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.

PCE
PILLAI COLLEGE OF ENGINEERING
AUTONOMOUS

Department of Computer Engineering

Syllabus

of

B.Tech. in Computer Engineering

for

The Admission Batch of AY 2023-24

First Year - Effective from Academic Year **2023-24**

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

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

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

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.

Program Outcomes:

Engineering Graduates will be able to:

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

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 every 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 C1, C2, C3, C4 and C5 and learners grade points in these courses are G1, G2, G3, G4 and G5 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,

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

The Department of Computer Engineering offers a B. Tech. programme in Computer Engineering. This is an eight-semester course. The complete course is a 168 credit course which comprises core courses and elective courses. The department level 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. These are

1. Business and Entrepreneurship
2. Bioengineering
3. Engineering Design
4. Art and Humanities
5. Applied Science
6. Life Skills, Repair, Maintenance and Safety

As minimum requirements for the credits to be earned during the B.Tech in Computer Engineering program, a student will have to complete a minimum of three specializations of which two are to be chosen from the department list and one has to be from the Institute level specialization list. In order to complete each specialization, a minimum of three courses under that specialization has to be completed. 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

Category	Credits
Humanities and Social Sciences including Management courses	10
Basic Science courses	28
Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	
Professional core courses	51
Professional Elective courses relevant to chosen specialization/branch	24
Open subjects – Electives from other technical and /or emerging subjects	14
Project work, seminar and internship in industry or elsewhere	18
Mandatory Courses - Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge	23
Total Credits	**168**

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. Prashant P Nitnaware	Member
3. Prof. Varunakshi Bhojane	Member
4. Prof. Payel Thakur	Member
5. Dr. Neeta Deshpande	Member
6. Dr.Jyoti Malhotra	Member
7. Dr.Kavita Sonawane	Member
8. Prof.Pranita Mahajan	Member
9. Mr. Samir Mahindre	Member
10. Prof. Deepti Lawand	Member

Program Structure for First Year
Bachelor of Technology in Computer Engineering
W.E.F. A.Y. 2023-24
Semester I

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract.	Theory	Pract.	Total
FY101	Engineering Mathematics I	BSC	3	2	3	1	4
FY102	Engineering Physics I	BSC	2	1	2	0.5	2.5
FY103	Engineering Chemistry I	BSC	2	1	2	0.5	2.5
FY104	C Programming	ESC	3	2	3	1	4
FY105	Basic Electrical Engineering*	ESC	3	-	3	-	3
FY109	Basic Electrical Engineering Lab	Skill Courses	-	2	-	1	1
FY111	Basic Workshop Practice-I	Skill Courses	-	2	-	1	1
FY113	Indian Knowledge System	Liberal Learning	-	2+2#	-	2	2
FY114	Co-curricular Course-I	Liberal Learning	-	4	-	2	2
Total			13	18	13	9	22

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
FY101	Engineering Mathematics I	40	40	40	60	2	25	-	125
FY102	Engineering Physics I	30	30	30	45	2	25	-	100
FY103	Engineering Chemistry I	30	30	30	45	2	25	-	100
FY104	C Programming	40	40	40	60	2	25	25	150
FY105	Basic Electrical Engineering*	40	40	40	60	2	-	-	100
FY109	Basic Electrical Engineering Lab	-	-	-	-	-	25	25	50
FY111	Basic Workshop Practice-I	-	-	-	-	-	50	-	50
FY113	Indian Knowledge System	-	-	-	-	-	50	-	50
FY114	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. 2023-24
Semester II

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract.	Theory	Pract.	Total
FY115	Engineering Mathematics II	BSC	3	2	3	1	4
FY116	Engineering Physics II	BSC	2	1	2	0.5	2.5
FY117	Engineering Chemistry II	BSC	2	1	2	0.5	2.5
FY107	Engineering Mechanics and Graphics*	ESC	3	-	3	-	3
FY118	Java Programming	PCC	3	2	3	1	4
FY121	Professional Communication Ethics-I	AEC	1	2	1	1	2
FY110	Engineering Mechanics and Graphics Lab	Skill Courses	-	2	-	1	1
FY123	Basic Workshop Practice-II	Skill Courses	-	2	-	1	1
FY125	Co-curricular Course-II	Liberal Learning	-	4	-	2	2
Total			**12**	**20**	**12**	**10**	**22**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
FY115	Engineering Mathematics II	40	40	40	60	2	25	-	125
FY116	Engineering Physics II	30	30	30	45	2	25	-	100
FY117	Engineering Chemistry II	30	30	30	45	2	25	-	100
FY107	Engineering Mechanics and Graphics*	40	40	40	60	2	-	-	100
FY118	Java Programming	40	40	40	60	2	25	25	150
FY121	Professional Communication Ethics	20	20	20	30	1	25	-	75
FY110	Engineering Mechanics and Graphics Lab	-	-	-	-	-	25	25	50
FY123	Basic Workshop Practice-II	-	-	-	-	-	25	25	50
FY125	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. 2024-25
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	OE	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 Logic and Computer Architecture	MD M	3	-	-	3	-	-	3
CE 205	**Human Values and Social Ethics**	***VEC***	2	-	-	2	-	-	2
CE 206	Python Programming Lab	CEP	-	2+2#	-	-	2	-	2
Total									**19**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Oral/ Pract.	Total
		1	2	Average					
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 Logic and Computer Architecture	40	40	40	60	2	-	-	100
CE 205	**Human Values and Social Ethic**	-		-	-	-	50	-	50
CE 206	Python Programming Lab	-		-	-	-	50	25	75
Total		**-**		**160**	**240**	**-**	**175**	**75**	**6505**

*** 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. 2024-25

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	MD M	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	AEC	3	-	-	3	-	-	3
CE 212	Entrepreneurship	***HSSM***	2	-	-	-	-	-	2
CE 213	Web Programming	***VSEC***	-	2+2#	-	-	2	-	2
CE 214	**Personal Finance Management**	VEC	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
CE 212	Entrepreneurship	30	30	30	45	2	-	-	75
CE 213	Web Programming	-	-	-	-	-	50	25	75
CE 214	Personal Finance Management	30	30	30	45	2	-	-	75
Total				**180**	**330**	**-**	**125**	**75**	**750**

*** 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. 2025-26
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	MD M	3	–	–	3	–	–	3
CE 304	Computer Network	PC	3	2	–	3	1	–	4
CE 305	**Professional Communication Skills II**	HSSM	2+2#		-		2	-	2
CE 3xx	Department Level Optional Course I	PEC	3	2	–	3	1	–	4
IL 3XX	ILOC-I	MC	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
CE 305	**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)	Advanced Database management System	Cryptography and Network Security	IoT Systems and Applications	Augmented Reality and Virtual Reality

Specializations	**Business and Entrepreneurship**	**Bioengineering**	**Engineering Design**	**Art and Humanities**	**Applied Science**	**Life Skills, Repair, Maintenance and Safety**
Course Code	1. IL350	IL 351	IL 352	1. IL 353	1. IL 354	1. IL 355
Institute Level Optional Course I (ILOC-I)*	IPR and Patenting	Introduction to Bioengineering	Product Design	Visual Art	Computational Physics	Vehicle Safety

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

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

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract.	Theory	Pract.	Total
CE 309	System Programming Compiler Construction	PCC	3	2	3	1	4
CE 310	Software Engineering and Project Management	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	MC	2	1	3	-	3
CE 391	Project A	SC		4	–	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 309	System Programming Compiler Construction	40	40	40	60	2	25	25	150
CE 310	Software Engineering and Project Management	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 310	CE 311	CE 312	CE 313
Department Level Optional Course II (DLOC II)	Data Warehouse and Data Mining	Ethical Hacking and Cyber Laws	Robotics and its Applications	Human Computer Interaction

Specializations	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 314	CE 315	CE 316	CE 317
Department Level Optional Course III (DLOC III)	Big Data Analysis	Advance System security	Internet of Everything	User Experience Design

Specializations	Business and Entrepreneurship	Bioengineering	Engineering Design	Art and Humanities	Applied Science	Life Skills, Repair, Maintenance and Safety
Course Code	1. IL 360	IL 361	IL 362	IL 363	IL 364	1. IL 365
Institute Level Optional Course II (ILOC II)*	e- Commerce and e-Business	Medical Image Processing	Technologies for Rural Development	Economics	GIS and Remote Sensing	Maintenance of Electronics and Mechanical Equipment

*** : 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. 2026-27

Semester VII

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract.	Theory	Pract.	Total
CE 401	Artificial Intelligence and Cognitive computing	PCC	3	2	3	1	4
CE 402	Parallel and Distributed Systems	PCC	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	Experiential Learning Courses	-	8	-	4	4
Total							**20**

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	Artificial Intelligence and Cognitive computing	40	40	40	60	2	25	25	150
CE 402	Parallel and Distributed Systems	40	40	40	60	2	25	25	150
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				**160**	**240**		**125**	**125**	**650**

Specializations	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 403	CE 404	CE 405	CE 406
Department Level Optional Course IV (DLOC IV)	Natural Language Processing	Network and Cloud security	Digital Image Processing	Usability Engineering

Specializations	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 407	CE 408	CE 409	CE 410
Department Level Optional Course V (DLOC V)	Data Science	Penetration and vulnerability Assessment	Deep Learning	Mobile and Ubiquitous Computing:

