition, Tata McGraw-Hill.
5. Reema Thareja, "Data Structures using C", Oxford Press.

B. References:

1. Prof. P. S. Deshpande, Prof. O. G. Kakde, "C and Data Structures", DreamTech press.
2. E. Balagurusamy, "Data Structure Using C", Tata McGraw-Hill Education India.
3. Rajesh K Shukla, "Data Structures using C and C++", Wiley-India
4. GAV PAI, "Data Structures", Schaum's Outlines.
5. Robert Kruse, C. L. Tondo, Bruce Leung, "Data Structures and Program Design in C", Pearson Edition

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 203	Database Management Systems	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 203	Database Management Systems	40	40	40	60	25	--	25	150

1. Course Objectives:

The course is aimed to:

1. Identify the need of a database management system.
2. To understand entity relationship data model and its mapping to relational model.
3. To give a foundation on Relational Model of data and usage of relational Algebra.
4. To introduce the concepts of SQL queries.
5. Demonstrate Design Approach of Database through Normalization.
6. Understand the concept of transaction, concurrency control and recovery techniques.

2. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Recognize the need of database management systems.
2. Design ER and EER diagrams for real life applications.
3. Construct relational models and write relational algebra queries.
4. Retrieve information from the database by formulating SQL queries, procedure cursor using PL/SQL.
5. Apply the concept of normalization to relational database design.
6. Describe the concept of transaction management.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	-	2	1	-	-	-	2
CO2	3	2	3	1	2	2	1	-	-	1	2
CO3	3	2	2	1	3	2	-	-	-	-	1
CO4	3	2	2	2	3	2	1	-	-	1	1
CO5	3	1	3	-	2	2	-	-	-	-	2
CO6	3	2	-	-	2	2	2	-	-	-	1

3. Detailed Theory Syllabus:

Prerequisite : Basic knowledge of file system, any programming language

Module No	Module	Detailed Contents of Module	Hrs.	CO
1	Introduction to Database Concepts	Introduction, Characteristics of databases, File system v/s Database system, Data abstraction and data Independence, Schemas and Instance, Users of Database System, Three level schema Architecture, Database Administrator.	4	CO1
2	Entity-Relationship Data Model	Introduction to Data Models, Entity The Entity-Relationship (ER) Model, Entity, Entity Set, Strong and weak entity, Types of Attributes, Keys, Relationship constraints: Cardinality and Participation, Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation.	7	CO2
3	Relational Model and relational Algebra	Introduction to the Relational Model, Mapping the ER and EER Model to the Relational Model, Relational schema Design, Introduction to Relational Algebra, Relational algebra-operators, Relational Algebra Queries.	7	CO3
4	Structured Query Language (SQL)	Overview of SQL, Data Definition Language Commands, Integrity constraints: key constraints, Domain Constraints, Referential integrity, check constraints, Data Manipulation commands, Data Control commands, Set and string operations, aggregate function-group by, having, Views in SQL, joins, Nested and complex queries, Triggers(ECA Model), Security and Authorization in SQL. Introduction to PL/SQL, Procedure, Cursor.	12	CO4
5	Relational-Database Design	Decomposition, Functional Dependency Concept of normalization, First Normal Form, 2NF, 3NF, BCNF.	5	CO5
6	Introduction to Transactions Management	Transaction concept, Transaction states, ACID properties, Transaction Control Commands, Concurrent Executions, Serializability - Conflict and View.	4	CO6

4. Suggested Experiments:

Software Requirements if any: DBMS like Postgresql, Oracle.

1. Identify the case study and detailed statement of the problem. Design an Entity-Relationship (ER) / Extended Entity-Relationship (EER) Model.
2. Mapping ER/EER to Relational schema model.
3. Create a database using Data Definition Language (DDL) and apply integrity constraints for the specified System.
4. Apply DML Commands for the specified system.
5. Perform Simple queries, string manipulation operations and aggregate functions.
6. Implement various Join operations.
7. Perform Nested and Complex queries.
8. Perform DCL and TCL commands.
9. Implementation of procedure cursor.
10. Implementation of Views and Triggers.
11. Implementation and demonstration of Transaction

5. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an

additional 35% syllabus is completed. The duration of each test shall be one and a half hours.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. The question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on the maximum contents of the syllabus.
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3).
4. A total of three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).

