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 Electronics & Computer Science

Syllabus

of

B.Tech. in Electronics & Computer Science

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 Electronics & Computer Science

Vision

To produce professionally competent and socially responsible engineers capable of working globally.

Mission

To provide in-depth quality education in Electronics & Computer Science Engineering and prepare the students for lifelong learning.

To develop professional engineers who can critically and creatively apply the knowledge of engineering principles to solve real world problems.

To inculcate entrepreneurship skills and impart ethical and social values.

Program Educational Objectives (PEOs):

I. Graduates will have the ability to apply engineering knowledge and skills to provide solutions to real world technical problems.
II. Graduates will be successful as engineering professionals, innovators or entrepreneurs with a multidisciplinary approach contributing towards research and technological developments.
III. Graduates will have the ability to pursue higher education in Electronics Engineering, Computer Science and allied streams.
IV. Graduates will function in their profession with social awareness and responsibility while maintaining ethical standards.

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 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 of 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 the 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 teamwork: 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 work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognized 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):

Engineering Graduates will be able to

1. Gain knowledge and skills to analyse and design Electronics circuits as well as Computer Programs.
2. Develop hardware and software systems in the areas like Artificial Intelligence & Machine learning, Big Data, Information Security, Automation, Embedded Systems, Signal Processing and Communication Systems.
3. Apply modern Electronics and Computer engineering techniques and tools to find solutions for real life interdisciplinary problems.

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 Electronics & Computer Science offers a B. Tech. programme in Electronics & Computer Science. This is an eight semester course. The complete course is a 163 credit course which comprises core courses and elective courses. The elective courses are distributed over 8 specializations. The specializations are:

1. AIML
2. Robotics
3. Data Analytics
4. System Security
5. High Performance Computing
6. Cloud Computing
7. VLSI Design
8. IOT

The students also have a choice of opting for Institute level specializations. These are

1. Business and Entrepreneurship
2. Bio Engineering
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 Electronics & Computer Science 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 Electronics & Computer Science is tabulated in Table.

Semester I

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract/ Tuts	Theory	Pract /Tuts	Total
FY 101	Engineering Mathematics I	BSC	TLP	3	2	3	1	4
FY 102	Engineering Physics I	BSC	TL	2	1	2	0.5	2.5
FY 103	Engineering Chemistry I	BSC	TL	2	1	2	0.5	2.5
FY 104	C Programming	ESC	T	3	-	3	-	3
FY 105	Basic Electrical Engineering	ESC	TL	3	2	3	1	4
FY 108	C Programming Lab	Skill	LP	-	2	-	1	1
FY 111	Basic Workshop I	Skill	LP	-	2	-	1	1
FY 113	Indian Knowledge System	HSSM	T	-	2+2#	-	2	2
FY 114	Co-curricular Course I	Liberal Learning	L	-	4	-	2	2
Total				**13**	**18**	**13**	**9**	**22**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract /Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
FY 101	Engineering Mathematics I	BSC	40	40	40	60	2	25	-	125
FY 102	Engineering Physics I	BSC	30	30	30	45	2	25	-	100
FY 103	Engineering Chemistry I	BSC	30	30	30	45	2	25	-	100
FY 104	C Programming	ESC	40	40	40	60	2	-	-	100
FY 105	Basic Electrical Engineering	ESC	40	40	40	60	2	25	25	150
FY 108	C Programming Lab	Skill	-	-	-	-	-	25	25	50
FY 111	Basic Workshop I	Skill	-	-	-	-	-	50	-	50
FY 113	*Indian Knowledge System*	HSSM	-	-	-	-	-	50	-	50
FY 114	Co-curricular Course I	Liberal Learning	-	-	-	-	-	50	-	50
Total										**775**

T- Theory , L- Lab , P-Programming, C- Communication

Semester II

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract/ Tuts	Theory	Pract /Tuts	Total
FY 107	Engineering Mechanics and Graphics	ESC	TL	3	2	3	1	4
FY 115	Engineering Mathematics II	BSC	TLP	3	2	3	1	4
FY 116	Engineering Physics II	BSC	TL	2	1	2	0.5	2.5
FY 117	Engineering Chemistry II	BSC	TL	2	1	2	0.5	2.5
FY 119	Python Programming	Program Courses	TLP	3	-	3	-	3
FY 121	Professional Communication & Ethics I	HSSM	TL	1	2	1	1	2
FY 122	Python Programming lab	Skill	LP	-	2	-	1	1
FY 123	Basic Workshop II	Skill	LP	-	2	-	1	1
FY 125	Co-curricular Course II	*Liberal Learning*		-	4	-	2	2
Total				**14**	**16**	**14**	**8**	**22**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract/ Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
FY 107	Engineering Mechanics and Graphics	ESC	40	40	40	60	3	25	25	150
FY 115	Engineering Mathematics II	BSC	40	40	40	60	2	25	-	125
FY 116	Engineering Physics II	BSC	30	30	30	45	2	25	-	100
FY 117	Engineering Chemistry II	BSC	30	30	30	45	2	25	-	100
FY 119	Python Programming	Program Courses	40	40	40	60	2	-	-	100
FY 121	Professional Communication & Ethics I	HSSM	**20**	**20**	20	30	1	25	-	75
FY 122	Python Programming lab	Skill	-	-	-	-	-	25	25	50
FY 123	Basic Workshop II	Skill	-	-	-	-	-	50	-	50
FY 125	Co-curricular Course II	*Liberal Learning*	-	-	-	-	-	50	-	50
Total										**800**

Semester III

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract /Tuts	Theory	Pract /Tuts	Total
EC 201	Engineering Mathematics III	ESC	T	3	-	3	-	3
EC 202	Analog Electronics Circuits	PCC	TL	3	-	3		3
EC 203	Digital Circuits & System Design	PCC	TL	3	-	3	-	3
EC 204	Data Structures & Algorithms	MDM	TL	3	2	3	1	4
EC 205	Database Management System	PCC	TLP	3	2	3	1	4
EC 206	Personal Finance Management	HSSM	T	2	-	2	-	2
EC 207	Human Values and Social Ethics		T	2	-	2	-	2
EC 208	Analog & Digital Electronics Lab	PCC	LP	-	2	-	1	1
Total				**19**	**6**	**19**	**3**	**22**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract /Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
EC 201	Engineering Mathematics III	ESC	40	40	40	60	2	-	-	100
EC 202	Analog Electronics Circuits	PCC	40	40	40	60	2	-	-	100
EC 203	Digital Circuits & System Design	PCC	40	40	40	60	2	-	-	100
EC 204	Data Structures & Algorithms	MDM	40	40	40	60	2	25	25	150
EC 205	Database Management System	PCC	40	40	40	60	2	25	25	150
EC 206	Personal Finance Management	HSSM	20	20	20	40	1.5	-	-	60
EC 207	Human Values and Social Ethics		-	-	-	-	-	50	-	50
EC 208	Analog & Digital Electronics Lab	PCC	-	-	-	-	-	25	25	50
Total										**760**

1[#] to be taken class wise **T- Theory , L- Lab , P-Programming, C- Communication**

Semester IV

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract/Tuts	Theory	Pract/Tuts	Total
EC 209	Engineering Mathematics IV	ESC	T	3	-	3	-	3
EC 210	Analysis of Algorithms	PCC	T	3	2	3	1	4
EC 211	Basics of VLSI	PCC	TLP	3	2	3	1	4
EC 212	System Software & Operating Systems	MDM	T	3	-	3	-	3
EC 213	Microprocessor and Microcontroller	PCC	T	3	2	3	1	4
EC 214	Entrepreneurship	HSSM	T	2	-	2	-	2
EC 215	System Software & Operating Systems Lab	Skill Courses	L	-	2	-	1	1
EC 291	Programming Lab I (Java Programming)	Experiential Learning Courses	LP LPC	-	1*+ 2	-	1	1
Total				**17**	**11**	**17**	**5**	**22**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract/ Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
EC 209	Engineering Mathematics IV	ESC	40	40	40	60	2	-	-	100
EC 210	Analysis of Algorithms	PCC	40	40	40	60	2	25	25	150
EC 211	Basics of VLSI	PCC	40	40	40	60	2	25	-	125
EC 212	System Software & Operating Systems	MDM	40	40	40	60	2	-	-	100
EC 213	Microprocessor and Microcontroller	PCC	40	40	40	60	2	25	25	150
EC 214	Entrepreneurship	HSSM	30-	30	30	45	2	-	-	75
EC 215	System Software & Operating Systems Lab	Skill Courses	-	-	-	-	-	25	25	50
EC 291	Programming Lab I (Java Programming)	Skill Courses	-	-	-	-	-	25	25	50
Total										**800**