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

Semester VIII

Course Code	Course Name	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract.	Theory	Pract.	Total
CE 411	Software Testing and Quality Assurance	PCC	3	2	3	1	4
CE 4xx	Department Level Optional Course VI	PEC	3	2	3	1	4
CE 493	Internship/ OJT	Experiential Learning Courses	-	16		8	8
CE 494	Project C		-	8		4	4
Total			6	28	6	14	20

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Oral/ Pract.	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		1	2	Average					
CE 411	Software Testing and Quality Assurance	40	40	40	60	2	25	25	150
CE 4xx	Department Level Optional Course VI	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

Specializations	Artificial Intelligence and Data Science	Cloud and Cyber Security	Robotics and Automation	Human Computer Interaction
Course Code	CE 411	CE 412	CE 413	CE 414
Department Level Optional Course VI (DLOC VI)	Social Media Analytics	Digital Forensics	Computer Vision	Social Computing and Collaboration:

SEM I

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY101	Engineering Mathematics I	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					
FY101	Engineering Mathematics I	40	40	40	60	25	-	-	125

1. Course Objectives:

The course is aimed to:

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

2. 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 basic concept of Hyperbolic, Inverse Hyperbolic, and logarithmic functions in engineering problems.
3. Apply the concept of expansion of functions and successive differentiation in optimization problems.
4. Use the basic concepts of partial differentiation in finding the Maxima and Minima required in engineering problems.
5. Use the concept of matrices in solving the system of equations used in many areas of research.
6. Apply the concept of numerical Methods for solving the engineering problems with the help of SCILAB software.

3. **Detailed Theory Syllabus:**

Module	Detailed Contents	Hrs.
1	**Complex Numbers** **Pre-requisite:** Review of Complex Numbers‑Algebra of Complex Number, Cartesian, polar and exponential form of complex number. 1.1. De Moivre's Theorem.(Without Proof) 1.2. Expansion of sinnθ, cosnθ in terms of powers of sinθ, cosθ and Expansion of sin^nθ, cos^nθ in terms of sines and cosines of multiples of θ. 1.3. Powers and Roots of complex number.	6
2	**Hyperbolic , Inverse Hyperbolic and Logarithmic functions** 2.1 Introduction to Hyperbolic functions, Inverse Hyperbolic Functions. 2.2 Logarithmic functions, Separation of real and Imaginary parts.	6
3	**Successive Differentiation and Expansion of Function** **Pre-requisite :-** Derivative of standard functions and Rules of derivative. 3.1 Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and problems 3.2 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
4	**Partial Differentiation and Applications of Partial Differentiation.** 4.1 Partial Differentiation: Function of several variables, Partial derivatives of first and higher order. Differentiation of composite function. 4.2.Euler's Theorem on Homogeneous functions with two independent variables (without proof). Deductions from Euler's Theorem. 4.3 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
5	**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
6	**Numerical Methods** 6.1 **Solution of system of linear algebraic equations**, (1) Gauss Elimination, (2)Gauss Jacobi Iteration Method (3) Gauss Seidel Iteration Method, 6.2 **Solutions of Transcendental equations** (1) Bisection Method (2) Secant Method (3) Newton Raphson Method.	6

4. Suggested Experiments:

General Instructions: Each student has to perform at least 4 SCILAB /MATLAB practical's and at least 6 assignments on the entire syllabus.

List of Scilab Programing:

1. Gauss Elimination
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

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 5 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. Total three questions need to be solved.

6. Practical Assessment: 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 8 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) = 10 Marks (Practical) + 10 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

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

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY102	Engineering Physics I	Contact Hours	2	1	1	3
		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					
FY102	Engineering Physics I	30	30	30	45	25	-	-	100

1. Course Objectives:

The course is aimed to:

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.

2. Course Outcomes:

On successful completion of course learner/student 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 SQUID and Magnetic levitation.

3. Detailed Theory Syllabus:

Module	Detailed Contents of Module	Hrs.
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. Application of Lasers: Holography.	4
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. 2.3. Classification of optical fibres.	**3**

	2.4. Expression for V-number and modes of propagation for a step index fibre. 2.5. Applications : Fibre optic communication system	
3.	**Interference in Thin Films:** 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 3.3.Interference in thin films of constant thickness due to transmitted light: Conditions for maxima and minima 3.4.Interference in Wedge shaped film: Conditions for maxima and minima 3.5.Newton's Rings: Diameter of dark and bright rings	4
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. 4.3: Newton's Rings: Estimation of ring diameter for a particular wavelength and estimation of refractive index of gap medium.	**3**
5.	**Quantum Mechanics**: 5.1. De Broglie wave hypothesis, properties of matter waves: wave packet, Derivation of expressions for phase velocity and group velocity and their relationship. 5.2. Wave Function, its physical interpretation and salient features. 5.3. Heisenberg's Uncertainty principle statements and their interpretation: momentum and position/energy time forms. 5.4. Derivation of Schrodinger's Time Dependent Wave equation and Schrodinger's Time Independent Wave Equation 5.5.Energy Levels and distribution of probabilities of a charged particle bounded in an infinite potential well	**7**
6.	**Superconductivity**: 6.1. Critical temperature, critical magnetic field of a superconductor. 6.2. Meissner Effect, Type I and Type II and high Tc superconductors 6.3. BCS Theory (concept of Cooper pair) 6.4. Applications of superconductors: MAGLEV and qualitative discussion of Josephson effect and SQUID.	**3**

4. Suggested 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 .

5. Theory Assessment:

A. Internal Assessment (IA): 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.

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 15 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. Total three questions need to be solved.

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

C. Term Work: Term Work shall consist of 7 practical based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

D. Term Work Marks: 25 Marks (Total marks) = 10 Marks () + 10 Marks (Group Project **or** Topic Presentation) + 5 Marks (Attendance)

7. Books and 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.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY103	Engineering Chemistry I	Contact Hours	2	1	-	3
		Credits	2	1	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY103	Engineering Chemistry I	30	30	30	45	25	-	-	100

1. Course Objectives:

The course is aimed to:

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 students to understand the role of engineering materials such as polymers.
5. To introduce composite materials and their applications.
6. To provide an understanding of the fundamental chemical processes that cause environmental problems.

2. Course Outcomes:

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

1. To analyze the quality of water for application in industries and to suggest methods to improve water quality.
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 their applications in engineering.
5. To identify, describe and evaluate the properties of different types of composite materials.
6. To develop an understanding of the environmental challenges and suggest methods for their minimisation based on green chemistry principles.

3. **Detailed Theory Syllabus:**

Module	Detailed Contents	Hrs
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, Priming and Foaming, Scales and Sludges, caustic embrittlement, (Causes, methods of prevention), Langlier Index Softening of water- Ion exchange process.	3

2	**Module 2 - Water Treatment** Domestic water treatment : Steps involved in domestic water treatment - screening, sedimentation, filtration, disinfection - chlorination ,treatment with ozone. Desalination of brackish water- Reverse Osmosis, Electro dialysis, Ultrafiltration Sewage water treatment **:** BOD and COD, determination and numerical problems, Steps involved in sewage water treatment- primary, secondary (activated sludge process)	3
3	**Module 3 - Lubricants** **Pre - requisites** : Definition of Lubricants and Lubrication, functions of lubricants 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 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.	4
4	**Module 4 - Polymeric materials** **Pre - requisite** : 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 Tg, Viscoelasticity Additives in polymers Commercially important polymers - Polyethylene, Polyvinyl acetate, Polydimethyl Siloxane , Epoxy resins , Polylactic acid (PLA) Conducting polymers - Mechanism of conduction in polymers, Examples and applications.	6
5	**Module 5: Polymer Composites** **Prerequisite** :Definition and basic understanding of composite materials. Constitution of composite materials- Matrix and Dispersed phase Classification of composite materials - Particle reinforced composites, Fibre reinforced composites, structural composites . Advantages and Applications of composite materials	4
6	**Module 6 - Environmental Chemistry** **Pre- requisites:** Definition of Environment and Primary concept of environmental pollution**.** Industrial Pollution- Causes, Effects and solutions, a case study on industrial pollution E-pollution- Causes, concerns and management , Carbon credit Concept of 12 principles of Green chemistry, discussion with examples (synthesis of indigo, adipic acid), numericals on atom economy.	4

4. Suggested Experiments:

1. Determination of Hardness in water.
2. Determination of Chloride content in water.
3. Acid value of lubricating oil.
4. Viscosity Index by Redwood viscometer.
5. Determination of Dissolved oxygen in water.

6. Determination of COD.
7. Viscoelasticity of Silly putty.
8. Synthesis of conducting polyaniline from aniline by chemical oxidative polymerization

5. Theory Assessment:

A. **Internal Assessment (IA):** 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 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 5 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. Total three questions need to be solved.

6. Practical Assessment: 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:

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

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY104	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					
FY104	C Programming	40	40	40	60	25	25	-	150

1. 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.

