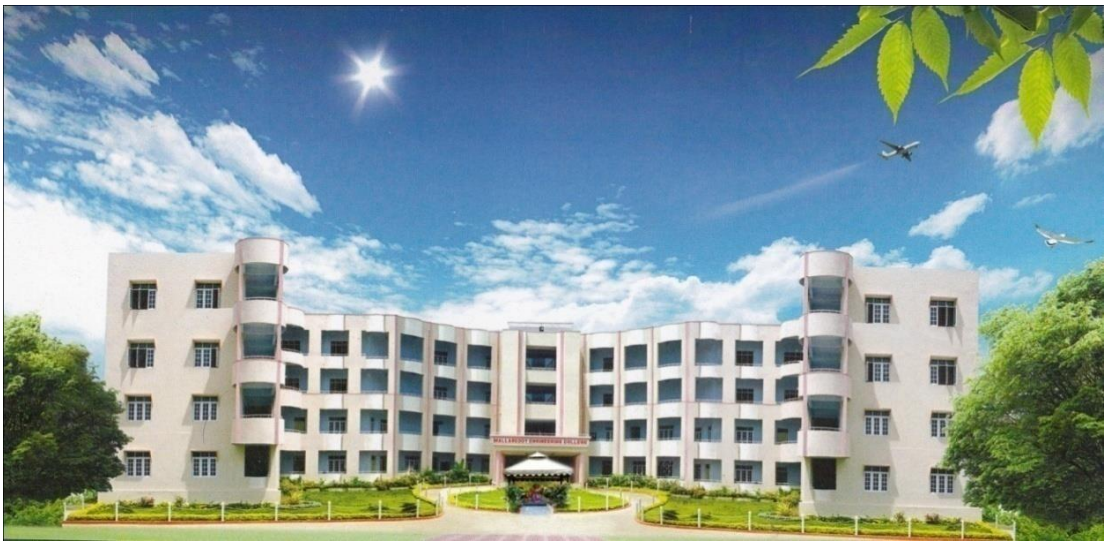
ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

Effective from the Academic Year 2022-23 onwards

Department of Electronics and Communication Engineering



For

B.Tech. - Four Year Degree Programme

(MR22 Regulations)

Department of Electronics and Communication Engineering

MALLA REDDY ENGINEERING COLLEGE

(Autonomous)

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH, Hyderabad)
Recognized under section 2(f) &12 (B) of UGC Act 1956, Accredited by NAAC with 'A' Grade (II Cycle) and NBA
Maisammaguda, Dhulapally (Post ViaKompally), Secunderabad - 500 100.
Website: www.mrec.ac.in E-mail: principal@mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
MR22 – ACADEMIC REGULATIONS (CBCS)
for B.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year ***2022-23*** onwards

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad, Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

VISION

To be a premier center of professional education and research, offering quality programs in a socio-economic and ethical ambience.

MISSION

- To impart knowledge of advanced technologies using state-of-the-art infrastructural facilities.
- To inculcate innovation and best practices in education, training and research.
- To meet changing socio-economic needs in an ethical ambience.

DEPARTMENT VISION

- To produce innovative, globally competent and ethical Electronics and communication Engineers to cater socio-economic needs.

DEPARTMENT MISSION

- To impart quality education in Electronics and Communication Engineering discipline and produce employable graduates
- To improve the thought process of students by exposing them to advanced technologies and make them innovative in their career
- To provide ethical and value-based education by encouraging activities addressing the societal needs.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To impart with a sound knowledge in scientific and engineering technologies necessary to formulate, analyze, design and implement solutions to computer technology related problems.

PEO2: To carry out research in frontier areas of computer science and engineering with the capacity to learn independently throughout life to develop new technologies.

PEO3: To train to exhibit technical, communication and project management skills in their profession and follow ethical practices.

PEO4: To posses leadership and team working skills to become a visionary and an inspirational leader and entrepreneur.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Understand the problem and apply design and analysis tools to find solution in the domains of Structural, thermal and Fluid Mechanics.

PSO2: Engage professionally in industries or as an entrepreneur by applying Manufacturing concepts.

PSO3: Systemize the Engineering and manufacturing practices using TQM concepts and Optimization techniques.

PROGRAMME OUTCOMES (POs)

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 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.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 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.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 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.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological Change.