1# to be taken class wise

T- Theory , L- Lab , P-Programming, C- Communication

Semester V

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract/ Tuts	Theory	Pract / Tuts	Total
EC 301	Signals & Systems	PCC	TL	3	1	3	1	4
EC 302	Computer Networks	PCC	TL	3	2	3	1	4
EC 303	Professional Communication and Ethics II	AEC	LC	1	2	1	1	2
EC 304	Software Engineering	MDM	T	3	2	3	1	4
EC 3xx	Department Level Optional Course I	PEC	TL	3	2	3	1	4
IL 3xx	Institute Level Optional Course I	Open Elective (OE)	T	2	-	2	-	2
EC 391	Programming Lab II(Web Programming)	Skill Courses	LPC	-	1*+ 2	-	1	1
Total				**15**	**12**	**15**	**6**	**21**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract / Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
EC 301	Signals & Systems	PCC	40	40	40	60	2	25	-	125
EC 302	Computer Networks	PCC	40	40	40	60	2	25	25	150
EC 303	Professional Communication and Ethics II	AEC	-	-	-	-	-	50	-	50
EC 304	Software Engineering	MDM	40	40	40	60	2	25	25	150
EC 3xx	Department Level Optional Course I	PEC	40	40	40	60	2	25	25	150
IL 3xx	Institute Level Optional Course I	Open Elective (OE)	30	30	30	45	2	-	-	75
EC 391	Programming Lab II(Web Programming)	Skill Courses	-	-	-	-	-	25	25	50
Total										**750**

1[#] to be taken class wise

T- Theory , L- Lab , P-Programming, C- Communication

Course Code	Department Level Optional Course (DLOC) I	Specializations
EC 305	Artificial Intelligence	AIML
EC 306	Advanced Database Management Systems + DWM	Data Analytics
EC 307	Advanced Operating System	High Performance Computing
EC 308	Embedded System Design & Basics of IOT	IOT

Semester VI

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract/ Tuts	Theory	Pract/ Tuts	Total
EC 309	Image Processing & Machine Vision	PCC	TLP	3	2	3	1	4
EC 310	Computer Organization & Architecture	PCC	T	3	-	3	-	3
EC 3xx	Department Level Optional Course II	PEC	TL	3	2	3	1	4
EC 3xx	Department Level Optional Course III	PEC	TL	3	2	3	1	4
IL 3xx	Institute Level Optional Course II	Open Elective (OE)	T	2	-	2	-	2
EC 392	Programming Lab III (R-Programming)	MDM	LPC	-	1+2*	-	1	1
EC 393	Project A (Literature Survey & Problem Formulation)	Experiential Learning Courses	LPC	-	4	-	2	2
Total				**14**	**13**	**14**	**6**	**20**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract/ Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
EC 309	Image Processing & Machine Vision	PCC	40	40	40	60	2	25	25	150
EC 310	Computer Organization & Architecture	PCC	40	40	40	60	2	-	-	100
EC 3xx	Department Level Optional Course II	PEC	40	40	40	60	2	25	25	150
EC 3xx	Department Level Optional Course III	PEC	40	40	40	60	2	25	25	150
IL 3xx	Institute Level Optional Course II	Open Elective (OE)	30	30	30	45	2	-	-	75
EC 392	Programming Lab III (R-Programming)	MDM	-	-	-	-	-	25	25	50
EC 393	Project A (Literature Survey & Problem Formulation)	Experiential Learning Courses	-	-	-	-	-	50	50	100
Total										**775**

T- Theory , L- Lab , P-Programming, C- Communication

Course Code	Department Level Optional Course (DLOC) II	Specializations
EC 311	Foundations of Robotics	Robotics
EC 312	Cryptography and System Security	System Security
EC 313	Mobile & Distributed Computing	Cloud Computing
EC 314	Integrated Circuit Technology	VLSI Design

Course Code	Department Level Optional Course (DLOC) III	Specializations
EC 315	Machine Learning	AIML
EC 316	Big Data Analytics	Data Analytics
EC 317	Parallel Computing Architecture	High Performance Computing
EC 318	Wireless Networks	IOT

Sr #	IL Specializations as per NEP	SEM	Open Elective courses to be offered
1	Business and Entrepreneurship	SEM V	IPR and Patenting
		SEM VI	e- Commerce and e-Business
2	Bioengineering	SEM V	Introduction to Bioengineering
		SEM VI	Medical Image Processing
3	Engineering Design	SEM V	Product Design
		SEM VI	Technologies for Rural Development
4	Art and Humanities	SEM V	Visual Art
		SEM VI	Economics
5	Applied Science	SEM V	Computational Physics
		SEM VI	GIS and Remote Sensing
6	Life Skills, Repair, Maintenance and Safety	SEM V	Vehicle Safety
		SEM VI	Maintenance of Electronics and Mechanical Equipment

Semester VII

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract/ Tuts	Theory	Pract/Tuts	Total
EC 401	Embedded Systems and Real Time Programming	PCC	T	3	2	3	1	4
EC 4xx	Department Level Optional Course IV	PEC	TL	3	2	3	1	4
EC 4xx	Department Level Optional Course V	PEC	TL	3	2	3	1	4
EC 410	Research Methodology	Experiential Learning Courses	T	4	-	4	-	4
EC 491	Project B	Experiential Learning Courses	LPC	-	8	-	4	4
Total				**12**	**14**	**12**	**7**	**20**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract/ Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
EC 401	Embedded Systems and Real Time Programming	PCC	40	40	40	60	2	25	25	150
EC 4xx	Department Level Optional Course IV	PEC	40	40	40	60	2	25	25	150
EC 4xx	Department Level Optional Course V	PEC	40	40	40	60	2	25	25	150
EC 410	Research Methodology	Experiential Learning Courses	40	40	40	60	2	-	-	100
EC 491	Project B	Experiential Learning Courses	-	-	-	-	-	50	100	150
Total										**700**

T- Theory , L- Lab , P-Programming, C- Communication

Course Code	Department Level Optional Course (DLOC) IV	Specializations
EC 402	Advanced Robotics	Robotics
EC 403	Advanced Network Theory	System Security
EC 404	Cloud Computing	Cloud Computing
EC 405	Advanced VLSI Design	VLSI Design

Course Code	Department Level Optional Course (DLOC) V	Specializations
EC 406	Deep Learning	AIML
EC 407	Data Science	Data Analytics
EC 408	High Performance Computing	High Performance Computing
EC 409	Internet of Everything	IOT

Semester VIII

Course Code	Course Name	Category	Course Component	Teaching Scheme (Contact Hours)		Credits Assigned		
				Theory	Pract	Theory	Pract	Total
EC 411	Software Testing & Quality Assurance	PCC	T	3	-	3	-	3
EC 4xx	Department Level Optional Course VI	PEC	TL	3	2	3	1	4
EC 416	Multidisciplinary Minor Course	MDM/ Open Elective (OE)	T	2	-	2	-	2
EC 492	Project C	Experiential Learning Courses	LPC	-	6	-	3	3
EC 493	Internship/ OJT	Experiential Learning Courses	LPC	-	16	-	8	8
Total				**8**	**24**	**8**	**12**	**20**

Course Code	Course Name	Category	Examination Scheme							
			Theory					Term Work	Pract /Oral	Total
			Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
			1	2	Avg					
EC 411	Software Testing & Quality Assurance	PCC	40	40	40	60	2	-	-	100
EC 4xx	Department Level Optional Course VI	PEC	40	40	40	60	2	25	25	150
EC 416	Multidisciplinary Minor Course	MDM/ Open Elective (OE)	30	30	30	45	1	-	-	75
EC 492	Project C	Experiential Learning Courses	-	-	-	-	-	50	50	100
EC 493	Internship/ OJT	Experiential Learning Courses	-	-	-	-	-	100	100	200
Total										**625**

T- Theory , L- Lab , P-Programming, C- Communication

Course Code	Department Level Optional Course (DLOC) VI	Specializations
EC 412	Intelligent Robotics	Robotics
EC 413	Cyber Security & Digital Forensic	System Security
EC 414	Blockchain Technology	Cloud Computing
EC 415	Analog and Mixed Signal VLSI Design	VLSI Design

Bachelor of Technology

In

Electronics & Computer Science

(Semester III)

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 201	Engineering Mathematics III	03	-	-	03	-	-	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 201	Engineering Mathematics-III	40	40	40	60	-	-	-	100

Prerequisite: Engineering Mathematics-I and Engineering Mathematics-2

Course Objectives:

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

Course Outcomes:

After successful completion of the course students will be able to

1. Apply the concept of Laplace transform and its application to solve the real integrals 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 Eigen values 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.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	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.	07

2.	**Fourier Series , Fourier Transform**	Dirichlet's conditions, Fourier series of periodic functions with period 2π and 2L, Fourier series for even and odd functions, Half range sine and cosine Fourier series, Orthogonal and Ortho-normal functions, Fourier Integral Representation, Fourier Transform and Inverse Fourier transform of constant and exponential function.	06
3.	**Linear Algebra Matrix Theory, Quadratic Forms**	Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Quadratic forms over real field, Linear Transformation of Quadratic form, Reduction of Quadratic form to diagonal form using congruent transformation. Rank, Index and Signature of quadratic form, Sylvester's law of inertia, Value-class of a quadratic form-Definite, Semidefinite and Indefinite. Reduction of Quadratic form to a canonical form using congruent transformations.	07
4.	**Complex Variables and conformal mappings**	Function f(z)of complex variable, Introduction to Limit, Continuity and Differentiability of (z), 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) or its combination (u+v / u-v) is given, Conformal mapping, Linear and Bilinear mappings, cross ratio	06
5.	**Relation and Function**	Partition of A Set, Relation, Diagram of A Relation, Matrix of A Relation, Digraph of A Relation, Types of Relation, Number of Binary Relations, Number of Reflexive Relations, Equivalance Relation, Relation of the Path, Operations on Relations, Closures, Warshall's Algorithm,	07
6.	**Algebraic Structures, coding theory**	Properties of Binary Operations, Semi-Group. Monoid, Group, Ring, Isomorphism, Homomorphism, Group Code, Decoding and Error Correction, Maximum Likelihood Technique	06

Theory Assessments:

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

2. End Sem Theory Examination:

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

Lab Assessment:

1. Term work Assessment:

Term work should consist of all the work done in tutorials and assignments. The final certification and acceptance of term work ensures satisfactory performance throughout in all the assigned work.