2. Course Outcomes:

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

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

3. **Detailed Theory Syllabus:**

Module	Detailed Contents	Hrs
1	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.	5
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

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
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
5	Structures: 5.1 Structure Introduction, Declaration, Initialization, operations on structure. 5.2 Nested structure, Array of Structure.	3
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	6

4. Suggested Experiments:

1.Write algorithm and draw flowchart to find roots of quadratic equation
2.Write a program to swap two integers with and without using temporary variables.
3.Write a program to calculate the volume of a cone. Accept radius & height from the user.
4.Write a program to find the greatest among three integers using ternary operator & if-else.
5.An electric power distribution company charges its domestic customer as follows

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.

6. Write a program to take input for a character and print the month names starting with that character using a switch case. (Ex: I/P = ‘A’, O/P = April, August).
7. Write a program to find the result of the series:

1 - 2^2/3 + 3^2/5……+ n^2/(2n-1)

8. Write a program to print the following pattern : (Take input for the no. of lines ‘N’).

```
*
* *
* * *
* * * *
```

9. Write a program to print the following pattern : (Take input for the no. of lines ‘N’).

1
12A
123BA
1234CBA

10. Write a program to find if the given number is a palindrome number or not.
11. Write a program for the sum of natural numbers using a recursive function.
12. Write a program to illustrate different ways of passing parameters to a function to demonstrate increment/decrement operators.
13. Write a program to cyclically rotate elements of the integer array in the right direction.
14. Write a program to find transpose using the same matrix.
15. 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).
16.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.
17.Write a program to dynamically allocate memory for the user entered size 'N' of an array, accept 'N' integers from the user and find the average of these integers using function and pointer (Pass array to the function using pointer).

5. Theory Assessment:

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.

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 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. Total three questions need to be solved.

6. Practical Assessment: 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 a minimum of 5 practical based on the above list. Also Term work Journal must include at least 4 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 10 Marks (Practical) + 10 Marks (Assignments) + 5 Marks (Attendance)

7. Books and 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 .

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY105	Basic Electrical Engineering	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					
FY105	Basic Electrical Engineering	40	40	40	60	-	-	-	100

1.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.

2. **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.

3. Detailed Theory Syllabus:

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

Sr. No.	Module	Detailed Contents of Module	Hrs.
1	Dc Circuits	**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
2	DC Theorems	**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
3	AC fundamentals	**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

4	Single-Phase AC Circuits	**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**.**	1
5	Three-Phase AC Circuits	**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
6	Electrical Machines	**Electrical Machines** Working principle of single-phase transformer, EMF equation of a transformer, Transformation Ratio, Transformer Rating. Losses in transformer.	3

4. 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

5. Books and 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.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY109	Basic Electrical Engineering Lab	Contact Hours	-	2	-	2
		Credits	-	1	-	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY109	Basic Electrical Engineering Lab	-	-	-	-	25	-	25	50

Basic Electrical Engineering Laboratory

Hardware Requirements: Hardware Kits, Three phase power supply.

List of Suggested Experiments:

1. Mesh and Nodal analysis.
2. Verification of Superposition Theorem.
3. Verification Thevenin's Theorem.
4. Study of R-L series and R-C series circuit.
5. R-L-C series resonance circuit
6. R-L-C parallel resonance circuit
7. Relationship between phase and line currents and voltages in three phase system (star & delta)
8. Power and phase measurement in three phase system by one wattmeter method.
9. Power and phase measurement in three phase system by two wattmeter method.

Lab Assessment:

I. Term work Assessment:

Term work consists of performing minimum 06 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	Scheme	Theory	Practical	Tutorial	Total
FY111	Basic Workshop Practice I	Contact Hours	-	3	-	3
		Credits	-	1.5	-	1.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY111	Basic Workshop Practice I	-	-	-	-	50	-	-	50

1. Course Objectives:

The course is aimed to:

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

2. Course Outcomes:

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

1. To develop the necessary skill required to handle / use different fitting tools.
2. To develop skills required for hardware maintenance.
3. Able to install an operating system and system drives.
4. Able to prepare the edges of jobs and do simple arc welding.
5. Demonstrate the turning operation with the help of a simple job.

3. Detailed Theory Syllabus:

Module No	Module	Detailed Contents of Module	Hrs.
1	Fitting	Fitting: Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping. Term work to include one job involving following operations : filing to size, one simple male- female joint, drilling and tapping	10
2	Hardware and Networking	Hardware and Networking: 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. ·Assembling of PC, Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one) · Basic troubleshooting and maintenance · 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	8
3	Welding	Welding: Edge preparation for welding jobs. Arc welding for different job like, Lap welding of two plates, butt welding of	6

		plates with simple cover, arc welding to join plates at right angles.	
4	Machine Shop	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.	6
5	Plumbing	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.	6
6	Adaptive Manufacturing Technology	Adaptive Manufacturing Technology: History of adaptive manufacturing, 3D Printer: - how a 3D printer works, Parts of 3D Printer and their functions, Constructional details of 3D printer.	6

Note:- Trade 1 & 2 are compulsory and select any one trade from trade 3 to 6.

4. 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: 50 Marks (Total marks) = 30 Marks (Experiment) + 10 Marks (Assignments) + 10 Marks (Attendance)

7. Books and 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
4. Workshop Technology by Chapman.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY113	Indian Knowledge System	Contact Hours	1	2	-	3
		Credits	1	1	-	2

Course Code	Course Name	Examination Scheme				
		Theory Marks	Term Work	Practical	Oral	Total
		End Sem Exam				
FY113	Indian Knowledge System	20	30	-	-	50

1. Course Objectives:

The course is aimed to:

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; Adding career, professional, and business opportunities to the youths

2. Course Outcomes:

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

1. Understand the importance of ancient Indian knowledge in today's world and its historical background.
2. Gain an appreciation for the valuable cultural heritage found in our traditions.
3. Discover the history and the scientific aspects behind our traditional arts, practices, and rituals.

3. Detailed Theory Syllabus:

Module	Detailed Contents	Hrs
1	**Indian Knowledge Systems: An Overview** Traditional Knowledge System, Introduction to the Vedas, Chhandas, Veda and Vedāṅga, Itihāsa and Purāṇa, Dharmaśāstra, Darśanas, Nyāya. The role of Itihasas and Puranas in understanding the Vedas.	4
2	**History of Indian Knowledge Systems** Bhagwat Purana, Arthashastra, ,The importance of Sthapatya-veda. The ancient cities of the Indus Saraswati region. Town planning and drainage systems. Irrigation and Dams, Decline of Knowledge system, Attack on the Universities and Knowledge Creation	4
3	**Iron and Steel Technology in Ancient India** Vedic references to metals and metal working. Mining and manufacture in India of Zinc, Iron, Copper, Gold, etc., from ancient times. Significance and wide prevalence of ironsmith and other metal workers in the pre-modern era.	4

4. Theory Assessment:

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

5. Term Work: Project and Presentation for 30 marks based on the syllabus

6. Books and 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	Scheme	Theory	Practical	Tutorial	Total
FY114	Co curricular course-I	Contact Hours	-	4	-	4
		Credits	-	1	-	2

Course Code	Course Name	Examination Scheme				
		Theory Marks	Term Work	Practical	Oral	Total
		End Sem Exam				
FY114	Co curricular course-I	-	50	-	-	50

Sr No.	Name of Activity	Number of Hours
1	Meditation	3
2	Makers Day	2
3	Pre-Placement Talk	2
4	NPTEL Course	
5	Any other Activity	

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 of 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)

SEM II

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY115	Engineering Mathematics II	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					
FY115	Engineering Mathematics II	40	40	40	60	25	-	-	125

1. Course Objectives:

The course is aimed to:

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 SCILAB software to handle Mathematical modeling.

2. 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 SCILAB software.

3. Detailed Theory Syllabus:

Prerequisite: Engineering Mathematics I

Sr. No.	Module	Detailed Contents of Module	Hrs.
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

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 ^axV*, *xV*. 2.2. Cauchy Differential equation, 2.3. Method of variation of parameters two variables	8
3	Beta and Gamma Function	3.1 Gamma Functions and its properties. 3.2 Beta Functions and its properties.	4
4	Double Integration	**Prerequisite**: Tracing of curves 4.1. 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
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
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

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 5 questions, each carrying 20 marks.

2.Total three questions need to be solved.

2.Question number 1 will be compulsory and based on the maximum contents of the syllabus.

3.Remaining questions will be randomly selected from modules.

4.Weightage of each module will be proportional to the number of respective lectures mentioned in the syllabus.

5. Books & References:

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley EasternLimited, 9thEd.
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 4 SCILAB /MATLAB practical's and at least 6 assignments on the entire syllabus.

List of Scilab 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.

Term Work:

The distribution of Term Work marks–

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

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY116	Engineering Physics II	Contact Hours	2	1	-	3
		Credits	2	1	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY116	Engineering Physics II	30	30	30	45	25	-	-	100

1. Course Objectives:

The course is aimed to:

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.

2. Course Outcomes:

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

1. Comprehend the basic concepts of semiconductor physics and apply the same to electronic devices.
2. Apply the concepts of electromagnetism in focusing systems and CRO.
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.

3. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Contents of Module	Hrs.
1	Semiconductors	**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.	7

		1.4 Energy level diagrams for unbiased and biased P-N junction. 1.5 Hall Effect: Derivation of expression for Hall Voltage and Hall coefficient. 1.6 Semiconductor Devices: I-V curves and mechanism for Solar Cell, LED and Zener Diode	
2	Electron Optics and CRO	**Electron Optics and CRO**: 2.1. Bethe's law 2.2 Electrostatic and Magnetic focussing 2.3 Cathode Ray Tube and its applications. 2.4. Block diagram of a CRO: CRT, Sawtooth Sweep Generator, Synchronisation and power supply 2.5. Applications of CRO: Measurement of : DC and AC voltages, frequency value and phase difference	4
3	Physics of Sensors	**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
4	Electrodynamics	**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
5	Material Characterisation Techniques	**Material Characterisation Techniques** 5.1 X-Ray Diffraction: Bragg's law and its application in measuring crystal lattice parameters. 5.2 STM and AFM, SEM and TEM: Principle of operation and working using schematic diagrams.	3
6	Ultrasonics	**Ultrasonics** : 6.1. Ultrasonic Wave generation; Magnetostriction Oscillator; Piezoelectric Oscillator; 6.2. Applications of ultrasonic: Echo sounding; NDT; ultrasonic cleaning(cavitation); ultrasonic sensors; 6.3.Industrial applications of ultrasonic(soldering, welding, cutting, drilling)	2

4. Theory Assessment:

A. Internal Assessment (IA): 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.

B. End Semester Theory 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 consist 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 3 then part (b) will be from other than module 3)

4. Total three questions need to be solved.

5. Books & 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

Suggested 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.

Term work:

Term Work shall consist of a minimum six experiments.
Overall Rubric for the distribution of term work marks:
Laboratory work (Experiments and Journal) : 10/20 marks
Group Project **or** Topic Presentation (Optional) : 10 marks
Attendance (Theory and Practical) : 05 marks

Note: Individual teachers may follow a different rubric for distribution of marks for term work.
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	Scheme	Theory	Practical	Tutorial	Total
FY117	Engineering Chemistry II	Contact Hours	2	1	-	3
		Credits	2	1	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY117	Engineering Chemistry II	30	30	30	45	25	-	-	100

1. Course Objectives:

The course is aimed to:

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.

2. Course Outcomes:

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

1. To understand and analyze the combustion mechanisms of various fuels and be able to characterize the 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 applications.

3. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Contents of Module	Hrs.
1	Fuels and combustion	**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 Solid fuels : Coal (Definition and Ranking) Analysis of coal - Proximate and Ultimate analysis, Numerical problems Liquid fuels: Petroleum -Composition, classification (Mining, Refining - Various fractions , their boiling points, composition and uses), Fuels for Internal Combustion Engines - Knocking, Octane number, Anti Knocking agents, Cetane number. Gaseous Fuels: Natural gas, CNG and LPG, (Composition, Properties and uses) Combustion of fuels – Numerical problems for calculating the amount of air needed for the complete combustion of solid and gaseous fuels. Green fuels - Biodiesel	6
2	Engineering Electrochemistry	**Module 2- Engineering Electrochemistry** **Pre -requisite :** redox reaction, cell reaction, electrode and its type, salt bridge Electrode potential, electrode reaction, derivation of Nernst equation for single electrode potential, numerical problems. Electrochemical cells, Concentration cells. Reference electrodes -Types of reference electrodes, Construction, working of SHE, Calomel electrode	3
3	Battery Technology	**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 Fuel Cells: Introduction, classification of fuel cells, limitations & advantages of fuel cells, Construction of Hydrogen oxygen alkaline fuel cells.	3

4	Corrosion and its Control	**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 Protective Coatings: Metallic coatings - anodic coating (galvanizing) and cathodic coating (Tinning) Methods of Applying Metallic Coatings - Hot dipping, Metal Spraying, Electroplating and Diffusion coating Organic coatings – Paints	6
5	Spectroscopic Techniques	**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 Fluorescence and its applications	3
6	Nanomaterials	**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 Applications of nano materials	3

4. Theory Assessment:

A. Internal Assessment (IA): 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 75 minutes.

B. End Semester Theory 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 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 & 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 Suggested Experiments:

1. Determination of moisture content and ash value in coal sample.
2. Preparation of bio- diesel.
3. Preparation of Fe2O3 nanoparticles.
4. Cu-Zn electrochemical cell- Effect of conc.on cell potential.
5. Determination of thinner content in paint.
6. Determination of strength of a strong acid by pH meter
7. Determination of strength of a strong acid by conductivity meter
8. EMF measurement

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

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

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY107	Engineering Mechanics & Graphics*	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					
FY107	Engineering Mechanics & Graphics*	40	40	40	60	-	-	-	100

1. Course Objectives:

The course is aimed to:

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 visualize physical configurations in terms of actual systems and its constraints, and able to formulate the mathematical function of the system.
3. To study, analyze 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 visualization skill.
6. To teach basic utility of computer aided drafting (CAD) tools.

2. Course Outcomes:

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

1. Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of FBD.
2. Illustrate different types of motions and establish Kinematic relations for a particle & rigid body.
3. Analyze particles in motion using force-acceleration, work-energy and impulse momentum principles.
4. Apply the basic principles of projections in reading and converting 3D view to 2D drawing.
5. Visualize an object from the given two views and convert 2D view to 3D drawing.
6. Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.

3. **Detailed Theory Syllabus:**

Module	Detailed Contents	Hrs
1	**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**
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**
3	**Kinematics of Particle and Rigid Body:** **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.	**06**
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**

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**
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**

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

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 90 minutes.

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 15 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. Total three questions need to be solved.

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

C. **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.

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

7. Books and 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 HousePvt. 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.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
FY118	Java Programming	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					
FY118	Java Programming	40	40	40	60	25	25	-	150

1. **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.

2. **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.

3. Detailed Theory Syllabus:

Prerequisite: Basics of Computer Programming

Sr. No.	Module	Detailed Contents of Module	Hrs.
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	08
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
3	Array, String and Vector	Array, Strings, String Buffer class, Wrapper classes, Vectors	03
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, using final, Dynamic Method Dispatch **Interfaces:** Defining, implementing and extending interfaces, variables in interfaces, Default Method in Interface, Static Method in interface, Abstract Classes vs Interfaces.	08
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 Thread, Implementing Runnable, Extending Thread, Creating Multiple Threads, Synchronization: Using Synchronized Methods, The synchronized Statement	05

6	GUI programming in JAVA	**Designing Graphical User Interfaces in Java:** Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components **Event-Driven Programming in Java:** Event-Handling Process, Event-Handling Mechanism, Event Listeners **Introducing Swing:** AWT vs Swings, Components and Containers, Swing Packages, A Simple Swing Application, Painting in Swing, Designing Swing GUI Application using Buttons, JLabels, Checkboxes, Radio Buttons, JScrollPane, JList, JComboBox, etc. **Introduction to JDBC**: Introduction to JDBC, JDBC-ODBC connectivity, JDBC architecture.	08

4. Assessment:

I.Internal Assessment :

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 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 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 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

5. Books & 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 Suggested 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	1. Internet Connection for installing additional packages if required

1. Programs on Basic programming constructs like branching and looping
2. Programs on Basic programming constructs like branching and looping
3. Programs on class and objects
4. Program on method and constructor overloading.
5. Program on Packages
6. Program on 2D array, strings functions
7. Program on String Buffer and Vectors
8. Program on types of inheritance
9. Program on Multiple Inheritance
10. Program on abstract class and abstract methods
11. Program using super and final keyword
12. Program on Exception handling
13. Program on user defined exception
14. Program on Multithreading
15. Program to create GUI application
16. Mini Project based on the content of the syllabus (Group of 3-4 students)

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	Scheme	Theory	Practical	Tutorial	Total
FY121	Professional Communication and Ethics - I	Contact Hours	2	2	-	2
		Credits	1	1	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY121	Professional Communication and Ethics - I	20	20	20	30	25	-		75

1. **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.

2. **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.

3. **Detailed Theory Syllabus:**

Sr. No.	Module	Detailed Contents of Module	Hrs.
1	**The Importance and Strategies of Effective Listening**	**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 a) Ability to discriminate stress and intonation b) Comprehend meaning of audio text-graded on the basis of vocabulary, sentence construction and theme. c) Potential barriers	**5 Hrs**
2	**Developing Speaking Skills**	**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**
3	**Strategies and Techniques to build Reading Skills**	**Strategies and Techniques to build Reading Skills** 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,	**5 Hrs**

		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	
4	**Developing Professional Writing Skills**	**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**
5	**Etiquette and Grooming for Personality Development**	**Etiquette and Grooming for Personality Development** 5.1 Social Etiquette 5.2 Corporate etiquette 5.3 Confidence building and Personality development	**1 Hr**
6	**Vocabulary and Grammar**	**Vocabulary and Grammar** 6.1 Contextual vocabulary Development- Word Maps 6.2 Identifying errors in a sentence.	**1 Hr**

4. 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.

5. Books & 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

Sr. No.	Level	Detailed Lab/Tutorial Description	LO Mapping
	1. Basic 2. Design 3. Advanced 4. Project/Case Study/Seminar		
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	Scheme	Theory	Practical	Tutorial	Total
FY123	Basic Workshop Practice-II	Contact Hours	-	2	-	2
		Credits	-		-	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY123	Basic Workshop Practice-II	-	-	-	-	50	-		50

1. **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.
2. **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.

