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 2024-25

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

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

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

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

as per Choice Based Credit and Grading System

Mahatma Education Society's

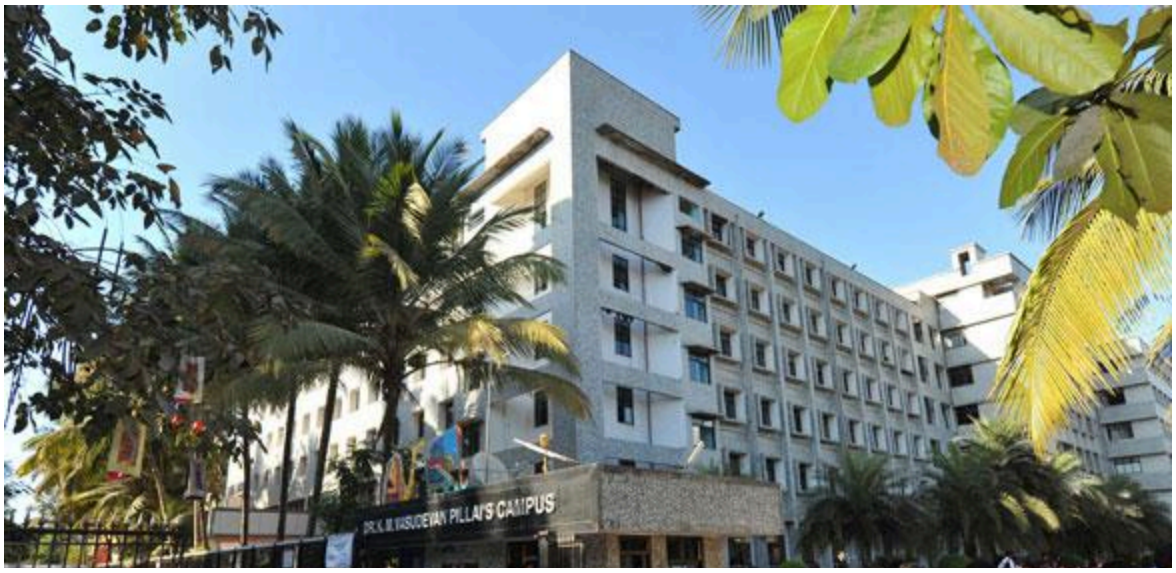
Pillai College of Engineering

Vision

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

Mission

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



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

Department of 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. Entrepreneurship Development and Management
2. Business Management
3. Intellectual Property Management
4. Bioengineering
5. Bio Instrumentation
6. Engineering Design
7. Sustainable Technologies
8. Contemporary Studies
9. Art and Journalism
10. Applied Science
11. Green Technologies
12. Maintenance Engineering
13. Life Skills
14. Environment & Safety
15. Quantum Computing and Quantum Technologies

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.

Preface by Board of Studies in Electronics & Computer Science

Dear Students and Teachers, we, the members of Board of Studies Electronics & Computer Science, are very happy to present the B.Tech Electronics & Computer Science syllabus effective from the Academic Year 2024-25 . We are sure you will find this syllabus interesting, challenging, and up to date to fulfill specific needs and expectations.

The Electronics and Computer Science discipline combines two important disciplines of engineering: Electronics and Computer Science. The syllabus focuses on providing a sound theoretical background as well as good practical exposure to students in the relevant areas. It is intended to provide a modern, industry-oriented education in Electronics & Computer Science. Its primary goal is to offer a contemporary and industry-centric education, preparing individuals to effectively meet the global demands of the field.

The syllabus is meticulously crafted to align with the vision and mission of the Electronics & Computer Science Department as well as the standards set by various accreditation agencies. It takes into account technological advancements, innovations, and industry requirements, ensuring that the curriculum remains up-to-date and relevant to the evolving landscape of the field.

The development of this syllabus involves a collaborative brainstorming session, which includes the participation of Heads of Department and senior faculty members from the Department of Electronics & Computer Science.