Text Books & References:

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

7. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication
8. Discrete Mathematical Structures Bernard Kolman, Robert C. Busby ,Sharon Cutler Ross, Nadeem-ur-Rehman, " Pearson Education".
9. Discrete Mathematical Structures: Theory and Applications, D.S. Malik and M.K. Sen: Cengage Learning, 2004.
10. Discrete Mathematics with Applications, Thomas Koshy: Elsevier, 2005, Reprint 2008.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/ Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 202	Analog Electronics Circuits	03	02	--	03	01	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 202	Analog Electronics Circuits	40	40	40	60	25	25	--	150

Prerequisite: Basic Electrical Engineering

Course Objectives:

1. To enhance comprehension capabilities of students through understanding of electronic circuits.
2. To perform DC and AC analysis of BJT and MOSFET amplifier circuits.
3. To teach fundamental principles of operational amplifiers.
4. To develop an overall approach for students from selection of integrated circuit, specification, functionality and applications.

Course Outcomes:

After successful completion of the course students will be able to

1. Understand construction, characteristics and working of semiconductor devices such as BJT, MOSFET.
2. Derive expressions for performance parameters of BJT and MOSFET based Electronic circuits
3. Select and Design electronic circuits (using BJT and MOSFET) for given specifications
4. Derive and determine various performances-based parameters and their significance for Op-Amp.
5. Analyze and identify the closed loop stability considerations, linear and nonlinear applications of operational amplifiers.
6. Design an application with the use of integrated circuits.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1.	**Semiconductor devices**	1.1Bipolar Junction Transistor - BJT operations, voltages and current equations, BJT characteristics (CE, CB, CC configurations), early effect. 1.2 Field Effect Devices- JFET: Construction, operation and characteristics. MOSFET: Construction, operation and characteristics of D-MOSFET and EMOSFET.	06
2.	**Biasing Circuits of BJTs and MOSFETs**	2.1 Concept of DC load line, Q point and regions of operations, Analysis and design of biasing circuits for BJT (Voltage divider Bias ONLY) 2.2 DC load line and region of operation for MOSFETs. Analysis and design of biasing circuits for E-MOSFET (voltage divider bias ONLY).	06
3.	**Small Signal Amplifiers**	3.1Concept of AC load line and Amplification, Small signal analysis (Zi, Zo, Av and Ai) of CE amplifiers using hybrid pi model ONLY. 3.2 Small signal analysis (Zi, Zo, Av) of CS (for EMOSFET) amplifiers. Introduction to multistage amplifiers. Cascade and cascode only.(Concept, advantages & disadvantages)	07
4.	**Operational Amplifiers**	4.1The ideal operational amplifier (op-amp), internal block diagram of op-amp, characteristics of op-amp, ideal & practical op-amp parameters / specifications (no detailed description or any analysis), mathematical model of op-amp, IC 741 op-amp with pin diagram & description 4.2 Operational amplifier open loop & closed loop configurations (theoretical description only), the concept of virtual ground & virtual short	06
5.	**Applications of Operational Amplifier**	5.1 The op-amp inverting amplifier & op-amp non-inverting amplifier (mathematical analysis for derivation of output voltage only,numerical examples & designing) 5.2 Adder, summing amplifier, averaging circuit, subtractor, integrator (ideal), differentiator (ideal), op-amp instrumentation amplifier (only mathematical analysis for derivation of output voltage)	07
6.	**Special Purpose Integrated Circuits**	6.1 IC 555 timer internal block diagram & pin configuration, operation in astable & monostable multivibrator with mathematical analysis & numerical examples, design problems on astable & monostable multivibrator, applications in astable & monostable configuration 6.2 Functional block diagram, working and design of general purpose IC 723 (HVLC and HVHC).(theoretical description only). working of the switching regulator. (theoretical description only)	07

Theory Assessments:

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

2. **End Sem Theory Examination:**

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

DETAILED LAB SYLLABUS:

Hardware Requirements: Breadboard, Transistors, Resistors, Diodes, Connecting wires,Op-amp IC 741, timer IC555

Software Requirements: LTSpice

Sr. No.	Detailed Lab/Tutorial Description
1	To study input and output characteristics of CE configuration
2	Analyze Integrator using op-amp IC 741
3	Design Monostable Multivibrator using IC 555.
4	To study EMOSFET biasing circuits..
5	To study BJT as CE amplifier.and calculate its voltage gain
6	To study frequency response of a multistage amplifier.
7	Design inverting, non-inverting amplifier and buffer using IC 741
8	Design Wein bridge and RC phase shift Oscillator using op-amp IC 741
9	Simulation experiment on drain and transfer characteristics of JFET
10	Simulation experiment on multistage amplifier.
11	Design High Voltage High Current voltage regulator using IC 723.

Lab Assessment:

1. Term work Assessment :

At least 8 experiments covering the entire syllabus of AEC should be set to have well predefined inference and conclusion. Simulation experiments are also encouraged. Minimum 3 Simulation Experiments covering the entire syllabus must be performed during the "Laboratory session batch wise". The experiments should be student centric and attempt to make experiments more meaningful, interesting and innovative. Term work assessment must be based on the overall performance of the student with every experiment and assignments are graded from time to time.

2. Oral/Viva Assessment:

The oral examination will be based on the entire syllabus.(10 marks for performance and 15 marks for oral)

Books:

1. Donald A. Neamen, "Electronic Circuit Analysis and Design", TATA McGraw Hill, 2nd Edition.
2. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4th Edition.

References:

1. Robert Boylestad," Electronic Devices and Circuit Theory", Pearson.
2. George Clayton and Steve Winder, "Operational Amplifiers", NewnesBali, "Linear Integrated Circuits", Mc Graw Hill
3. Gray, Hurst, Lewise, Meyer, "Analysis & Design of Analog Integrated Circuits, Wiley Publications.
4. K. R. Botkar, "Integrated Circuits", Khanna Publishers (2004)
5. S. Salivahanan, N. Suresh Kumar,"Electronic Devices and Circuits", Tata McGraw Hill.
6. D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition.
7. Sergio Franco, "Design with operational amplifiers &analog integrated circuits", Tata McGraw Hill, 3rd edition
8. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 4th Edition

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/ Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 203	Digital Circuits & System Design	03	02	--	03	01	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 203	Digital Circuits & System Design	40	40	40	60	25	--	25	150

Prerequisite: Physics of Std 11th, 12th and FE - Basic Electrical & Electronics Engineering

Course Objectives:

1. To understand various number systems & codes and to introduce students to various logic gates, SOP, POS form and their minimization techniques.
2. To teach the working of combinational circuits, their applications and implementation of combinational logic circuits using MSI chips.
3. To teach the elements of sequential logic design, analysis and design of sequential circuits.
4. To understand various counters and shift registers and its design using MSI chips.
5. To explain and describe various logic families, their interfacing and Programmable Logic Devices.
6. To train students in writing programs with VHDL hardware description languages.

Course Outcomes:

After successful completion of the course students will be able to

1. Perform code conversion and able to apply Boolean algebra for the implementation and minimization of logic functions.
2. Analyze, design and implement Combinational logic circuits.
3. Analyze, design and implement Sequential logic circuits.
4. Design and implement various counter using flip flops and MSI chips.
5. Understand TTL & CMOS logic families, PLDs, CPLD and FPGA.
6. Understand basics of VHDL Hardware Description Language and its programming with combinational and sequential logic circuits.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1.	**Logic Gates and Boolean Algebra**	Digital logic gates, Realization using NAND, NOR gates, Boolean Algebra, De Morgan's Theorem, SOP and POS representation, K Map up to four variables.	04
2.	**Combinational Circuits using basic gates as well as MSI devices**	Arithmetic Circuits: Half adder, Full adder, Ripple carry adder, Carry Look ahead adder, Half Subtractor, Full Subtractor, multiplexer, cascading of Multiplexer, demultiplexer, decoder, Comparator (Multiplexer and demultiplexer gate level upto 4:1). MSI devices: IC7483, IC74151, IC74138, IC7485.	07
3.	**Elements of Sequential Logic Design**	Sequential Logic: Latches and Flip-Flops. RS, JK, Master slave flip flops, T & D flip flops with various triggering methods, Conversion of flip flops Counters: Asynchronous, Synchronous Counters, Up Down Counters, Mod Counters, Ring Counter, Twisted ring counter, Shift Registers, Universal Shift Register.	07
4.	**Sequential Logic Design**	Sequential Logic Design: Mealy and Moore Machines, Clocked synchronous state machine analysis, State reduction techniques (inspection, partition and implication chart method) and state assignment, sequence detector, Clocked synchronous state machine design. Sequential logic design practices: MSI counters (7490, 7492, 7493,74163, 74169) and applications, MSI Shift registers (74194) and their applications.	07
5.	**Logic Families and Programmable Logic Devices**	Logic Families: Types of logic families (TTL and CMOS), characteristic parameters (propagation delays, power dissipation, Noise Margin, Fan-out and Fan-in), transfer characteristics of TTL NAND (Operation of TTL NAND gate),CMOS Logic: CMOS inverter, CMOS NAND and CMOS NOR, Interfacing CMOS to TTL and TTL to CMOS. Programmable Logic Devices: Concepts of PAL and PLA. Simple logic implementation using PAL and PLA, Introduction to CPLD and FPGA architectures.	07
6.	**Introduction to VHDL**	Design of Combinational circuits using VHDL: Introduction to Hardware Description Language, Core features of VHDL, data types, concurrent and sequential statements, data flow, behavioral, structural architectures, subprograms, Examples like Adder, subtractor, Multiplexers, De-multiplexers, decoder. Design of Sequential circuits using VHDL: VHDL code for flip flop, counters.	07