7. Books and References:

A. Books:

1. Korth, Silberchatz, Sudarshan, Database System Concepts, 6th Edition, McGraw Hill.
2. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson Education.
3. Raghu Ramkrishnan and Johannes Gehrke, Database Management Systems, TMH.

B. References:

1. G. K. Gupta, Database Management Systems, McGraw Hill, 2012.
2. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dreamtech Press.

Syllabus :

Module	Detailed Contents	Hrs	CO
1	Fundamentals of Digital Systems and Techniques: Digital signals, AND,OR,NOT,NAND,NOR and Exclusive-OR Operations,Boolean Algebra,number system:Binary,signed binary,octal,hexadecimal number,binary arithmetic,one's and two's complements arithmetic,Codes: BCD codes, Excess-3, Gray codes, Error detecting and correcting codes: Parity check codes and Hamming code	09	CO1
2	Minimization Techniques: Basic postulates and fundamental theorems of Boolean algebra:Standard representation of logic functions: SOP and POS forms, Simplification of switching functions using K-Map and Quine-McCluskey tabular methods, Don't care conditions, Digital logic families: TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic	08	CO2
3	Combinational Digital Circuits: Design procedure: Half adder,Full Adder,Half Subtractor, Full subtractor,Parallel binary adder,parallel binary subtractor, Carry Look Ahead adder, Serial Adder/Subtractor, BCD adder,Binary Multiplier,Binary Divider, Multiplexer/ De-multiplexer, decoder,encoder,parity checker,parity generators,code converters,magnitude Comparator.	07	CO3
4	Sequential circuits: A 1-bit memory,the circuit properties of Bistable latch, the clocked SR flip flop, J-K,T and D types flip flops,Application of flip flops:shift registers,serial to parallel converter,parallel to serial converter,Synchronous and Asynchronous mode counter,FSM,sequence generator and detector.	08	CO4
5	A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter,specification for D/A converters,analog to digital converter:quantization and encoding,parallel comparator A/D converter,successive approximation A/D converter,Specification for A/D converters.	04	CO5
6	Semiconductor Memories and Programmable Logic Devices: Characteristics of memories,read only memory(ROM), read and write memory (RAM), Programmable logic array (PLA),Programmable array logic (PAL), Introduction to Field Programmable Gate Array(FPGA).	03	CO6

Assessment**I. Internal Assessment Test:**

Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be 90 minutes.

II. End Semester Theory Examination:

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.
3. Question No: 01 will be compulsory and based on the entire syllabus wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of each module will be proportional to number of respective lecture mentioned in the syllabus.

References:

Text Books:

1. R P Jain, Modern digital electronics, TMH
2. M.M.Mano, "Digital design", Pearson Education India,2016.
3. Donald P.Leach and Albert Paul Malvino,Digital Principles and Applications, 8th Edition,TMH,2003

Reference Books:

1. A. Kumar,"Fundamental of Digital Circuits", Prentice Hall India, 2016
2. A.K. Maini, Digital Electronics,Wiley India
3. Taub Schilling,Digital Integrated Electronics, TMH

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 205	Computer Organization and Architecture	Contact Hours	3	-	-	3
		Credits	3	-	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 205	Computer Organization and Architecture	40	40	40	60		—		100

1. Course Objectives:

The course is aimed to:

1. To study basic computer structure and compare computer architecture models
2. To discuss operation of the arithmetic logic unit for the algorithms & implementation of integer arithmetic.
3. To study the characteristics of memory systems including internal and cache memories.
4. To Design and implement micro programmed control units, instruction formats and addressing modes. (Synthesis).
5. To study the different ways of communicating with I/O devices and standard I/O interfaces.
6. To study the different parallel processing concepts and pipelines.

2. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Understand the basic computer architectures
2. Demonstrate ALU arithmetic algorithms for different operations.
3. Understand memory hierarchy and organization with different types of memories
4. Understand different Processor Organization concepts
5. Identify various types of buses, interrupts and I/O operations in a computer system
6. Describe Parallel processing and Pipeline concepts

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1					1			
CO2	3	2	1		2			1			
CO3	2	2	1					1		1	1
CO4	3	2	1	1				1		1	2
CO5	3	2	1					1		1	1
CO6	3	2	1	1				1		1	1

3. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Contents of Module	Hrs	CO
1	Overview of Computer Architecture and Organization	Introduction of Computer Organization and Architecture, Basic organization of computer and block level description of the functional units, Von Neumann model, Harvard Model	6	CO1
2	Computer Arithmetic Algorithms	Addition, two's complement subtraction, Multiplication using Booth's algorithm, Division using Restoring and non-restoring division algorithms. IEEE 754 floating point number representation.	9	CO2
3	Memory Organization	Introduction to Memory, Memory Hierarchy, Characteristics of memory systems, Internal Memory: Types of RAM and ROM Cache Memory: Design Principles, Memory mappings, Replacement Algorithms, Cache Coherence. Interleaved and Associative Memory.	8	CO3
4	Processor Organization	CPU Architecture, Register Organization, Instruction formats, Basic instruction cycle. Addressing modes Control Unit: hardwired control unit and its design methods, Soft wired (Micro-programmed) control unit design.	7	CO4
5	Input/ Output	Input/output systems, I/O module, Types of data transfer techniques: Programmed I/O, Interrupt driven I/O and DMA. Introduction to buses: Bus structure, Bus Contention, Bus Arbitration and its types	4	CO5
6	Advanced Processors	Parallel Architecture: Classification of Parallel Systems, Flynn's Taxonomy, Instruction Pipelining- Pipelining Strategy, Pipeline Performance, Pipeline Hazards, Dealing with Branches, Introduction to Multiprocessor Systems, Multi-Core Computers	4	CO6

4. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and a half hours.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

5. Books and References:

A. Books:

1. William Stalling, "Computer Organization and Architecture: Designing and Performance", Pearson Publication 10TH Edition.
2. John P Hayes, "Computer Architecture and Organization", McGraw-Hill Publication, 3RD Edition.
3. Dr. M. Usha and T. S. Shrikanth, "Computer system Architecture and Organization", Wiley publication.

B. References:

1. B.Govindarajalu, "Computer Architecture and Organization", McGraw-Hill Publication.
2. Smruti Ranjan Sarangi, "Computer Organization and Architecture", McGraw-Hill Publication

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 206	Human Values and Social Ethics	Contact Hours	2	-	-	2
		Credits	2	-	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 206	Human Values and Social Ethics	-	-	-	-	50	-	-	50

1. Course Objectives:

The course is aimed to:

1. To enable learners to understand the core values that shape the ethical behaviour of a professional.
2. To develop an awareness of the different ethical dilemmas at the workplace and society.
3. To inculcate the ethical code of conduct in writing technical articles and technology development.
4. To internalize ethical principles and code of conduct of a good human being at home, society and at work place.

2. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Identify the relation between ethics and values pertinent for an engineering professional.
2. Demonstrate responsibility in establishing fair and just processes for inclusive participation and collaborative decision making.
3. Evaluate an awareness of self-held beliefs and values and analyze how they are altered in interactions with others.
4. Develop effective academic writing skills to analyze research data and cite sources appropriately.
5. Integrate incorporates values and ethical principles in social and professional situations.
6. Evaluate technology development and its application on the basis of moral issues and individual rights.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						1	3				1
CO2		1				1	3				1
CO3							3	1			1
CO4			2		2		3				1
CO5						1	3			1	1
CO6		1			2		3			1	1

3. Detailed Theory Syllabus:

Prerequisite: Should have respect for justice and be able to reflect on one's personal beliefs and values.

Sr. No.	Module	Detailed Contents of Module	Hrs	CO
1	Ethics and Values	Meaning & Concept of Ethics Difference between Ethics and Values Ethical code of conduct	3	CO1
2	Professional Ethics	Professional Ethics vs Personal ethics Components of professional ethics Professional values and its importance	5	CO2
3	Ethics and Society	Relevance of values and ethics in social work Ethical dilemmas Values and ethical principles of social work - Service - Dignity and worth of a person - Importance of Human relationships - Integrity - Competence - Social Justice	6	CO3
4	Ethics in Technical writing	Documenting sources Presentation of Information Ethics & Plagiarism	6	CO4
5	Ethics and Technology Development	Risk management and Individual rights Moral issues in development and application of technology Privacy/ confidentiality of information Managing Technology to ensure fair practices	6	CO5, 6

4. Assessment:

Term Work : 50 marks (Continuous Evaluation)

Activities based on the ethics could be created based on the content of the syllabus (Debates, Presentations, Group Discussions)

The evaluation can be based on the activities

Quiz on various professional ethics can be conducted.