We express our sincere appreciation and gratitude to the faculty, students, industry experts, and all the stakeholders for their invaluable contributions towards the formulation of this syllabus. Their expertise, insights, and active involvement have been instrumental in shaping and refining the curriculum.

Board of Studies in Electronics & Computer Science

1. Dr. Monika Bhagwat	Coordinator (Chairman)
2. Dr. Uttam Kolekar	Vice Chancellor's Nominee
3. Dr. Vaishali Ingle	Academic Council Nominee
4. Dr. Shweta Chiwhane	Academic Council Nominee
5. Mr. Vijay Raut	Industry Representative
6. Mr.Saurabh Bhopi	Alumnus Nominee
7. Dr. Parikshi Sahatiya	Experts from outside the Autonomous College
8. All faculty members of the Department.	

Semester I

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract/ Tuts	Theory	Pract /Tuts	Total
MATH101	Engineering Mathematics I	BSC	3	2	3	1	4
PHY102	Engineering Physics I	BSC	2	1	2	0.5	2.5
CHEM103	Engineering Chemistry I	BSC	2	1	2	0.5	2.5
CE104	C Programming	ESC	3	2	3	1	4
ENGG105	Basic Electrical Engineering	ESC	3	2	3	1	4
ENGG111	Basic Workshop-I	SKILL	-	2	-	2	1
HUM113	Ancient Indian Engineering(IKS)	*IKS*	1	2+2#	1	1	2
ENGG114	Co Curricular Course I	*CC*	-	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					
MATH101	Engineering Mathematics I	BSC	40	40	40	60	2	25	-	125
PHY102	Engineering Physics I	BSC	30	30	30	45	2	25	-	100
CHEM103	Engineering Chemistry I	BSC	30	30	30	45	2	25	-	100
CE104	C Programming	ESC	40	40	40	60	2	25	25	150
ENGG105	Basic Electrical Engineering	ESC	40	40	40	60	2	25	25	150
ENGG111	Basic Workshop-I	*VSEC*	-	-	-	-	-	50	-	50
HUM113	Ancient Indian Engineering(IKS)	*IKS*	-	-	-	-	-	50	-	50
ENGG114	Co Curricular Course I	*CC*	-	-	-	-	-	50	-	50
Total										**775**

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

Semester II

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract/ Tuts	Theory	Pract/Tuts	Total
MATH115	Engineering Mathematics II	BSC	3	2	2	1	4
PHY116	Engineering Physics II	BSC	2	1	2	0.5	2.5
CHEM117	Engineering Chemistry II	BSC	2	1	2	0.5	2.5
MECH107	Engineering Mechanics and Graphics	ESC	2	4	2	2	4
CE119	Python Programming	Program Courses	3	2	2	1	4
ENGG123	Basic Workshop -II	SKILL	-	4	-	2	1
COMM121	Professional Communication and Ethics I	AEC	1	2	1	1	2
ENGG125	Co Curricular Course II	*Liberal Learning*	-	4	-	2	2
Total			**12**	**20**	**12**	**10**	**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					
MATH115	Engineering Mathematics II	BSC	40	40	40	60	2	25	-	125
PHY116	Engineering Physics II	BSC	30	30	30	45	2	25	-	100
CHEM117	Engineering Chemistry II	BSC	30	30	30	45	2	25	-	100
MECH107	Engineering Mechanics and Graphics	ESC	40	40	40	60	2	25	50	175
CE119	Python Programming	Program Courses	40	40	40	60	2	25	25	150
ENGG123	Basic Workshop -II	*VSEC*	-	-	-	-	-	50	-	50
COMM121	Professional Communication and Ethics I	AEC	-	-	-	-	-	50	-	50
ENGG125	Co Curricular Course II	Liberal Learning	-	-	-	-	-	50	-	50
Total										**775**