3. **Detailed Syllabus**

Module	Detailed Contents	Hrs.
	Module 1 and 2 are compulsory. Select any one trade topic out of the topic trade 3 and 5. Demonstrations with hands on experience to be provided during the periods. Report on the demonstration including suitable sketches to be included in term work. Trade evaluation is to be done according to the opted Trades in addition to compulsory trades.	**5 Hrs**
1	**Carpentry (Compulsory)** 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. Term work to include one carpentry job involving a joint and report on demonstration of a job involving wood turning	**8**
2	**Basic Electrical workshop:(Compulsory):** Single phase and three phase wiring. Familiarization. of protection switchgears and their ratings (fuse, MCB, ELCB). Wiring standards, Electrical safety in the work place safe work practices. Protective equipment, measures and tools. Layout drawing, layout transfer to PCB, etching and drilling and soldering technique	**8**
3	**Measurement*** Vernier Height gauge, wire gauge, Dial gauge of the listed guages and precaution.	**4**
4	**Sheet metal working and Brazing:** Use of sheet metal, working hand tools, cutting , bending , spot welding.	
5	**Forging (Smithy):** At least one forging job to be demonstrated and a simple job to be made for Term Work in a group of 4 students	

1. 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

5. Books & 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	Scheme	Theory	Practical	Tutorial	Total
FY114	Co-curricular course - II	Contact Hours	-	4	-	4
		Credits	-	1	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
FY114	Co-curricular course - II	-	-	-	-	50	-		50

Sr No.	Name of Activity	Number of Hours
1	Yoga Day	6
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	

SEM III

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 201	Engineering Mathematics III	Contact Hours	3	-	1	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. Understand the concept of complex variables, C-R equations with applications.
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. Apply complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic functions.
5. Apply the concept of relation and function
6. Use groups and codes in Encoding-Decoding

3. Detailed Theory Syllabus:

Prerequisite: Engineering Mathematics I, Engineering Mathematics-II

Sr. No.	Module	Detailed Contents of Module	Hrs.
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, Division by t, (Properties without proof). Inverse of Laplace Transform by partial fraction and convolution theorem.	7
2	Fourier Series , Fourier Transform	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, Fourier Transform.	6

3	Linear Algebra, Matrix Theory	Eigenvalues and eigenvectors, Diagonalization of matrices; Cayley-Hamilton Theorem, Functions of square matrix, Singular Value Decomposition	7
4	Complex Variables and conformal mappings	Function f(z) of complex variable, Analytic function: Necessary and sufficient conditions for f(z) to be analytic, Cauchy-Riemann equations in Cartesian coordinates, Milne-Thomson method: Determine analytic function f(z)when real part(u), imaginary part (v) is given, Conformal mapping, Linear and Bilinear mappings, cross ratio	6
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
6	Algebraic Structures, coding theory	Properties of Binary Operations,, Group, Ring, Group Code, Decoding and Error Correction, Maximum Likelihood Technique, parity-check matrix.	6

4. Theory Assessment:

C. **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.

D. **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. Tutorial Assessment: The final certification and acceptance of TW ensures the satisfactory performance of tutorials and minimum passing in the TW.

A. **Term Work:** Batch wise tutorials have to be conducted. Students must be encouraged to write at least 6 class tutorials on the entire syllabus. Also Term Work Journal must include at least 2 assignments based on topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Class Tutorials on entire syllabus) + 5 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 concept and implementation of linear and nonlinear data structures.
3. To analyse various data structures and select the appropriate one to solve a specific real-world problem.
4. To introduce various techniques for representation of the data in the real world.
5. To teach various searching techniques.

2. Course Outcomes:
On successful completion of course learner/student will be able to:
1. Students will be able to implement linear and Non-Linear data structures.
2. Students will be able to handle various operations like searching, insertion, deletion and traversals on various data structures.
3. Students will be able to explain various data structures, related terminologies and its types.
4. Students will be able to choose appropriate data structure and apply it to solve problems in various domains.
5. Students will be able to analyse and Implement appropriate searching techniques for a given problem.
6. Students will be able to demonstrate the ability to analyse, design, apply and use data structures to solve engineering problems and evaluate their solutions.

3. Detailed Theory Syllabus:
Prerequisite: Knowledge of C programming language

Sr. No.	Module	Detailed Contents of Module	Hrs
1	Introduction to Data Structures	Introduction to Data Structures, Concept of ADT, Types of Data Structures - Linear and Nonlinear, Operations on Data Structures.	3

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
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.	10
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
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
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

4. Suggested Experiments:

1. Implement Stack ADT using array.
2. Convert an Infix expression to Postfix expression using stack ADT.
3. Evaluate Postfix Expression using Stack ADT.
4. Implement Linear Queue ADT using array.
5. Implement Circular Queue ADT using array.
6. Implement Singly Linked List ADT.
7. Implement Circular Linked List ADT.
8. Implement Stack / Linear Queue ADT using Linked List.
9. Implement Binary Search Tree ADT using Linked List.
10. Implement Graph Traversal techniques : a) Depth First Search b) Breadth First Search

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 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.

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 10 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. Develop 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 diagram 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.

3. Detailed Theory Syllabus:

Prerequisite : Basic knowledge of file system, any programming language

Module No	Module	Detailed Contents of Module	Hrs.
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
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
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
4	Structured Query Language (SQL)	Overview of SQL, Data Definition Language Commands, Integrity constraints: key constraints, Domain Constraints,	12

		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.	
5	Relational-Database Design	Decomposition, Functional Dependency Concept of normalization, First Normal Form, 2NF, 3NF, BCNF.	5
6	Introduction to Transactions Management	Transaction concept, Transaction states, ACID properties, Transaction Control Commands, Concurrent Executions, Serializability-Conflict and View.	4

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. Duration of each test shall be one and a half hour.

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 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. Total 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, Slberchatz, Sudarshan, Database System Concepts, 6thEdition, McGraw Hill.
2. Elmasri and Navathe, Fundamentals of Database Systems, 5thEdition, 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.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 204	Digital Logic and Computer 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 204	Digital Logic and Computer 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 have an understanding of processor organization.
4. To study the characteristics of memory systems including internal and cache memories.
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 different Processor Organization concepts
4. Understand memory hierarchy and organization with different types of memories
5. Identify various types of buses, interrupts and I/O operations in a computer system
6. Describe Parallel processing and Pipeline concepts

3. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Contents of Module	Hrs
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, Evolution of x86 Computers, Von Neumann model, Harvard Model, Embedded system .Performance Issues: Designing for performance, Amdahl's Law.	6
2	Computer Arithmetic Algorithms	Number representation: 1's and 2's complement representation. Binary Arithmetic: Addition, Subtraction, Multiplication, Division using 2's complement, BCD and Hex Arithmetic Operation. Addition, Subtraction Multiplication using Booth's algorithm, Division using Restoring and non-restoring division algorithms. IEEE 754 floating point number representation.	9
3	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

4	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
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
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

4. Suggested Experiments:

1. Verify the truth table of various logic gates using ICs / virtual lab
2. Realize the gates using universal gates
3. Code conversion
4. Realize half adder and full adder
5. Binary addition, subtraction, Booth's Algorithm, Restoring and Non restoring Division, IEEE representation
6. Computer Components- Memory, Ports, Motherboard and add-on cards
7. Assembling and Dismantling and PC
8. ALU Design, CPU Design
9. Memory design, Cache Memory design
10. Case study on buses like ISA, PCI, USB etc
11. Case Study on multi-core Processors

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 half hour.

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.

6. Practical Assessment: An 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 10 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. R. P. Jain, "Modern Digital Electronic", McGraw-Hill Publication, 4thEdition.
2. William Stalling, "Computer Organization and Architecture: Designing and Performance", Pearson Publication 10TH Edition.

3. John P Hayes, “Computer Architecture and Organization”, McGraw-Hill Publication, 3RD Edition.
4. Dr. M. Usha and T. S. Shrikanth, “Computer system Architecture and Organization”, Wiley publication.

B. References:

1. Malvino, “Digital computer Electronics”, McGraw-Hill Publication, 3rdEdition.
2. B.Govindarajalu, “Computer Architecture and Organization”, McGraw-Hill Publication.
3. Smruti Ranjan Sarangi, “Computer Organization and Architecture”, McGraw-Hill Publication.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 205	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 205	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. Learners will be able to recognize the relation between ethics and values pertinent for an engineering professional.
2. Learners will be able to exercise the responsibility for establishing fair and just processes for participation and group decision making
3. Learners will be able to demonstrate an awareness of self-held beliefs and values and how they are altered in interactions with others.
4. Learners will be able to acquire the writing skills necessary to analyse data from research and attribute the source with proper citation.
5. Learners will be competent to incorporate values and ethical principles in social and professional situations.
6. Learners will be able to evaluate technology development and its application on the basis of moral issues and individual rights.