DETAILED LAB SYLLABUS:

Hardware Requirements: Hardware Kits

Software Requirements: VHDL simulation software

Sr. No.	Detailed Lab/Tutorial Description
1	Implementation of Asynchronous counter using MSI counter IC and flip flops
2	Implementation of synchronous counter using MSI counter IC and flip flops
3	Conversion of Flip flops.
4	Application of Universal Shift Register.
5	Design and implement Mealy machine
6	Design and implement Moore machine
7	Design sequence detector using Flip Flop
8	VHDL program for Combinational circuits
9	VHDL program for sequential circuits
10	VHDL program for Mealy and Moore machines.

Theory Assessments:

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

2. End Sem Theory Examination:

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

Lab Assessment:

1.Term work Assessment:

At least 6 experiments covering the entire syllabus of DCSD should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiments must be graded from time to time. The grading and term work assessment should be done based on this scheme. 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. Equal weightage should be given to laboratory experiments and while assigning term work marks.

2.Oral/Viva Assessment:

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

Books:

1. R. P. Jain, Modern Digital Electronics, Tata McGraw Hill Education, Third Edition 2003.
2. Morris Mano, Digital Design, Pearson Education, Asia 2002.
3. J Bhaskar, VHDL Primer, Prentice Hall, Third Edition (1999).

References:

1. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006
2. John F. Warkerly, Digital Design Principles and Practices, Pearson Education, Fourth Edition, 2008.
3. Stephen Brown and Zvonko Vranesic, Fundamentals of digital logic design with VHDL, McGraw Hill, 2nd Edition.
4. Volnei A. Pedroni, "Circuit Design with VHDL" MIT Press (2004)
5. Digital Circuits and Logic Design – Samuel C. Lee , PHI
6. William I.Flectcher, "An Engineering Approach to Digital Design", Prentice Hall of India.
7. Parag K Lala, "Digital System design using PLD", BS Publications, 2003.
8. Charles H. Roth Jr., "Fundamentals of Logic design", Thomson Learning, 2004.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 204	Data Structures and Algorithms	03	02	--	03	01	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 204	Data Structures and Algorithms	40	40	40	60	25	–	25	150

Prerequisite: C Programming

Course Objectives:

1. To teach concept and implementation of linear and nonlinear data structures.
2. To analyze various data structures and select the appropriate one to solve a specific real-world problem.
3. To introduce various techniques for representation of the data in the real world.

Course Outcomes:

After successful completion of the course students 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 analyze and Implement appropriate sorting and searching techniques for a given problem.
6. Students will be able to demonstrate the ability to analyze, design, apply and use data structures to solve engineering problems and evaluate their solutions.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1	**Introduction to Data Structures**	Introduction to Data Structures, Types of Data Structures – Linear and Nonlinear, Operations on Data Structures, Concept of array, Static arrays vs Dynamic Arrays, structures, Array Data Type:- Single and Multidimensional Arrays. Introduction to Analysis of Algorithms, characteristics of algorithms, Time and Space complexities, Asymptotic notations.	04
2	**Stack and Queue**	**Stack:** Basic Stack Operations, Representation of a Stack using Array, Applications of Stack – Well form-ness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation. **Queue:** Operations on Queue, Array Implementation of Queue, Types of Queue-Circular Queue, Priority Queue, Dequeue, queue-Round Robin Algorithm, Applications of Queue:- Interrupt handling	07
3	**Linked List**	Representation of Linked List, Linked List v*/s* Array, Types of Linked List - Singly Linked List (SLL), Doubly Linked List, Circular Linked List, Operations on Singly Linked List: Insertion, Deletion, reversal of SLL, Print SLL. Implementation of Stack and Queue using Singly Linked List. Singly Linked List Application-Documenting a sequence of heterogeneous records.	08
4	**Tree**	Tree Terminologies, Binary Tree, Types of Binary Tree, Binary Tree Representation: Array and Linked Representation of Binary trees, Binary Tree Traversals algorithms: In-order, Pre-order, Post-order, Binary Search Tree Operations on Binary Search Tree, Applications of Binary Tree - Expression Tree, Huffman Encoding.	07
5	**Graph**	Graph Terminologies, Representation of graph (Adjacency matrix and adjacency list), Graph Traversals – Depth First Search (DFS) and Breadth First Search (BFS), Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal's algorithm, Application of Graph – Topological Sorting.	06
6	**Sorting and Searching**	**Searching:** Linear search, Random search, Binary search, Hashing, Applications:- Finding a root of a general quadratic polynomial over a finite interval. **Sorting:** Bubble, Insertion, selection, Quick Sort, Merge Sort, Two Way Merge Sort, Counting sort, Comparison of sorting Techniques based on their complexity, A few practical considerations for in-memory sorting	07

DETAILED LAB SYLLABUS:

Software Requirements: Turbo C/Code Blocks, Windows/Linux

Sr. No.	Detailed Lab/Tutorial Description
1	Program to reverse a list of given numbers using stack ADT.
2	Program to Check whether parentheses are balanced or not.
3	Convert an Infix expression to Postfix expression using stack ADT.
4	Program to evaluate Postfix Expression using Stack ADT.
4	Program to implement Linear Queue ADT using array.
5	Program to implement Stack/Queue using linked list.
6	Program to implement Circular Queue ADT using array.

7	Program to implement Priority Queue ADT using array.
8	Program to implement Binary Search Tree ADT using Linked List.
9	Program to implement searching algorithms -Linear search, Binary search.
10	Implement Depth First Search and Breadth First Search Graph Traversal technique.
11	Program to implement sorting algorithms (any 2)- bubble, selection, insertion, merge, quick.
12	Implementation of Prim's and Kruskal's algorithms for finding out Minimum Cost Spanning Tree of a given input graph. For eg. Finding out electricity distribution cable network with minimum overall cable length.

Theory Assessments:

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

2. End Sem Theory Examination:

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

Lab Assessment:

1. Term work Assessment :

The experiments should be student centric and attempt to make experiments more meaningful, interesting and innovative. Term work assessment must be based on the overall performance of the student with every experiment and assignments are graded from time to time.

2. Oral/Viva Assessment:

The oral examination will be based on the entire syllabus.

Text Books:

1. Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein, "Data Structures Using C", Pearson Publication.
2. Jean Paul Tremblay, P. G. Sorenson, "Introduction to Data Structure and Its Applications", McGraw-Hill Higher Education
3. Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, Clifford Stein, "Introduction to Algorithms", PHI Learning Pvt. Ltd. (Originally MIT Press); Third edition, 2010
4. Mark A.Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education India; 2nd edition, 2002.
5. Data Structures using C and C++, Rajesh K Shukla, Wiley - India
6. Data Structures Using C, Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein, Pearson.
7. Data Structures: A Pseudocode Approach with C, Richard F. Gilberg & Behrouz A., Forouzan, Second Edition, CENGAGE Learning.
8. Introduction to Data Structure and Its Applications, Jean Paul Tremblay, P. G. Sorenson.

Reference Books:

1. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, 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

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 205	Database Management System	03	02	–	03	01	–	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 205	Database Management System	40	40	40	60	25	25	--	150

Prerequisite: Data Structures

Course Objectives:

1. Develop entity relationship data model and its mapping to relational model
2. Learn relational algebra and Formulate SQL queries.
3. Apply normalization techniques to normalize the database.
4. Understand the concept of transaction, concurrency control and recovery techniques.