Semester III

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract/ Tuts	Theory	Pract /Tuts	Total
MATH 201E	Mathematics for Electronics and Computer Science III	ESC	2+1*	2	2	1	3
ECS 202	Analog Electronics Circuits	PCC	3	-	3	-	3
ECS 203	Digital Circuits and System Design	PCC	3	-	3	-	3
ECS 204	Data Structures and Algorithms	MDM	3	2	3	1	4
ECS 205	Database Management System	PCC	3	2	3	1	4
ECS 206	Analog and Digital Electronics Lab	PCC	-	2	-	1	1
MGMT 290	Personal Finance Management	HSSM	2	-	2	-	2
HUM 201	Human Values and Social Ethics	VEC	2	-	2	-	2
			19	**8**	**18**	**2**	**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					
MATH 201E	Mathematics for Electronics & Computer Science III	ESC	40	40	40	60	2	25	-	125
ECS 202	Analog Electronics Circuits	PCC	40	40	40	60	2	-	-	100
ECS 203	Digital Circuits and System Design	PCC	40	40	40	60	2	-	-	100
ECS 204	Data Structures and Algorithms	MDM	40	40	40	60	2	25	25	150
ECS 205	Database Management System	PCC	40	40	40	60	2	25	25	150
ECS 206	Analog and Digital Electronics Lab	PCC	-	-	-	-	-	25	25	50
MGMT 290	Personal Finance Management	HSSM	20	20	20	40	2	-	-	60
HUM 201	Human Values and Social Ethics	VEC	-	-	-	-	-	50	-	50
										785

*additional lecture class wise

Semester IV

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)		Credits Assigned		
			Theory	Pract/ Tuts	Theory	Pract/ Tuts	Total
MATH 209E	Mathematics for Electronics & Computer Science IV	ESC	2+1*	2	2	1	3
ECS 210	Analysis of Algorithms	PCC	3	2	3	1	4
ECS 211	Basics of VLSI	PCC	3	2	3	1	4
ECS 212	System Software & Operating Systems	MDM	3	-	3	-	3
ECS 213	Microprocessor and Microcontroller	PCC	3	2	3	1	4
ECS 214	System Software & Operating Systems Lab	Skill courses	-	2	-	1	1
ECS 291	Programming Lab I (Java Programming)	VSEC	-	2	-	1	1
ENGG 201	Entrepreneurship	HSSM	2	-	2	-	2
Total			**17**	**10**	**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					
MATH 209E	Mathematics for Electronics & Computer Science IV	ESC	40	40	40	60	2	-	-	100
ECS 210	Analysis of Algorithms	PCC	40	40	40	60	2	25	25	150
ECS 211	Basics of VLSI	PCC	40	40	40	60	2	25	25	150
ECS 212	System Software & Operating Systems	MDM	40	40	40	60	2	-	-	100
ECS 213	Microprocessor and Microcontroller	PCC	40	40	40	60	2	25	25	150
ECS 214	System Software & Operating Systems Lab	Skill courses	-	-	-	-	-	25	25	50
ECS 291	Programming Lab I (Java Programming)	VSEC	-	-	-	-	-	25	25	50
ENGG 201	Entrepreneurship	HSSM	20	20	20	40	2	-	-	60
Total										**810**

*additional lecture class wise

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)
MATH 201E	Mathematics for Electronics and Computer Science III	02+1*	02	-	02	01	-	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
MATH 201E	Mathematics for Electronics and Computer Science III	40	40	40	60	25	-	-	125

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 concepts of complex integration and analyze the Engineering problem
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. Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
5. Apply the concept of relation and function.
6. Use groups and codes in Encoding-Decoding

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	3	2	1		1			1	1		1			
CO2	3	2	1		2			1	1		1			
CO3	3	2	1		1			1	1		1			
CO4	3	2	1		1			1	1		1			
CO5	3	2	1		1			1	1		1			
CO6	3	2	1					1	1		1			

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, (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 Integration**	Line Integral, Cauchy's Integral theorem for simple connected and multiply connected regions (without proof), Cauchy's Integral formula(withoutproof). Taylor'sandLaurent'sseries(withoutproof). Definition of Singularity, Zeroes, poles of f(z), Residues, Cauchy's ResidueTheorem(withoutproof)	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.