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
1	Ethics and Values	Meaning & Concept of Ethics Difference between Ethics and Values Ethical code of conduct	3
2	Professional Ethics	Professional Ethics vs Personal ethics Components of professional ethics Professional values and its importance	5

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	5
4	Ethics in Technical writing	Documenting sources Presentation of Information Ethics & Plagiarism	5
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

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 206	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 206	Python Programming Lab	-	-	-	-	50	25	--	75

1. Lab Objectives:

The lab is aimed to:

1. Basics of python including data types, operator, conditional statements, looping statements input and output functions in Python
2. List, tuple, set, dictionary, string, array
3. Functions, Concepts of modules, packages
4. Object Oriented Programming concepts in python
5. Concept of exception handling and File handling operations
6. Graphical User Interface and SQLite Database

2. Lab Outcomes:

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

1. To understand the structure, syntax of the Python language
2. To interpret varied data types in python
3. To implement functions, modules and packages
4. To illustrate the concepts of object-oriented programming as used in Python
5. To raise and handle exceptions through exception handling mechanisms and to implement File handling programs
6. To gain proficiency in creating GUI applications and implement database connectivity in python

3. Detailed Theory Syllabus:

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

Sr. No.	Module	Detailed Contents of Module	Hrs
1	Basics of Python	Introduction, Features, Python building blocks – Identifiers, Keywords, Indention, 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
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.	10

		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	
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.	08
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.	03
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.	05
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.).	06

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.

SEM IV

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 208	Engineering Mathematics IV	Contact Hours	03	--	01	04
		Credits	03	--	01	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
CE 208	Engineering Mathematics IV	40	40	40	60	25	--	--	125

1. **Course Objectives:**

The course is introduced to

1. Understand the basic techniques of statistics like correlation, regression, and curve fitting for data analysis, Machine learning, and AI.
2. Acquainted with the concepts of probability, random variables with their distributions and expectations.
3. Understand the concepts of vector spaces used in the field of machine learning and, engineering problems, To learn the Non-Linear Programming Problems techniques.
4. Introduce students to Lattice theory, recurrence relations.
5. Learn sampling theory and Number theory.
6. Introduce students to graphs, and trees.

2. Course Outcomes:

The learner will be able to

1. Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning, and AI.
2. Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
3. Apply the concept of vector spaces and orthogonalization process in Engineering Problems. Solve Non-Linear Programming Problems to engineering problems of optimization.
4. Express recursive functions of other subjects like Data Structures as recurrence relations.
5. Use the concept of sampling theory and Number theory to engineering problems.
6. Understand the use of functions, graphs and trees in programming applications.

3. Detailed Theory Syllabus:

Prerequisite: Engineering Mathematics I, Engineering Mathematics-II, Engineering Mathematics-III

Sr. No.	Module	Detailed Content	Hours
1	Correlation and Regression	Scattered diagrams, Karl Pearson‟s coefficient of correlation, covariance, Spearman‟s Rank correlation(non-repeated and repeated ranks) Regression coefficient & Lines of Regression, Fitting of the straight line and parabolic curve.	6

2	Probability, Probability Distributions,	Discrete and Continuous random variables, Probability mass and density function, Probability distribution for random variables, Expectation, Variance, Binomial distribution ,Poisson distribution, Normal distribution.	6
3	Linear Algebra :Vector Spaces and NonLinear programming (NLPP)	Vectors in n-dimensional vector space, norm, dot product, The Cauchy Schwarz inequality, Unit vector ; Linear combinations, Orthogonal projection, Orthonormal basis, Gram-Schmidt process for vectors ; Vector spaces over real field,. NLPP with one equality constraint (two variables) using the method of Lagrange's multipliers, NLPP with one inequality constraint (two variables) using Kuhn-Tucker conditions.	7
4	Lattice Theory & Recurrence relation,	Poset, Hasse Diagram, Lattices, Special Types of Lattices, Solving Recurrence relation, Linear Homogeneous Recurrence relation with constant coefficients,	6
5	Sampling Theory, Number Theory,	Small Sample test, Large Sample test, chi-square test, Euler's, Fermat's Little Theorem, Congruences, Computing Inverse in Congruences, Chinese Remainder Theorem, Euclid's algorithm,	8
6	Graphs and Trees:	Types of Graphs, And Isomorphism Of Graphs, Subgraphs, Types of Graphs, Complement of Graphs, Connected Graphs, Eulerian And Hamiltonian Graphs, Trees, Minimum Spanning Tree, Kruskal's Algorithm.	6

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.

A. 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 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. Total three questions need to be solved.

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 tutorial work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of tutorials 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).

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 209	Design and Analysis of Algorithms	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 209	Design and Analysis of Algorithms	40	40	40	60	25	25	--	150

1. Course Objectives:

The course is aimed to:

1. To conceptualize learners with mathematical models for analysis of algorithm
2. Describe, apply and analyze the complexity of divide and conquer strategy
3. Describe, apply and analyze the complexity of dynamic programming strategy
4. Describe, apply and analyze the complexity of greedy strategy
5. Explain and apply backtracking, branch and bound and to deal with computationally hard problems.
6. Describe the classes P, NP, and NP-Complete

2. Course Outcomes:

Learner should be able to:

1. Analyze space and time complexity of various algorithms
2. Understand and Apply divide and conquer strategy.
3. Describe, apply and Analyze design strategy and complexity for optimization problems.
4. Describe, apply and Analyze design and complexity of Backtracking.
5. Describe, apply and Analyze design strategy and complexity of Branch and Bound.
6. Understand concepts of various complexity classes.

3. Detailed Theory Syllabus:

Prerequisite : C Programming, Python Programming

Module No	Module	Detailed Contents of Module	Hrs.
1	Introduction to analysis of algorithm	Problems and Instances, RAM model of computation and costing methods(uniform costing), time and space complexity, *Analysis of algorithm*:- Asymptotic notations, Best, average and worst case analysis (*example:- Incremental sorting algorithm:- Insertion Sort on an array input*)	4
2	Divide and Conquer Approach	General Method, Analysis of D&C algorithm:-General equation, solution using Recursion tree, Master Theorem, Applications- Large number multiplication, Sorting	8

		problem:- Merge sort, Quick sort, Order statistic problem:- Finding kth smallest element of an array	
3	Dynamic Programming Approach	General method, *Applications*-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Single source shortest path problem	9
4	Greedy Method Approach	General method, *Applications*-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.	8
5	Backtracking and Branch-and-bound	*Backtracking*: General method, *Applications*-n-queen problem, sum of subsets problem, graph coloring *Branch and Bound*: General method, *Applications* - Travelling salesperson problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.	6
6	Introduction to Computational Complexity Theory	Decision problems, Languages and Encoding schemes, Complexity class P, Non-deterministic computation and class NP, Relationship between P and NP, Concept of polynomial reduction and NP-completeness, class NP-Hard	4

4. Suggested Experiments:

Software Requirements if any: C, Python wherever required

1. All 3 Programs
   a) Implement Insertion sort, Merge sort, Quicksort on array input
   b) Write a program, analyze it and find time complexity with various cases.
2. Both Programs
   a) Implement D&C approach to Large number multiplication, Finding k^{th} smallest element of a given array input
   b) Write a program, analyze it and find time complexity with various cases.
3. Any two Programs
   a) Implement DP approach to Matrix chain multiplication/Optimal binary search trees/0/1 knapsack problem/All pairs shortest path problem.
   b) Write a program, analyze it and find time complexity with various cases.
4. Any two Programs
   a) Implement a greedy approach to Fractional knapsack problem/ Minimum cost spanning trees/ Single source shortest path problem.
   b) Write a program, analyze it and find time complexity with various cases.
5. Any two Programs
   a) Implement backtracking approach to n-queen problem/ sum of subsets problem/ graph coloring.
   b) write a program, analyze it and find time complexity with various cases.
6. Write a case study on TSP.

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 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. Total 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 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)

7. Books and References:

A. Books:

1. Ellis Horowitz, Satraj Sahni and Rajasekaran, *Fundamentals of Computer Algorithms*, Galgotia publications pvt. Ltd.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, *Design and Analysis of Algorithms* Pearson Education, 2007
3. T. H. Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, *Introduction to Algorithms*, 2nd edition, Prentice-Hall India, 2001
4. Michael R. Garey and David S. Johnson. *Computers and Intractability: A Guide to the Theory of NP-Completeness*. W. H. Freeman, 1979.

B. References:

1. J. Kleinberg and E. Tardos, *Algorithm Design*, Pearson International Edition, 2005.
2. G. Brassard and P. Bratley, *Fundamentals of Algorithmics*, Prentice Hall India, 1996

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 210	Operating 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 210	Operating Systems	40	40	40	60	25	--	25	150

1. Course Objectives:

The course is aimed to:

1. To introduce basic concepts and functions of operating systems.
2. To introduce the concept of a process, thread and its management.
3. To introduce the basic concepts of Inter-process communication (IPC) and to understand concepts of process synchronization and deadlock.
4. To understand the concepts and implementation of memory management policies and virtual memory.
5. To understand functions of Operating Systems for file management and device management.
6. To study the need and fundamentals of special-purpose operating systems with the advent of new emerging technologies.

2. Course Outcomes:

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

1. Understand the role of Operating System in terms of process, memory, file and I/O management.
2. Apply and analyse the concept of a process, process scheduling and threads.
3. Understand and apply the concepts of synchronization and deadlocks.
4. Apply and analyse the concepts of memory management techniques. Evaluate the performance of memory allocation and replacement techniques.
5. Apply and analyse different techniques of file and I/O management.
6. Compare the functions of various special purpose Operating Systems.