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

1. Recognize the need of database management system
2. Design ER diagram for real life applications.
3. Construct relational models and write relational algebra queries.
4. Formulate SQL queries.
5. Apply the concept of normalization to relational database design.
6. Describe the concept of transaction, concurrency and recovery.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1	**Introduction Database Concepts**	Introduction, Characteristics of databases, File system v/s Database system, Data abstraction and data Independence, DBMS system architecture, Database Administrator	04

2	**Entity–Relationship Data Model**	The Entity-Relationship (ER) Model: Entity types: Weak and strong entity sets, Entity sets, Types of Attributes, Relationship constraints: Cardinality and Participation,	06
3	**Relational Model and relational Algebra**	Introduction to the Relational Model, relational schema and concept of keys. Relational Algebra-operators, Relational Algebra Queries.	07
4	**Structured Query Language (SQL)**	Overview of SQL, Data Definition Commands, Integrity constraints: key constraints, Domain Constraints, Referential integrity , check constraints, Data Manipulation commands, Data Control commands, Set and string operations, aggregate functions, group by, having, Views in SQL, joins, Nested and complex queries, Triggers.	08
5	**Relational-Data base Design**	Concept of normalization, Function Dependencies, First Normal Form, 2NF, 3NF, BCNF.	06
6	**Transactions Management and Concurrency and Recovery**	Transaction concept, Transaction states, ACID properties, Transaction Control Commands, Concurrent Executions, Serializability-Conflict and View, Concurrency Control: Lock-based, Timestamp-based protocols, Recovery System: Log based recovery, Deadlock handling.	07

DETAILED LAB SYLLABUS:

Hardware Requirements: 2GB RAM

Software Requirements: SQL server (Oracle/MySQL/PostGreSQL)

Sr. No.	Detailed Lab/Tutorial Description
1	Identify the case study and detail 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 Views and Join operations.
7	Perform Nested and Complex queries

8	Perform DCL and TCL commands.
9	Implement function and trigger.
10	Demonstrate Database connectivity
11	Implementation and demonstration of Transaction and Concurrency control techniques using locks.

Theory Assessments:

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

2. End Sem Theory Examination:

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

Lab Assessment:

1.Term work Assessment:

Term work should have min. 8 experiments. Journal must include at least 2 assignments on content of theory and practical of "Database Management System". The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work. Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks).

2.Oral/ Practical 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.

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.

References:

1. Microsoft SQL Server Black Book By Patrick Dalton.
2. https://www.w3schools.com/sql/
3. https://www.postgresqltutorial.com/

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
EC 206	Personal Finance Management	Contact Hours	2	-	-	2
		Credits	2	-	-	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		1	2	Average					
EC 206	Personal Finance Management	20	20	20	40	-	-	--	60

Course Objectives: The course or instructor aims

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 .

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

1. To know 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 .

Detailed Theory Syllabus:

Sr. 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 of 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

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.

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

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/ Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 207	Human Values and Social Ethics	02	--	--	02	--	--	02

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

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

Course Objectives:

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

Course Outcomes:

After successful completion of the course students 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.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1.	**Ethics and Values**	Meaning & Concept of Ethics Difference between Ethics and Values Ethical code of conduct	03

2.	**Professional Ethics**	Professional Ethics vs Personal ethics Components of professional ethics Professional values and its importance	05
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	04
4.	**Ethics in Technical writing**	Documenting sources Presentation of Information Ethics & Plagiarism	07
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	07

Assessments:

Termwork : 50 marks (Continuous evaluation)

Books/References:

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

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/ Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 208	Analog & Digital Electronics Lab		2	--	-	1	--	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment (Review)			End Sem. Exam				
		1(10)	2(10)	Average					
EC 208	Analog & Digital Electronics Lab	-	-	-	-	25	–	25	50

Course Objectives:

1. To enhance comprehension capabilities of students through understanding of electronic circuits.
2. To perform DC and AC analysis of BJT and MOSFET amplifier circuits.
3. To teach fundamental principles of operational amplifiers.
4. To develop an overall approach for students from selection of integrated circuit, specification, functionality and applications.
5. To teach the working of combinational circuits, their applications and implementation of combinational logic circuits using MSI chips.
6. To teach the elements of sequential logic design, analysis and design of sequential circuits.
7. To understand various counters and shift registers and its design using MSI chips.
8. To explain and describe various logic families, their interfacing and Programmable Logic Devices.
9. To train students in writing programs with VHDL hardware description languages.

Course Outcomes:

After successful completion of the course students will be able to

1. Understand construction, characteristics and working of semiconductor devices such as BJT, MOSFET.
2. Derive expressions for performance parameters of BJT and MOSFET based Electronic circuits.
3. Derive and determine various performances-based parameters and their significance for Op-Amp.
4. Analyze and identify the linear and nonlinear applications of operational amplifiers.
5. Design an application with the use of integrated circuits.

6. Analyze, design and implement Combinational logic circuits.
7. Analyze, design and implement Sequential logic circuits.
8. Design and implement various counter using flip flops and MSI chips.
9. Understand basics of VHDL Hardware Description Language and its programming with combinational and sequential logic circuits.

DETAILED LAB SYLLABUS:

Software Requirements for AEC : LTSpice

Hardware Requirements for AEC: Breadboard, Transistors, Resistors, Diodes, Connecting wires,Op-amp IC 741, timer IC555

Software Requirements for DCSD: VHDL simulation software

Hardware Requirements for DCSD: Hardware Kits

Sr. No.	Detailed Lab/Tutorial Description
1	To study input and output characteristics of CE configuration
2	Analyze Integrator using op-amp IC 741
3	Design Monostable Multivibrator using IC 555.
4	To perform DC analysis of voltage divider bias for (BJT) CE amplifier.
5	To study BJT as CE amplifier.and calculate its voltage gain
6	Design inverting, non-inverting amplifier and buffer using IC 741
7	Design Wein bridge and RC phase shift Oscillator using op-amp IC 741
8	Simulation experiment on drain and transfer characteristics of JFET
9	Simulation experiment on multistage amplifier.
10	Design High Voltage High Current voltage regulator using IC 723.
11	Study and design of Combinational circuits.
12	Study and design of sequential circuits
13	Implementation of Asynchronous counter using MSI counter IC and flip flops
14	Implementation of synchronous counter using MSI counter IC and flip flops
15	VHDL program for Combinational circuits
16	VHDL program for sequential circuits

Lab Assessment:

Term work Assessment :

At least 8 experiments covering the entire syllabus of AEC and DCSD should be set to have well predefined inference and conclusion. Simulation experiments are also encouraged. The experiments should be student centric and attempt to make experiments more meaningful, interesting and innovative. Term work assessment must be based on the overall performance of the student with every experiment and assignments are graded from time to time.

Practical/Viva Assessment:
The practical and oral examination will be based on the entire syllabus.(10 marks for performance and 15 marks for oral)

Bachelor of Technology

In

Electronics & Computer Science

(Semester IV)

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 209	Engineering Mathematics IV	03	--	01	03	--	01	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 209	Engineering Mathematics IV	40	40	40	60	25	--	--	125

Prerequisite: Engineering Mathematics I, Engineering Mathematics II and Engineering Mathematics III.

Course Objectives:

1. Understand the basic techniques of statistics like correlation, regression, and curve fitting for data analysis, Machine learning, and AI.
2. Acquaint 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.
4. Introduce students to equivalence relations, recurrence relations, Introduce students to graphs, and trees.
5. Understand the concepts of complex integration.
6. Use concepts of vector calculus to analyze and model engineering problems.

Course Outcomes:

After successful completion of the course students 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.
4. Express recursive functions of other subjects like Data Structures as recurrence relation, Ability to understand use of functions, graphs and trees in programming applications.
5. Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
6. Apply the concepts of vector calculus in real life problems.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1	**Correlation, Regression and Curve Fitting,**	Karl Pearson's Coefficient of correlation (r),Spearman's Rank correlation coefficient (R) ,Lines of regression , Fitting of first and second degree curves.	06
2	**Probability, Probability Distributions**	Conditional probability, Total Probability and Baye's Theorem, Discrete and Continuous random variables, Probability mass and density function, Probability distribution for random variables, Expectation, Variance, Binomial distribution ,Poisson distribution, Normal distribution	06
3	**Linear Algebra : Vector Spaces**	Vectors in n-dimensional vector space, norm, dot product, The Cauchy Schwarz inequality, Unit vector ; Linear combinations, linear Dependence and Independence, QR decomposition ; Orthogonal projection, Orthonormal basis, Gram-Schmidt process for vectors ; Vector spaces over real field, subspaces.	06
4	**Graphs and Trees**	Types of Graphs, Homomorphism And Isomorphism Of Graphs, Subgraphs, Types of Graphs, Complement of Graph, Connected Graphs, Eulerian And Hamiltonian Graphs, Trees, Binary Trees, Minimum Spanning Tree, Kruskal's Algorithm	08
5	**Lattice Theory & Recurrence relation**	Poset, Hasse Digram, Isomorphism, Extremal Elements of Posets, Lattices, Special Types of Lattices, Solving Recurrence relation, Linear Homogenous Recurrence relation with constant coefficients, Non-Homogenous Recurrence relation	06
6	**Complex Integration and Vector Integration**	Line Integral, Cauchy's Integral theorem for simple connected and multiply connected regions (without proof), Cauchy's Integral formula (without proof). Taylor's and Laurent's series (without proof). Definition of Singularity, Zeroes, poles of f(z), Residues, Cauchy's Residue Theorem (without proof) Vector integral: Line Integral, Green's theorem in a plane (Without Proof), Stokes' theorem (Without Proof) only evaluation. Gauss' divergence	07

Theory Assessments:

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

2. End Sem Theory Examination:

- Question paper will consist of 4 questions, each carrying 20 marks.
- Total 3 questions need to be solved.
- Q.1 will be compulsory, based on the entire syllabus.
- Remaining questions will be randomly selected from all the modules.

Weightage of marks should be proportional to the number of hours assigned to each module.

Lab Assessment:

Term work Assessment:

Term work should consist of all the work done in tutorials and assignments. The final certification and acceptance of term work ensures satisfactory performance throughout in all the assigned work.