5. Books and References:

1. Martin Cohen, 101 Ethical Dilemmas Routledge, 2nd edition, 2007
2. M. Govindarajan, S. Natarajan & V.S. Senthil kumar, Professional Ethics and Human Values,
3. Prentice Hall India Learning Private Limited, 2013 Mike W. Martin, Ethics in Engineering, McGraw Hill Education; Fourth edition, 2017

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 207	Python Programming Lab	Contact Hours	-	2+2#	-	2
		Credits	-	2	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 207	Python Programming Lab	-	-	-	-	50	25	--	75

1. Lab Objectives:

The lab is aimed to:

1. **Identify** and **recall** the fundamental concepts of Python programming, including data types, operators, conditional statements, looping constructs, and input/output functions.
2. **Describe** and **differentiate** various Python data structures such as lists, tuples, sets, dictionaries, strings, and arrays.
3. **Implement** user-defined functions and **use** modules and packages to create modular Python programs.
4. **Analyze** Object-Oriented Programming (OOP) concepts in Python by **examining** classes, objects, inheritance, and polymorphism.
5. **Evaluate** error-handling strategies through exception handling and **assess** file operations using file-handling techniques.
6. **Design** and **develop** Python applications using Graphical User Interface (GUI) frameworks and **integrate** them with SQLite database systems.

2. Lab Outcomes:

On successful completion of lab learner/student will be able to:

1. Understand the structure and syntax of the Python programming language.
2. Interpret and work with various data types and structures in Python.
3. Apply the concepts of functions, modules, and packages to develop modular Python programs.
4. Illustrate and apply Object-Oriented Programming (OOP) concepts such as classes, objects, inheritance, and polymorphism.
5. Develop programs using exception handling and file-handling mechanisms.
6. Create GUI-based applications and implement database connectivity using SQLite in Python.

CO/PO Mapping

CO-PO Mapping (3 High , 2 Medium , 1 Low)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	—	—	—	—	—	—	—	—	—
CO2	3	2	—	—	—	—	—	—	—	—	—
CO3	3	3	2	—	2	—	—	—	1	1	—
CO4	3	3	2	—	2	—	—	—	1	1	—
CO5	3	3	2	—	2	—	—	1	1	1	—
CO6	3	3	3	—	3	—	—	—	2	2	1

3. Detailed Theory Syllabus:

Prerequisite: Programming Language (C/Java), Python IDE installation and environment setup.

Sr. No.	Module	Detailed Contents of Module	Hrs	CO
1	Basics of Python	Introduction, Features, Python building blocks – Identifiers, Keywords, Indentation, Variables and Comments, Basic data types (Numeric, Boolean, Compound) Operators: Arithmetic, comparison, relational, assignment, logical, bitwise, membership, identity operators, operator precedence, Control flow statements: Conditional statements (if, if...else, nested if), Looping in Python (while loop, for loop, nested loops), Loop manipulation using continue, pass, break, Input/output Functions,.	06	CO1
2	Data types	Lists: a) Defining lists, accessing values in list, deleting values in list, updating lists b) Basic list operations c) Built-in list functions. Tuples: a) Accessing values in Tuples, deleting values in Tuples, and updating Tuples b) Basic Tuple operations c) Built-in Tuple functions. Dictionaries: a) Accessing values in Dictionary, deleting values in Dictionary, and updating Dictionary b) Basic Dictionary operations c) Built-in Dictionary functions Sets: a) Accessing values in Set, deleting values in Set, updating Sets b) Basic Set operations, c) Built-in Set functions Strings: a) String initialization, Indexing, Slicing, Concatenation, Membership & Immutability b) Built-in String functions Arrays: a) Working with Single dimensional Arrays: Creating, importing, Indexing, Slicing, copying and processing array arrays. b) Working with Multi-dimensional Arrays using Numpy: Mathematical operations, Matrix operations, aggregate and other Built-in functions	12	CO2
3	Functions, modules and packages	Functions: a) Built-in functions in python b) Defining function, calling function, returning values, types of parameters c) Nested and Recursive functions d) Anonymous Functions (Lambda, Map, Reduce, Filter) e) List Comprehension Modules: Writing modules, importing objects from modules, Python built-in modules (e.g. Numeric and Mathematical module, Functional Programming module, Regular Expression module), Namespace and Scoping. Decorators, Iterators and Generators. Packages: creating user defined packages and importing packages.	10	CO3
4	Object Oriented Programming	Overview of Object-oriented programming, Creating Classes and Objects, Self-Variable, Constructors, Inner class, Static method, Namespaces. Inheritance: Types of Inheritance (Single, Multiple, Multi-level, Hierarchical), Super() method, Constructors in inheritance, operator overloading, Method overloading, Method overriding, Abstract class, Abstract method, Interfaces in Python.	06	CO4