3. Detailed Theory Syllabus:

Prerequisite : Basic knowledge of Data structures and Computer architecture, Any programming language

Module No	Module	Detailed Contents of Module	Hrs.
1	Operating system Overview	Introduction, Objectives, Functions and Types of Operating System, Operating System Services and Interface, Operating system structures: Layered, Monolithic and Microkernel. Linux Kernel, Shell and System Calls.	03
2	Process and Process Scheduling	Concept of a Process, Process States, Process Description, Process Control Block, Operation on Process Uniprocessor Scheduling-Types: Pre-emptive and Non-pre-emptive, scheduling algorithms (FCFS, SJF, SRTN, Priority, RR) Threads: Definition and Types, Concept of Multithreading, Introduction to Linux Scheduling.	08

3	Process Synchronization and Deadlocks	Principles of Concurrency, Inter-Process Communication, Process Synchronization, Mutual Exclusion: Peterson Solution, Hardware Support (TSL),Operating System Support (Semaphores), Classic problem of Synchronization, Principles of Deadlock: Conditions and Resource, Allocation Graphs, Deadlock Handling Mechanism, Dining Philosophers Problem.	09
4	Memory Management	Basic Concept of Memory Management; Swapping; Contiguous Memory Allocation Techniques; Paging; TLB, Segmentation; Basic Concepts of Virtual memory; Demand Paging, Copy-on Write; Page Replacement Algorithms; Thrashing	10
5	File Management and Input /Output	Overview, File Organization and Access,File Allocation Method, File Directories, Free Space management, Linux Virtual File System. Operating System Design Issues, I/O Buffering, Disk Scheduling algorithm: FCFS, SSTF, SCAN, CSCAN, LOOK, C- LOOK, Linux I/O.	6
6	Special purpose Operating Systems	Fundamental of NOS, DOS, Comparison between Functions of various Special-purpose Operating Systems.	3

4. Suggested Experiments:

Software Requirements if any: C, IDE/Compiler (Geany). Bash shell, Bourne shell, Operating System

1. Explore usage of basic and advanced Linux Commands For eg: (mkdir, chdir, cat, ls, chown, chmod, chgrp, ps etc).
2. Explore the file and process management system calls.
3. Write shell scripts to do the following:
   a) Display OS version, release number, kernel version, current shell, home directory, operating system type, current path setting, current working directory.
   b) Display top 10 processes in descending order. Display processes with highest memory usage. Display current logged in user and log name.
4. Create a child process in Linux using the fork system call. From the child process obtain the process ID of both child and parent by using getpid and getppid system calls.
5. Write a program to demonstrate the concept of non-pre-emptive and preemptive scheduling algorithms.
6. Write a C program to implement the solution of the Producer consumer problem through Semaphore.
7. Write a program to demonstrate the concept of deadlock avoidance through Banker's Algorithm
8. Write a program to demonstrate the concept of dynamic partitioning placement algorithms i.e. Best Fit, First Fit, Worst-Fit etc.
9. Write a program in C demonstrating the concept of page replacement policies for handling page faults eg: FIFO, LRU etc.
10. Write a C program to simulate File allocation strategies typically sequential, indexed and linked files.
11. Write a C program to simulate file organization of multi-level directory structure.
12. Write a program in C to do disk scheduling - FCFS, SCAN, C-SCAN.

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 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.

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. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918 .
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons , Inc., 9th Edition, 2016, ISBN 978-81-265-5427-0.
3. Andrew Tannenbaum, Operating System Design and Implementation, Pearson, 3rd Edition.

B. References:

1. D.M Dhamdhere, Operating Systems: A Concept Based Approach, Mc-Graw Hill.
2. Principles of Operating Systems, Naresh Chauhan, First Edition, Oxford university press.
3. Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rd Edition.
4. The Linux Kernel Book, Remy Card, Eric Dumas, Frank Mevel, Wiley Publications.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 211	Computer Graphics and Virtual Reality	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 211	Computer Graphics and Virtual Reality	40	40	40	60	-	----	-	100

1. Course Objectives:

The course is aimed to:

1. To introduce the use of the components of a graphics system and become familiar with building the approach of graphics system components and algorithms related to them.
2. To learn the basic principles of 3-dimensional computer graphics.
3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
4. Provide an understanding of mapping from world coordinates to device coordinates, clipping, and projections.
5. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.
6. To comprehend and analyse the fundamentals of augmented reality, Virtual reality, underlying technologies, principles, and applications.

2. Course Outcomes:

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

1. To list the basic concepts used in computer graphics.
2. To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. To describe the importance of viewing and projections.
4. To define the fundamentals of augmented virtual reality and its related technologies.
5. To understand a typical graphics pipeline
6. To design an application with the principles of virtual reality and augmented reality

3. Detailed Theory Syllabus:

Prerequisite: Knowledge of Mathematics

Sr. No.	Module	Detailed Contents of Module	Hrs
1	Introduction to Computer graphics and Output primitives	Introduction: Display Devices, Bitmap and Vector based graphics, Overview of Coordinate System. Introduction to OpenGL: Scan Conversion of: point, line using Digital differential analyzer & Bresenham's algorithm, circle using midpoint approach, Curve Generation: Bezier and B-Spline curves. Introduction to fractals: generation procedure, classification, dimension and Koch Curve.	7
2	Area Filling, Transformations (2D and 3D)	Area filling: Inside/Outside Test, Scan line Polygon Fill Algorithm, Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D Transformations: Translation, Rotation, Scaling,	7

		Reflection, Shear, their homogeneous Matrix representation and Composite transformation. Three Dimensional transformations: Translation, Scaling, Rotations, Composite.	
3	Viewing (2D and 3D)and Clipping, Projection	Viewing: Introduction, Viewing Pipeline, Window to viewport transformation. Clipping: Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms, Polygon clipping: Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping. Projections: Parallel (Oblique and orthographic), perspective (one, two and three Point) with matrix representation.	7
4	Introduction to Virtual Reality	Virtual Reality: Basic Concepts, Overview and perspective on virtual reality, Human sensation and perception. Classical Components of VR System, Types of VR Systems, Navigation and Manipulation Interfaces, Gesture Interfaces, Input Devices, Graphical Display. Graphical Rendering Pipeline, Haptic Rendering Pipeline, Applications of Virtual Reality.	6
5	VR Modeling and Programming	Geometric Modeling: Virtual Object Shape, Object Visual Appearance. Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling: Collision Detection, Surface Deformation, Force Computation. Behavior Modeling. Programming through VRML: VRML Browsers, Java 3D, OpenCV for augmented reality.	6
6	Augmented and Mixed Reality	Technology and features of augmented reality, Difference between AR and VR, Mixed reality. Challenges with AR, Augmented reality methods, visualization techniques for augmented reality	4

4. Suggested Experiments:

1. Implement DDA Line Drawing algorithm
2. Implement midpoint Circle algorithm.
3. Implement Area Filling Algorithm: Boundary Fill, Flood Fill.
4. Implement Curve: Bezier for n control points
5. Character Generation: Bitmap method or Stroke Method
6. Implement 2D Transformations: Translation, Scaling, Rotation
7. Implement Line Clipping Algorithm: Cohen Sutherland
8. Implement polygon clipping algorithm : Sutherland Hodgeman
9. Perform projection of a 3D object on Projection Plane
10. Perform Animation (Use multiple objects)
11. Create interactive application(games)
12. Design VR system for real time requirement (e.g. car driving simulator for driving learners)

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 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.

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. Mini Project to be performed using C /C++/OpenGL/Blender/ any other tool (2/3 students per group), possible Ideas: Game development with audio, Graphics editor: Like Paint brush, Text editor etc.

A. **Term Work:** Term Work shall consist of 10 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:** Total 25 Marks (Experiments: 10-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks, Mini Project: 5-marks)

7. Books and References:

A. Books:

1. Donald Hearn and M. Pauline Baker, “Computer Graphics”, Pearson Education.
2. R. K Maurya, “Computer Graphics with Virtual Reality”, Wiley India.

B. References:

1. Grigore Burdea, Philippe Coiffet, “Virtual Reality Technology”, Wiley.
2. Steven Harrington, “Computer Graphics”, McGraw Hill.
3. Rogers, “Procedural Elements of Computer Graphics”, Tata McGraw Hill.
4. Vince, “Virtual Reality Systems”, Pearson Education.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IL 360	Entrepreneurship	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					
IL 360	Entrepreneurship	20	20	20	40	-	--	--	60

1. Course Objectives:

The course is aimed to:

1. Understand the Fundamentals of Entrepreneurship
2. Identify and Evaluate Business Opportunities
3. Develop a Comprehensive Business Plan
4. Secure and Manage Funding and Operations
5. Leverage Technology and Demonstrate Entrepreneurial Readiness

2. Course Outcomes:

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

1. Develop a comprehensive business plan.
2. Understand the process of identifying and evaluating business opportunities.
3. Gain practical knowledge of financial management, marketing, and operations.
4. Develop skills in pitching, networking, and scaling a business.
5. Be prepared to launch and manage own entrepreneurial venture

3. Detailed Theory Syllabus:

Module No	Detailed Content	Hrs.
1	**Introduction to Entrepreneurship** Overview of Entrepreneurship:Definition and importance of entrepreneurship, Characteristics of successful entrepreneurs Entrepreneurial Mindset and Motivation: Developing an entrepreneurial mindset Sources of entrepreneurial motivation	3