Books/References:

1. Probability, Statistics and Random Processes, T. Veerarajan, Mc. Graw Hill education.
2. Vector Analysis, Murray R. Spiegel, Schaum Series.
3. Beginning Linear Algebra Seymour Lipschutz Schaum's outline series, Mc-Graw Hill Publication.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication.
5. Discrete Mathematical Structures"Bernard Kolman, Robert C. Busby ,Sharon Cutler Ross, Nadeem-ur-Rehman, " Pearson Education.
6. Discrete Mathematical Structures: Theory and Applications, D.S. Malik and M.K. Sen: Cengage Learning, 2004.
7. Higher Engineering Mathematics B. V. Ramana, Tata Mc-Graw Hill Publication.
8. Advanced Engineering Mathematics Wylie and Barret, Tata Mc-Graw Hill.
9. Advanced engineering mathematics H.K. Das, S . Chand, Publications.
10. Discrete Mathematics with Applications, Thomas Koshy, Elsevier, 2005, Reprint 2008.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 210	Analysis of Algorithms	03	02	–	03	01	–	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 210	Analysis of Algorithms	40	40	40	60	25	25	--	150

Prerequisite: Data Structure

Course Objectives:

1. To conceptualize learners with mathematical models for analysis of algorithm
2. To understand and solve problems using various algorithmic design strategies.
3. To apply algorithm strategies to real life problems.

Course Outcomes:

After successful completion of the course students will be able to

1. Understand notations used for time complexity analysis of algorithms.
2. Explain Divide and Conquer Approach with its applications.
3. Understand Dynamic Programming Approach for finding the shortest path.
4. Apply the concept of Greedy Method Approach with different applications.
5. Use Backtracking and Branch-and-bound method for various applications.
6. Understand the concept of Number Theoretic, Graph Theoretic and Non-deterministic polynomial time algorithms

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1	**Introduction to algorithms and analysis of algorithm**	Notion of an Algorithm, Brief introduction:-algorithm design paradigms, Algorithm analysis :- Asymptotic notations and their properties, notions of time and space complexity, best case, worst case and average case analysis of algorithms, Brief introduction:- randomized algorithms and notion of expected time complexity	07
2	**Divide and Conquer Approach**	Recurrence equations, Solution of recurrence equations:-Recurrence Tree method, Master Theorem, General structure of a Divide and Conquer algorithm, Finding closest pair of points in 2D plane, Merge/Quick sort.	06
3	**Dynamic Programming Approach**	General method, applications-Matrix chain multiplication, Optimal binary search trees, Single Source Shortest Path:- Bellman-Ford algorithm, All pairs shortest path problem:-Floyd-Warshall, Travelling salesperson problem.	08
4	**Greedy Method Approach**	General method, Applications-Job sequencing with deadlines, fractional knapsack problem, Minimum cost spanning trees, Single source shortest path problem:- Dijkstra's algorithm	08
5	**Backtracking and Branch-and-bound**	Backtracking: General method, graph coloring Branch and Bound: General method, applications - 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.	05
6	**Selected algorithms and Non-deterministic polynomial time algorithms**	Number Theoretic:- Euclid's algorithm for GCD and it's time complexity analysis, Graph Theoretic:- Johnson's algorithm for All pair Shortest Path problem Computational Complexity classification of problem: Brief introduction:- non deterministic algorithms, Complexity classes:- P, NP.	05

DETAILED LAB SYLLABUS:

Lab Prerequisite:

Software Requirements: C/Python/C++

Sr. No.	Detailed Lab/Tutorial Description
1	Implement Merge and Quick sort algorithms.
2	Implement Bellman-Ford algorithm.

3	Implement Floyd-Warshall algorithm.
4	Implement Dijkstra's algorithm for the single source shortest path problem on a given weighted graph.
5	Implement Prim/Kruskal algorithm for finding a minimum cost spanning tree of a given input graph.
6	Implement a backtracking based algorithm for vertex coloring of a given graph.
7	Implement Johnson's algorithm for shortest paths, for a given graph.
8	Implement a randomized algorithm for searching an element in an unsorted array and derive its expected time complexity.
9	Implement Euclid's algorithm to calculate GCD of a given set of n>2 natural numbers.

Theory Assessments:

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

2. End Sem Theory Examination:

- Question paper will consist of 4 questions, each carrying 20 marks.
- Total 3 questions need to be solved.
- Q.1 will be compulsory, based on the entire syllabus.
- Remaining questions will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Lab Assessment:

1.Termwork Assessment:

Term work should consist of all the work done in tutorials and assignments. The final certification and acceptance of term work ensures satisfactory performance throughout all the assigned work.

2. Oral/Practical Assessment: Practical & Oral Exams should be conducted based on syllabus and practicals conducted.

Text Books:

1. Ellis Horowitz,Satraj Sahni and Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publications pvt. Ltd.
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design and Analysis Algorithms - Publisher: Pearson

Reference Books:

1. T.H.Cormen, C.E.Leiserson, R.L.Rivest, C. Stein, Introduction to Algorithms, 2nd edition, Prentice-Hall India, 2001.
2. J. Kleinberg and E. Tardos, Algorithm Design, Pearson International Edition, 2005.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/ Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 211	Basics of VLSI Design	03	02	--	03	01	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 211	Basics of VLSI Design	40	40	40	60	25	--	25	150

Course Objectives:

1. To teach fundamental principles of VLSI circuit design and layout techniques.
2. To highlight the circuit design issues in the context of VLSI technology.
3. To explain different scaling effects.
4. To study CMOS gates and effect of W/L ratio.
5. To study dynamic gates and circuit realization using pass transistors.
6. To design semiconductor memories and its importance.

Course Outcomes: Upon successful completion of the course students will be able to

1. Apply the knowledge to demonstrate a clear understanding of choice of technology and technology scaling.
2. Explain the design of MOSFET Inverters.
3. Analyze and design MOS based circuits design styles.
4. Understand CMOS gates and effect of W/L ratio.
5. Understand dynamic gates and circuit realization using pass transistors.
6. Understand the design of Semiconductor Memories.

Prerequisite: Analog Electronics Circuits, Digital Circuits and System Design(DCSD)

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs
1	**Technology Comparison, MOSFET Scaling**	Comparison of BJT, NMOS and CMOS technology Types of scaling, MOSFET Models, MOSFET capacitances	05
2	**MOSFET Inverters**	**Circuit Analysis:** Static and dynamic analysis (Noise, propagation delay and power dissipation) of resistive load, E mode MOSFET load, D mode MOSFET load inverter and CMOS inverter, comparison of all types of MOS inverters, design of CMOS inverters	07
3	**Universal gates, Complex circuits using MOSFETs**	**Logic Circuit Design**: Analysis and design of 2-I/P NAND and NOR using equivalent CMOS inverter, W/L ratio, Complex circuits.	07
4	**MOS Circuit Design Styles**	**Design Styles:** Static CMOS, pass transistor logic, transmission gate, Pseudo NMOS, Domino, NORA, Zipper, C2MOS, sizing using logical effort	08
5	**Circuit Realization using MOSFETs**	**Circuit Realization:** SR Latch, JK FF, D FF, 1 Bit Shift Register, MUX, decoder using above design styles	06
6	**Semiconductor Memories**	**SRAM:** ROM Array, SRAM (operation, design strategy, leakage currents, read/write circuits), DRAM (Operation, leakage currents, refresh operation), Flash memory- NOR flash, NAND flash.	06

DETAILED LAB SYLLABUS:

Software Requirements: TINA**,** NGSpice, Microwind

Sr. No.	Detailed Lab Description
1	Effect of parasitic capacitance and threshold voltage on output of NMOS inverter with resistive load.
2	Circuit characteristics and performance estimation of NMOS inverter with resistive load. 1) Verification of V_{OH} level for different values of load resistance.

	2) Find rise time for different values of load resistance.
3	Circuit characteristics and performance estimation of NMOS inverter with Enhancement mode MOSFET load.
4	Circuit characteristics and performance estimation of NMOS inverter with Depletion mode N channel MOSFET as a load.
5	Circuit characteristics and performance estimation of CMOS inverter. 1) Verification of V_{OH} and V_{OL} levels. 2) Comparison of rise and fall times for different values of W/L ratio of pull up and pull down devices.
6	Circuit characteristics and performance estimation of CMOS Dynamic 2 Input NAND Gate. 1) Verification of V_{OH} and V_{OL} levels for various input possibilities. 2) Verification of precharge and evaluate condition for different inputs. 3) Verification of charge leakage problem.
7	Design of 4:1 MUX using pass transistor logic and transmission gates.
8	Design of 6T SRAM using Microwind dsch3.1.

Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**

- Question paper will consist of 4 questions, each carrying 20 marks.
- Total 3 questions need to be solved.
- Q.1 will be compulsory, based on the entire syllabus.
- Remaining questions will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

Lab Assessments:

Term work should consist of 8 experiments.

Journal must include at least 3 assignments.

Term work Assessment:

Total 25 Marks (Experiments: 10-marks, Assignments: 10-marks, Attendance Theory & Practical: 05-marks)

Oral/Viva Assessment:

Based on the above contents and entire syllabus.