5	Exception handling and File Handling	Exception handling: Compile time errors, Runtime errors, exceptions, types of exception, try, block, except block, final block, raise statement, Assert statement, User-Defined Exceptions. Debugging: Programming Challenges, Classes of Tests, Bugs, Debugging, Debugging Examples– Assertions and Exceptions File Handling: Opening file in different modes, closing a file, Writing to a file, accessing file contents using standard library functions, Reading from a file – read(), readline(), readlines(), Renaming and Deleting a file, File Exceptions, Directories.	08	CO5
6	GUI & database programming	Graphical user interface (GUI): Overview of different GUI tools in python (Tkinter, PyQt, Kivy etc.), Working with containers, Canvas, Frame, Widgets (Button, Label, Text, Scrollbar, Check button, Radio button, Entry, Spinbox, Message etc.) Connecting GUI with databases to perform CRUD operations. (on supported databases like SQLite, MySQL, Oracle, PostgreSQL etc.).	10	CO6

4. Suggested Experiments:

Hardware & Software Requirements:

Minimum Hardware Requirements	Software Requirements	Other Requirements
PC With following Configuration 1. Intel Dual core Processor or higher 2. Minimum 2 GB RAM 3. Minimum 40 GB Hard disk 4. Network interface card	1. Windows or Linux Desktop OS 2. Python 3.6 or higher 3. Notepad ++ 4. Python IDEs like IDLE	1. Internet Connection for installing additional packages

- 1 Write python programs to understand
 - a. Basic data types, Operators, expressions and Input Output Statements
 - b. Control flow statements: Conditional statements (if, if...else, nested if)
 - c. Looping in Python (while loop, for loop, nested loops)
 - d. Decorators, Iterators and Generators.
- 2 Write python programs to understand
 - a. Different List and Tuple operations using Built-in functions
 - b. Built-in Set and String functions
 - c. Basic Array operations on 1-D and Multidimensional arrays using Numpy
 - d. Implementing User defined and Anonymous Functions
- 3 Write python programs to understand
 - a. Classes, Objects, Constructors, Inner class and Static method
 - b. Different types of Inheritance
 - c. Polymorphism using Operator overloading, Method overloading, Method overriding, Abstract class, Abstract method and Interfaces in Python.
- 4 Write python programs to understand
 - a. Creating User-defined modules/packages and import them in a program

- b. Creating user defined multithreaded application with thread synchronization and deadlocks
- c. Creating an menu driven applications which should cover all the built-in exceptions in python

5 Write python programs to understand

- a. Different File Handling operations in Python
- b. Designing Graphical user interface (GUI) using built-in tools in python (Tkinter, PyQt, Kivy etc.).
- c. GUI database connectivity to perform CRUD operations in python (Use any one database like SQLite, MySQL, Oracle, PostgreSQL etc.)

5. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. Term Work: Term Work shall consist of at least 15 practical based on the above list. Also Term work Journal must include at least 2 Programming assignments. The Programming assignments should be based on real world applications which cover concepts from more than one module of syllabus. Mini Project based on the content of the syllabus (Group of 3-4 students)

B. Term Work Marks: 50 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 20 Marks (Mini Project) + 5 Marks (MCQ as a part of lab assignments) + 5 Marks (Attendance)

6. Books and References:

A. Books:

1. Dr. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, Wiley Publication
2. M. T. Savaliya, R. K. Maurya, "Programming through Python", StarEdu Solutions.
3. E Balagurusamy, "Introduction to computing and problem solving using python", McGraw Hill-Publication.

B. References:

1. Zed A. Shaw, "Learn Python 3 the Hard Way", Zed Shaw's Hard Way Series.
2. Martin C. Brown, "Python: The Complete Reference", McGraw-Hill Publication.
3. Paul Barry, "Head First Python", 2nd Edition, O'Reilly Media, Inc.