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

A. Term Work:

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

(i) Laplace Transform.
(ii) Inverse Laplace Transform
(iii) Fourier series
(iv) Eigen values and Eigen Vector.
(v)Singular Value Decomposition
(vi) Diagonalization of matrices
(vii) Evaluate the Complex Integral
(viii) Warshall's Algorithm.

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)
ECS 202	Analog Electronics Circuits	03	-	--	03	-	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
ECS 202	Analog Electronics Circuits	40	40	40	60	-	-	--	100

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.

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	3	2	2	2	2	1	-	-	1	1	2	3	2	2
CO2	3	3	2	2	2	2	-	-	-	1	1	3	1	2
CO3	3	3	2	2	2	2	-	-	-	1	1	3	1	1
CO4	3	3	2	2	2	2	-	-	-	2	2	3	3	2
CO5	3	3	2	2	2	2	-	-	-	1	1	3	3	2
CO6	3	3	2	2	2	2	-	-	-	3	2	3	3	2

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.

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)
ECS 203	Digital Circuits and System Design	03	-	--	03	-	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
ECS 203	Digital Circuits and System Design	40	40	40	60	-	--	-	100

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

Course Objectives:

1. 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. 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 counters 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.

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	2	2	2								2	3	2	
CO2	2	2	2								2	3	2	
CO3	2	2	2								2	3	2	1
CO4	2	2	2	2							2	3	2	1
CO5	2	2	2	2		2					2	3	2	1
CO6	2	2	2	2							2	3	2	1

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.	05
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 up to 4:1). MSI devices: IC7483, IC74151, IC74138, IC7485.	06
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

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.

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)
ECS 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					
ECS 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.

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	2	1	1	2	1	1	-	-	-	-	-	2	1	1
CO2	1	1	1	1	1	-	-	-	-	-	-	2	1	1
CO3	1	1	1	1	1	-	-	-	-	-	-	2	1	1
CO4	2	2	2	2	3	-	-	-	-	-	-	3	2	1
CO5	3	3	2	3	3	-	-	-	1	-	2	3	2	2
CO6	3	3	3	3	3	-	-	-	2	-	2	3	2	2

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	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)
ECS 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					
ECS 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.

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	3	1			1						1	1	1	2
CO2	3	2	2	1	1	1					1	--	3	2
CO3	3	3	2		1						1	--	3	1
CO4	3	2	2		1					1	1	--	1	1
CO5	3	2	1		1						1	--	1	1
CO6	3	1									1	1	1	1

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-Database 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	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical/ Oral (Credits)	Tutorial (Credits)	Total (Credits)
ECS 206	Analog and Digital Electronics Lab		2	--	-	1	--	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		1	2	Average					
ECS 206	Analog and Digital Electronics Lab	-	-	-	-	25	–	25	50

Course Objectives:

1. To Enhance students' understanding of electronic circuits.
2. To Perform DC and AC analysis of BJT and MOSFET amplifiers.
3. To Learn operational amplifier principles and applications.
4. To Develop skills in IC selection, functionality, and application.
5. To Explain combinational and sequential circuit design using MSI chips.
6. To Introduce logic families, PLDs, and VHDL programming.

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 and analyze and identify the linear and nonlinear applications of operational amplifiers.
4. Design an application with the use of integrated circuits.
5. Analyze, design and implement Combinational logic circuits, Sequential logic circuits and implementation of various counters using flip flops and MSI chips.
6. Understand basics of VHDL Hardware Description Language and its programming with combinational and sequential logic circuits.

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	3	2	2	2	2	1	-	-	1	1	2	3	2	2
CO2	3	3	2	2	2	2	-	-	-	1	1	3	1	2
CO3	3	3	2	2	2	2	-	-	-	1	1	3	1	1
CO4	3	3	2	2	2	2	-	-	-	3	2	3	3	2
CO5	3	3	3	2	3	1		1		2	2	3	3	2
CO6	3	2	2	2	3	1		1		2	2	3	2	2

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:

1. **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.