Text Books:

1. Sung-Mo Kang and Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", Tata McGraw Hill, 3rd Edition.
2. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits: A Design Perspective", Pearson Education, 2nd Edition.

References

1. Etienne Sicard and Sonia Delmas Bendhia, "Basics of CMOS Cell Design", Tata McGraw Hill, First Edition. 2. Neil H. E. Weste, David Harris and Ayan Banerjee, "CMOS VLSI Design: A Circuits and Systems Perspective", Pearson Education, 3rd Edition.

2. Debaprasad Das, "VLSI Design", Oxford, 1st Edition. 6. Kaushik Roy and Sharat C. Prasad, "Low-Power CMOS VLSI Circuit Design", Wiley, Student Edition.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 212	System Software & Operating Systems	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 212	System Software & Operating Systems	40	40	40	60	--	--	--	100

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

Course Objectives:

1. To understand the role and functioning of various system programs over application programs.
2. To understand basic concepts and designing of assembler and Macro processor.
3. To understand the role of loaders, linkers and Compilers.
4. To introduce basic concepts and functions of operating systems.
5. To understand the concepts and implementation of Process Management, IPC, memory management policies, File and I/O Management.

Course Outcomes:

After successful completion of the course students will be able to

1. Identify the relevance of different system programs.
2. Identify the need of assembler and macro processor design.
3. Understand the functions of linkers, loaders and compilers.
4. Understand the role of Operating System in terms of process, memory, file and I/O management.
5. Apply and analyse the concept of a process,process scheduling and synchronization.
6. Apply and analyze different techniques of memory management, file and I/O management.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1	**Introduction to System Software**	Concept of System Software, Introduction to various system programs such as Assembler, Macro processor, Loader, Linker, Compiler, Interpreter, Device Drivers, Operating system, Editors, Debuggers.	03
2	**Assemblers and Macro Processors**	Elements of Assembly Language programming, Assembler Design: Introduction to single pass Assembler Design for Hypothetical machines, data structures used. Macro definition and call, parameterized, conditional Macro, Design of Two pass macro processor for Hypothetical machines, data structures used.	08
3	**Linkers, Loaders and Compilers**	Functions of loaders, Absolute loader/Compile and Go loader, Phases of compilers: Lexical Analysis, Syntax analysis, SR Parser, Introduction to semantic analysis, Intermediate Code Generation: Types of Intermediate codes, Code optimization techniques, Introduction to Code Generation.	08
4	**Overview of operating System**	Introduction, Objectives, Functions and Types of Operating System, Operating System Services and Interface; Operating system structures: Layered, Monolithic and Microkernel.	04
5	**Process Management**	Concept of a Process, Process States, Operation on Process Uniprocessor Scheduling-Types: Preemptive and Non-preemptive, scheduling algorithms Threads: Definition and Types, Concept of Multithreading, Inter-Process Communication, Process Synchronization, Mutual Exclusion: ,Semaphores, Producer Consumer problem, Principles of Deadlock: Conditions Deadlock Handling Mechanism.	08
6	**Memory Management and I/O Management**	Basic Concepts of Memory Management; Memory Allocation Techniques, Paging, TLB, Segmentation, Virtual Memory; Demand Paging, Page Replacement Algorithms, I/O Devices, Disk Scheduling algorithm: FCFS, SSTF, SCAN, CSCAN, LOOK, C- LOOK, Linux I/O.	08

DETAILED LAB SYLLABUS:

Lab Prerequisite:聽 Any programming language, Knowledge on Operating system principles

Hardware Requirements: 2GB RAM,PC i3 processor and above

Software Requirements: C, IDE/Compiler (Geany). Linux Operating System

Sr. No.	Detailed Lab/Tutorial Description
1	Implementation of File handling program to check whether entered input is Mnemonic or Pseudo opcode or symbol.
2	Design and Development of Simple Macro Processor
3	Implementation of Lexical analysis phase of compilers
4	Implementation of Intermediate code generation phase of compilers
5	Implementation of code generation phase of compilers
6	Explore usage of basic and advanced Linux Commands
7	Explore the file and process management system calls.
8	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 call.
9	Write a program to demonstrate the concept of non-preemptive and preemptive聽 scheduling algorithms.
10	Write a program in C demonstrate the concept of page replacement policies

Theory Assessments:

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

2. End Sem Theory Examination:

- Question paper will consist of 4 questions, each carrying 20 marks.
- Total 3 questions need to be solved.
- Q.1 will be compulsory, based on the entire syllabus.
- Remaining questions will be randomly selected from all the modules.

Weightage of marks should be proportional to the number of hours assigned to each module.

Lab Assessment:

1.Term work Assessment:

Term work should consist of 10 experiments. Journal must include at least 2 assignments on content of theory and practical of “System Software & Operating Systems”.The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term

work. Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks).

Text Books:

1. D. M Dhamdhere: Systems programming, Tata McGraw Hill.

2. A. V. Aho, R. Shethi, Monica Lam , J.D. Ulman : Compilers Principles, Techniques and Tools, Pearson Education , Second Edition.

3. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN-10: 0133805913 鈥?ISBN-13: 9780133805918 .

4. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons , Inc., 9th Edition, 2016, ISBN 978-81-265-5427-0

References:

1. Compiler construction : principles and practices , Kenneth C.Louden ,CENGAGE Learning.
2. System software : An introduction to system programming , Leland L. Beck, Pearson.
3. Principles of Operating Systems, Naresh Chauhan, First Edition , Oxford university press.
4. Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rd Edition.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 211	Microprocessor & Microcontrollers	03	02	--	03	01	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 211	Microprocessor & Microcontrollers	40	40	40	60	25	25	--	150

Prerequisite: Digital System Design

Course Objectives:

1. To understand the basic concepts of Microprocessor based systems.
2. To understand the architecture and instruction set of 8-bit Microcontroller 8051.
3. To write assembly / C programs for 8051 Microcontroller.
4. To understand peripheral devices and their interfacing with 8051 Microcontroller.
5. To understand various applications of 8051microcontroller.
6. To understand architecture of 32-bit Microcontroller ARM Cortex M3.

Course Outcomes:

After successful completion of the course students will be able to

1. Identify the features of microcontrollers (8051 & ARM Cortex M3)
2. Understand the architecture and aspects of 8051& Cortex M3 microcontroller.
3. Interface microcontroller with hardware for given application
4. Write and execute assembly or C language programs for given application.
5. Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051
6. Develop small microcontroller based applications.

DETAILED THEORY SYLLABUS:

Sr. No.	Module	Detailed Content	Hrs.
1.	**Introduction to Microprocessor System.**	1.1 Microprocessor based system: CPU, I/O Devices, Clock, Memory, Concept of Address, Data and Control Bus. 1.2 Features of 8086 Microprocessor. 1.3 Comparison between Microprocessor and Microcontroller. 1.4 Concept of Harvard & Von Neumann Architecture.	04

		1.5 pipelined operation.	
2	**8051 Microcontroller Architecture**	2.1 8051 Features & its architecture (ALU, PC, DPTR, PSW, Internal RAM, Internal ROM, Latch, SFRs, General purpose registers, Timer/Counter, Interrupt, Ports). 2.2 Pin configuration of 8051 Microcontroller. 2.3 Memory organization (Program and Data memory Map)	04
3.	**8051 Microcontroller assembly language programming**	3.1 Addressing modes of 8051. 3.2 Assembler directives of 8051. 3.3 Instruction Set: Data transfer, Arithmetic, Logical, Branching. 3.4 Programming concepts: Looping , Counting, sorting and Indexing, Data manipulation, Masking. 3.5 Programs related to: arithmetic, logical, Branch & delay.	08
4.	**Internal Hardware of 8051 Microcontroller & Programming**	4.1 I/O port structure and programming. 4.2 Timer/Counter and programming.. 4.3 Serial port and programming. 4.4 Interrupts and programming. 4.5 Power saving modes of 8051: Power down and idle mode.	08
5.	**8051 Interfacing & Applications**	6.1 Display interfacing: 7-segment LED display, 16x2 generic alphanumeric LCD display. 6.2 Analog devices interfacing: 8-bit ADC and DAC 6.3 Motor interfacing: Dc motor & Stepper motor. 6.4 Waveform (Ramp, triangular & Sine wave) generation program using DAC.	08
6.	**Advanced Microcontroller Architecture (ARM CORTEX-M3)**	6.1 Comparison of CISC & RISC architectures. 6.2 Overview of ARM family. 6.3 ARM Cortex-M3 architecture,. 6.4 Programmer's model: Operation Modes and States, registers, special registers, Application Program Status Register- Integer status flags, Q status flag, GE bits. 6.5 Memory system: Features and memory map 6.6 Exceptions and Interrupts - Nested vectored interrupt controller.	07

DETAILED LAB SYLLABUS:

Lab Prerequisite: Digital System Design

Hardware Requirements: Experiments can be conducted on Assembler, Emulator

Software Requirements: Hardware kits

Sr. No.	Detailed Lab/Tutorial Description
1	Introduction to 8086 microprocessor kit and assembler.
2	To write an assembly language program to perform Arithmetic and Logical Operations using 8051 microcontroller.