	Types of Entrepreneurship: Small businesses, startups, and social enterprises Identifying Opportunities and Market Needs: Techniques for opportunity recognition, Conducting Internal and External feasibility analysis	
2	**Entrepreneurial Business Types:** A. Overview of Franchising and Their Advantages and Disadvantages B. Overview of Buyouts & Their Advantages and Disadvantages C. Overview of Family Businesses and Their Advantages and Disadvantages **Institutions Supporting Entrepreneurship** A brief overview of financial institutions in India- Central level and state level institutions- SIDBI- NABARD- IDBI- SIDCO- Indian Institute of Entrepreneurship- DIC- Single Window- Latest Industrial Policy of Government of India.	4
3	**Business Planning** Components of a Business Plan: Market Analysis and Competitive Research, Marketing mix (4 Ps- Product, price, place, promotion), Financial Planning and Budgeting, Developing a marketing strategy Legal and Ethical Issues in Business: Understanding business law, Ethical considerations and responsibilities Presentation of the Business Plan: Matching the Business Plan to the Needs of the Firm, Prepare business document.	4
4	**Business Operations and Management** Operations Management: Setting up business operations, Process and workflow optimization Human Resource Management : Recruiting and managing a team, Building a positive company culture Product Development and Management: Product lifecycle and development stages, Quality assurance and control Sales and Customer Relationship Management: Sales strategies and techniques, Managing customer relationships Funding and Financial Management: Sources of Funding for Startups, Managing cash flow, Financial ratios and KPIs, Identifying and mitigating risks, Insurance and contingency planning Technology and Tools for Entrepreneurs: Leveraging technology for business growth,Practical session on using business management tools **Business Failure Analysis** Entrepreneurial failure, early stage failure, late stage failure	8
5	**Practical Experience and Business Plan Development** Drafting business plans, Mentorship and Networking, Connecting with mentors and industry expert (Building a professional network) Digital Marketing and Online Presence-Digital marketing strategies Building and managing an online presence, Scaling and Growth Strategies-Strategies for scaling the business, International expansion considerations.	7

4. Assessment:

Internal Assessment: 20 marks, IA 1 should be on 40% of the syllabus, IA2 should be carried out as a presentation on the basis of mini projects where students need to showcase their entrepreneur knowledge for any business idea of their choice.

End Semester Examination: 40 Marks

5. Books and References:

1. Fundamentals of Entrepreneurship by H. Nandan, PHI
2. Entrepreneurship by Robert Hisrich, Michael Peters, Dean Shepherd, Sabyasachi Sinha, McGraw Hill
3. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Hermawan Kartajaya, and Iwan Setiawan
4. Blue Ocean Strategy by W. Chan Kim and Renée Mauborgne

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 213	Web Programming	Contact Hours	-	2+2#	-	4
		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 213	Web Programming	-	-	-	-	50	25	-	75

1. Course Objectives:

The course is aimed to:

1. To get familiar with the basics of Internet Programming.
2. To acquire knowledge and skills for creation of a website considering both client and server side programming.
3. To gain the ability to develop responsive Web Applications.
4. To explore different Web extensions and Web Services Standards.
5. To learn characteristics of RIA
6. To be familiarized with Python Web Framework-Flask.

2. Course Outcomes:

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

1. Implement interactive web page(s) using HTML,CSS and JavaScript.
2. Design a responsive web site using HTML5 and CSS3.
3. Demonstrate Rich Internet Application.
4. Build Dynamic web site using server side PHP Programming and Database connectivity
5. Describe and differentiate different Web Extensions and Web Services.
6. Demonstrate web application using Python web Framework-Flask.

3. Detailed Theory Syllabus:

Prerequisite : Basic of Programming and Web

Module No	Module	Detailed Contents of Module	Hrs.
1	HTML, CSS and JavaScript	Basic of HTML: Web System architecture-1,2,3 and n tier architecture, URL, domain name system, overview of HTTP and FTP, Cross browser compatibility issues, W3C Validators. Formatting and Fonts, Anchors, images, lists, tables, frames and forms. Introduction to CSS: Evolution of CSS, Syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML Document, Defining Inheritance in CSS. Introduction to JavaScript: JavaScript language constructs, Objects in JavaScript- Built in, Browser objects and DOM objects, event handling, form validation and cookies.	10
2	Web Design with HTML5 and CSS3	Native Audio and Video, Geo-location, Canvas, CSS3 and Responsive Web Design: Media Queries, Selectors, Typography and color Modes, CSS3 Transitions, Transformations and Animations.	5

3	Rich Internet Application (RIA)	Introduction to XML, Introduction to AJAX :AJAX design basics, AJAX vs Traditional Approach, Rich User Interface using Ajax. Working with JavaScript Object Notation(JSON): Create data in JSON format, JSON Parser .	4
4	Server Side Programming: PHP	Introduction to PHP- Data types, control structures, built in functions, Building web applications using PHP- tracking users, PHP and Mysql database connectivity with example. Introduction to PHP Framework,	5
5	Python Web Framework: Flask	Introduction to Flask, Creating Flask application, "Hello World" Application.	2

4. Suggested Experiments:

Software Requirements if any: Windows or Linux Desktop OS, HTML5 compatible web browsers(Chrome, Opera, Firefox, Safari etc), HTML, CSS editors like Dreamweaver, Notepad++ etc. Netbeans or Eclipse IDE, XAMPP.

1. A Write five HTML programs showing use of: Links, images, table, lists, forms
2. Create a HTML document and style it using three ways of applying CSS.
3. Create a HTML document applying following CSS styles: color, background, border, margins, padding, text alignment, font.
4. Write a program for form validation using JavaScript
5. Create a HTML document to display audio and video files.
6. Create a HTML showing use of canvas.
7. Create a HTML showing use of media queries.
8. Write a program using geolocation api.
9. Write a program showing use of AJAX.
10. Write five PHP programs showing use of: server side form validation, session tracking, MySQL connection.
11. Any two programs creating basic flask applications.

5. 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.

- **Term Work:** The Term work shall consist of at least 10 experiments based on the above list.The 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)
- **Term Work Marks** - Total 50-Marks: Experiments: 15 Marks, Attendance: 05 Marks, Assignments: 05 Marks, Mini Project: 25 Marks

6. Books and References:

- **Books:**
  1. HTML 5 Black Book: Kogent Learning solutions.
  2. "Learning PHP 5", David Sklar, O'Reilly Publication.
  3. Rich Internet Application AJAX and Beyond WROX press.
  4. Responsive Web Design with HTML5 and CSS3, Ben Frain, PACKT Publication.
- **References:**
  1. "Web Technologies: Black Book", Dreamtech publication.
  2. HTML5 Cook-book, By Christopher Schmitt, Kyle Simpson, O'Reilly Media.

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
CE 214	**Personal Finance Management**	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 214	**Personal Finance Management**	30	30	45	45	-	-	--	75

1. Course Objectives: The course is aimed

1. To introduce the basic concepts of finance and their practical application .
2. To demonstrate the process of drafting a financial budget.
3. To explain investment avenues and planning of personal finance.
4. To develop portfolio strategies for individual and institutional investor
5. To discuss various components of insurance and tax management.
6. To introduce financial frauds , measures to avoid frauds and resources of frauds .

2. Course Outcomes: On successful completion of course learner/student will be able:

1. To know the basic concepts of finance and interpret current business positions by reading books of accounts .
2. To analyze investment avenues and plan personal finance to develop portfolio strategies for individuals .
3. To Develop skills to interpret current market position.
4. To Create analytical approach for financial decisions.
5. To learn and understand Tax and Insurance management.
6. To identify financial frauds and understand the level of financial aspects .

3. Prerequisite : NA

4. Detailed Theory Syllabus:

Module No	Module	Detailed Contents of Module	Hrs.
1	Introduction to Personal Financial Planning	Financial Planning Process: Goal, Vision and mission , Components of Personal Financial Plan, Advantages and developing personal financial plan	3
2	Financial Budget	Meaning and Process of Drafting Financial Budget,Components of Financial Budget,Drafting Financial Budget	3
3	Investment Management	Meaning of Investment,Concept of Risk and Return and Time Value of Money,Investment Avenues,Portfolio Creation and Management	6
4	Insurance and Spending Management	Components of Insurance: Life Insurance, Health Insurance ,Property Insurance ,Spending Management	3

5	Tax Management	Introduction to Tax Regime and Tax Returns,Introduction to Income Tax and its impact on Incomes ,Tax on property: Revenue and Capital Incomes,Tax Management, Tax Saving, Tax Avoidance	3
6	Financial Frauds	Meaning and Types of Fraud,Investment Frauds, Online Payment Frauds, Identity Theft, Mass Marketing Fraud ,Measures to avoid frauds,Recourse from frauds,Cases of Frauds	6

5. Theory Assessment:

Internal Assessment: 20 marks
Consisting of Two compulsory internal assessments 20 Marks each. The final marks will be the average score of both the assessments.

End Semester Examination: 40 Marks
Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

6. Books and References:

1. Financial Management: I M Pandey, Vikas Publishing House.
2. Financial Management: M.Y. Khan, P.K. Jain, Tata McGraw Hill.
3. Financial Management: Prassana Chandra, Prentice Hall.
4. Investment Analysis & Portfolio Management- Prasanna Chandra, Tata McGrawHill
5. Wealth Management- Dun & Bradstreet, Tata McGrawHill
6. Wealth Management- S.K .Bagachi, Jaico publishing house