2. **Practical/Viva Assessment:**

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

Course Code	Course Name	Theory (Hrs.)	Practical (Hrs.)	Tutorial (Hrs.)	Theory (Credits)	Practical /Oral (Credits)	Tutorial (Credits)	Total (Credits)
MGMT 290	Personal Finance Management	02	-	–	02	-	–	02

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		1	2	Average					
MGMT 290	Personal Finance Management	20	20	20	40	-	-	--	60

Course objectives: The course is aimed

1. To understand the fundamentals of budgeting and create effective personal budgets.
2. Gain knowledge of investment options, risk and returns for informed decision making.
3. Learn how to assess insurance needs
4. Implement tax - saving strategies for financial security
5. To know the various financial scams and frauds & to overcome them.

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

1. Understand the principles of budgeting and to integrate personal financial planning concepts into real - world scenarios
2. Comprehend various investment types, risk and returns
3. Develop skills to assess insurance needs and select appropriate coverage
4. Master tax planning strategies for effective tax management
5. Identify and prevent financial scams and fraud

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1		1		1	1	1								
CO2	2	2	1		2									
CO3		2	3	1		1								
CO4	2	3	2		2	1								
CO5	1	2	2	1	2	1								

Detailed Theory Syllabus:

Sr. No.	Module	Detailed Contents of Module	Hrs
1	Budgeting	1. Understanding income & expenses: - Identifying sources of income, tracking expenses, balancing necessary Vs. discretionary spending. 2. Creating a Personal Budget: - Applying budgeting methods (e.g., 50/30/20 rule), setting financial goals and allocating for savings and debt repayment. 3. Budgeting Tools and Techniques: - Exploring budgeting apps and tools to automate savings and expense tracking.	4
2	Investment	1. Types of Investment: Equities (stocks), Fixed income (bonds), Real Estate and Mutual Funds/ ETFs. 2. Understanding investment risks: Market risk, credit risk, liquidity risk and interest rate risk. 3. Risk and return relationship: How risk affects returns, diversification and assessing personal risk tolerance. 4. Evaluating investment opportunities: Analysing potential investments and choosing based on financial goals and risk profile.	5
3	Insurance	1. Types of insurance: Health, Life, Disability, Auto and Property Insurance. 2. Key Insurance concepts: Premiums, deductibles, coverage limits and policy terms, Grace Period, Free Look period and revival of policy. 3. Evaluating insurance needs: Calculating the right coverage for personal risk and financial security 4. Choosing the right insurance products: Comparing different policies, terms and conditions based on personal needs.	5
4	Tax Planning	1. Tax Savings Strategies: Contribution to tax-advantaged accounts and using tax-efficient investments 2. Tax deductions: Common deductions like mortgage interest, medical expenses, and charitable contributions. 3. Tax Exemptions: Exemptions for personal income, dependent exemptions and specific retirement income 4. Understanding tax planning tools: Leveraging tools and resources to maximize tax efficiency.	5
5	Financial Scams and Frauds	1. Common Financial Scams: Ponzi Schemes, Phishing, Identity theft and online fraud.	5

		2. Recognizing Red Flags of Fraud: Identifying warning signs of financial scams. 3. Preventing Financial Scams: Best practices for protecting personal information and avoiding scams. 4. Reporting Scams: How to report financial fraud to relevant authorities like FTC, SEC and local consumer agencies.	

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)
HUM 201	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					
HUM 201	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.

CO-PO-PSO Mapping (3 High , 2 Medium , 1 Low)

Course outcomes	Programme Outcomes											PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	1	2	3
CO1	1	2	3	1	1	1	1	1	2	1	1	1	2	1
CO2	2	2	1	3	2	1	2	1	2	2	1	1	1	2
CO3	2	3	3	1	3	3	2	3	2	3	3	2	3	1
CO4	2	1	2	2	2	2	1	1	1	2	2	1	2	3
CO5	1	3	2	2	1	3	3	2	3	3	1	3	1	2

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.

Bachelor of Technology

In

Electronics & Computer Science

(Semester IV)