3	To write an assembly language program to transfer of data bytes between Internal and External Memory using 8051 microcontroller.
4	To write an assembly language program to perform experiments based on General Purpose Input-Output & Timers.
5	Program for Serial communication of 8051 using UART.
6	Programs for Interfacing of Stepper Motor/DC motor with 8051 microcontroller.
7	Programs for generating waveform (Square, Triangular, Sine wave) with 8051 microcontroller.
8	Programs for Interfacing of LCD with 8051
9	Mini project based on any application related to 8051 microcontroller.

Theory Assessments:

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

2. End Sem Theory Examination:

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

Lab Assessment:

1. Term work Assessment:

08 Experiments covering the entire syllabus must be given during the "Laboratory session batch wise". Computation/simulation based experiments are also encouraged. The experiments should be student centric and attempts should be made to make experiments more meaningful, interesting and innovative. Application oriented one mini-project can be conducted for a maximum batch of at least 04 students.

Text Books:

1. Microprocessor and Interfacing: By Douglas Hall (TMH Publication)
2. M. A. Mazidi, J. G. Mazidi and R. D. Mckinlay, "The 8051 Microcontroller & Embedded systems", Pearson Publications, Second Edition 2006.
3. C. Kenneth J. Ayala and D. V. Gadre, "The 8051 Microcontroller & Embedded system using assembly & 'C' ", Cengage Learning, Edition 2010.
4. Joseph Yiu,"The Definitive Guide to ARM CORTEX-M3 & CORTEX-M4 Processors", Elsevier, 2014, 3rd Edition.

Reference Books:

1. 8086 Microprocessor Programming and Interfacing the PC: By Kenneth Ayala (West Publication).

2. Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: By Liu & Gibson (PHI Publication).
3. Satish Shah, "The 8051 Microcontrollers", Oxford publication first edition 2010.
4. "MCS@51 Microcontroller, Family users Manual" Intel.
5. David Seal, "ARM Architecture", Reference Manual (2nd Edition), Publisher Addison Wesley.

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 214	Entrepreneurship	03	-	-	03	-	-	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test2	Avg. of 2 Tests					
EC 214	Entrepreneurship	40	40	40	60	-	-	-	100

Course Objectives:

1. To understand the basic concepts of entrepreneurship.
2. To understand the role of entrepreneurship in economic development
3. To understand the importance of opportunity recognition and internal and external analyses to the success of a business venture
4. To enable the learners to know the factors contributed in failure of the enterprise

Course Outcomes:

1. Analyse the business environment in order to identify business opportunities
2. Identify the elements of success of entrepreneurial ventures
3. Evaluate the effectiveness of different entrepreneurial strategies,
4. Interpret their own business plan

Detailed Theory Syllabus:

Module No	Detailed Content	Hours
1	Conceptual definition of entrepreneurs and entrepreneurship, Advantages and Disadvantages of Being an Entrepreneur, Entrepreneurial motivation, Entrepreneurial characteristics	8
2	Recognizing, assessment and Exploiting the Opportunity, Conducting Internal and External Analyses, Determining the Feasibility of the Concept, Selecting a Marketing Strategy	6
3	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	6
4	The Overall Business Plan, Purpose of the Business Plan, Components of the Business Plan, Presentation of the Business Plan, Matching the Business Plan to the Needs of the Firm	6
5	The Marketing Plan, conducting a Market Analysis, Understanding the Target Market, Reaching the Target Market through Locale and Engagement	8
6	Entrepreneurial failure, early stage failure, late stage failure	6

Assessment:
Internal Assessment: 40 marks

End Semester Examination: 60 Marks

Books and References:

1. Fundamentals of Entrepreneurship by H. Nandan, PHI
2. Entrepreneurship by Robert Hisrich, Michael Peters, Dean Shepherd, Sabyasachi Sinha, Mc Graw Hill
3. Why startups fail: A new roadmap for entrepreneurial success by Tom Eisenmann

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 216	System Software & Operating Systems Lab	-	02	--	-	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
EC 216	System Software & Operating Systems Lab	-	-	-	-	25	--	25	50

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

Course Objectives:

1. To understand the role and functioning of various system programs over application programs.
2. To understand basic concepts and designing of assembler and Macro processor.
3. To understand the role of loaders, linkers and Compilers.
4. To introduce basic concepts and functions of operating systems.
5. To understand the concepts and implementation of Process Management, IPC, memory management policies, File and I/O Management.

Course Outcomes:

After successful completion of the course students will be able to

1. Identify the relevance of different system programs.
2. Identify the need of assembler and macro processor design.
3. Understand the functions of linkers, loaders and compilers.
4. Understand the role of Operating System in terms of process, memory, file and I/O management.
5. Apply and analyse the concept of a process,process scheduling and synchronization.
6. Apply and analyze different techniques of memory management, file and I/O management.

DETAILED LAB SYLLABUS:

Lab Prerequisite: Any programming language, Knowledge on Operating system principles

Hardware Requirements: 2GB RAM,PC i3 processor and above

Software Requirements: C, IDE/Compiler (Geany). Linux Operating System

Sr. No.	Detailed Lab/Tutorial Description
1	Implementation of File handling program to check whether entered input is Mnemonic or Pseudo opcode or symbol.
2	Design and Development of Simple Macro Processor
3	Implementation of Lexical analysis phase of compilers
4	Implementation of Intermediate code generation phase of compilers
5	Implementation of code generation phase of compilers
6	Explore usage of basic and advanced Linux Commands
7	Explore the file and process management system calls.
8	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 call.
9	Write a program to demonstrate the concept of non-preemptive and preemptive scheduling algorithms.
10	Write a program in C demonstrate the concept of page replacement policies

Lab Assessment:

1.Term work Assessment:
Term work should consist of 10 experiments. Journal must include at least 2 assignments on content of theory and practical of "System Software & Operating Systems".The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work. Total 25 Marks (Experiments: 15-marks, Attendance Theory & Practical: 05-marks, Assignments: 05-marks).

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
EC 291	Programming Lab I (Java Programming)		1#+2	--	-	1	--	1

1# to be taken class wise

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment (Review)			End Sem. Exam				
		1(10)	2(10)	Average					
EC 291	Programming Lab I (Java Programming)	-	-	-	-	25	–	25	50

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using the java collection framework.
3. To write Exception Handling & multithreaded programs.
4. To write GUI programs using swing controls in Java.
5. To introduce java compiler and eclipse platform.
6. To impart hands-on experience with java programming

Course Outcomes:

After successful completion of the course students will be able to

1. Understand Java Programming.
2. Develop a program that efficiently implements the features and packaging concept of java.
3. Implement Exception handling and Applets using Java.
4. Identify problems based on societal /research needs , write code using java and demonstrate capabilities of self-learning in a group, which leads to lifelong learning.

5. Analyse the impact of solutions in societal and environmental context for sustainable development.
6. Use standard norms of engineering practices.

DETAILED SYLLABUS:

Sr. No.	Module	Detailed Lab/Tutorial Description	No of Hours
1	Introduction to Java	Java History, Java Features, Java Virtual Machine, Data Types and Size (Signed vs. Unsigned, User Defined vs. Primitive Data Types, Explicit Pointer type)Installing Java, Java Program Development, Java Source File Structure, Compilation, Executions.	3
2	Object-Oriented Programming	Class Fundamentals, Object & Object reference, Creating and Operating Objects, Constructor & initialization code block, Access Control, Modifiers, Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism.	5
3	Classes, and Inheritance	Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance	5
4	Package	Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, Classpath, Setting for Packages, Making JAR Files for Library Packages Import and Static Import Naming Convention For Packages.	4
5	Exception Handling & Multithreading	The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow In Exceptions, JVM reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions. Multithreaded programming, Create thread, Life cycle, Thread methodsThread exception,	5
6	Applet and Graphics Programming	Applet: Applet Fundamental, Applet Architecture, Applet Life-Cycle, Applet Skeleton, Applet, and Application Program.Graphics Programming, Graphics classes, Functions and methods	4

DETAILED LAB SYLLABUS:

Software Requirements: Netbeans:https://netbeans.org/downloads/ J-Edit/J-Editor/Blue J

Sr. No.	Detailed Lab/Tutorial Description
1	Introduction to Java programming language.
2	Creating Classes and their Objects in Java.
3	Using constructors to create objects.
4	To understand the inheritance in Java
4	Learning of abstraction through Interface.
5	Learning of Encapsulation through Package.
6	Handling Exceptions in Java
7	Understanding Life cycle of a Thread
8	Develop an applet in Java that displays a simple message
9	Mini Project

Guidelines for Mini Project

- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Students should do surveys and identify needs, which shall be converted into problem statements for mini projects in consultation with faculty supervisor/head of department/internal committee of faculties.
- Students shall submit an implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of mini projects.
- A log book to be prepared by each group, wherein the group can record weekly work progress, guide/supervisor can verify and record notes/comments.
- Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.
- Students in a group shall understand the problem effectively, propose multiple solutions and select the best possible solution in consultation with the guide/ supervisor. Students shall convert the best solution into a working model using various components of their domain areas and demonstrate. The solution to be validated with proper justification and report to be compiled in standard format.

Lab Assessment:

1.Term work Assessment:

For performance experiments	: 15 Marks
Attendance	: 05 Marks
Quality of Project report	: 05 Marks

2.Oral/Practical Assessment:

Practical and Oral exam will be based on the experiments and project implemented in the semester.