MALLA REDDY ENGINEERING COLLEGE
COURSE STRUCTURE – B.Tech_ Electronics and Communication Engineering
Programme (MR22 Regulations - Effective from Academic Year 2022 – 23 onwards)

SEMESTER – I							
S. No	**Category**	**Course Code**	**Name of the Subject**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1.	HSMC	C0H01	English	3	-	-	3
2.	BSC	C0B03	Linear Algebra and Applied Calculus	3	1	-	4
3.	ESC	C0501	Programming for Problem Solving	3	-	-	3
4.	ESC	C0201	Basic Electrical and Electronics Engineering	3	-	-	3
5.	ESC	C0502	Programming for Problem Solving Lab	-	1	2	1
6.	HSMC	C0H02	English Language and Communication Skills Lab	-	-	3	1
7.	ESC	C0302	Engineering Workshop	-	-	2	1
8.	ESC	C0202	Basic Electrical and Electronics Engineering Lab	-	-	2	1
Total				**12**	**2**	**9**	**17**
Total Contact Hours				**23**			

SEMESTER – II							
S. No	**Category**	**Course Code**	**Name of the Subject**	**Contact hours/week**			**Credits**
				L	**T**	**P**	
1.	BSC	C0B17	Engineering Chemistry	3	1	-	4
2.	ESC	C0305	Engineering Drawing	2	-	2	3
3.	BSC	C0B10	Applied Physics	3	1	-	4
4.	BSC	C0B04	Advanced Calculus	3	1	-	4
5.	PCC	C0401	Analog Electronics	3	-	-	3
6.	ESC	C0553	Basic Python Programming Lab	-	1	2	2
7.	BSC	C0B11	Applied Physics Lab	-	-	2	1
8.	BSC	C0B18	Engineering Chemistry Lab	-	1	2	1
9.	PCC	C0402	Analog Electronics Lab	-	-	2	1
Total				**14**	**5**	**10**	**23**
Total Contact Hours				**29**			

SEMESTER-III							
S.No	**Category**	**Course Code**	**Name of the Subject**	**L**	**T**	**P**	**Credits**
1	BSC	C0B08	Complex Variables and Numerical Methods	3	-	-	3
2	PCC	C0403	Digital Electronics	3	-	-	3
3	PCC	C0404	Signal Theory and Stochastic Processes	3	1	-	4
4	PCC	C0405	Electromagnetic Fields & Transmission lines	3	-	-	3
5	PCC	C0406	Network Theory and Circuit Analysis	3	-	-	3
6	PCC	C0407	Digital Electronics Lab	-	-	2	1
7	PCC	C0408	Signals and Stochastic Processes Lab	-	-	2	1
8	ESC	C0554	Fundamentals of Data Structures Lab	-	-	4	2
9	MC	C00M2	Environmental Science	3	-	-	-
Total				**18**	**1**	**8**	**20**
Total Contact Hours				**27**			

SEMESTER-IV							
S.No.	**Category**	**Course Code**	**Name of the Subject**	**L**	**T**	**P**	**Credits**
1	HSMC	C0H08	Business Economics and Financial Analysis	3	-	-	3
2	PCC	C0409	Sensors & Devices	3	-	-	3
3	PCC	C0410	Microprocessor & Microcontroller	3	-	-	3
4	PCC	C0411	Analog and Digital Communications	3	-	-	3
5	PCC	C0412	Pulse and Linear Integrated Circuits	3	1	-	4
6	PCC	C0413	Analog and Digital Communications Lab	-	-	3	1
7	PCC	C0414	Pulse and Linear Integrated Circuits Lab	-	-	3	1
8	ESC	C0555	Object Orient Programming Lab	-	-	2	1
9	PROJ	C04P1	Real Time Project / Field Based Project				1
9	MC	C00M1	Gender Sensitization	-	-	2	0
Total				**15**	**1**	**10**	**20**
Total Contact Hours				**26**			

SEMESTER-V							
S. No.	**Category**	**Course Code**	**Name of the course**	**Contact Hours/Week**			**Credits**
				L	**T**	**P**	
1.	HSMC	C0H05	Management Fundamentals	3	-	-	3
2.	PCC	C0415	Embedded Systems	3	-	-	3
3.	PCC	C0416	CMOS VLSI Design	3	-	-	3
4.	PEC-I	C0417	Electronic Measurements and Instrumentation	3	-	-	3
		C0418	Computer Organization and Operating Systems				
		C0419	Data Communications and Computer Networks				
		C0420	Advanced Programmable Logic Device Architectures				
		C0421	Information Theory & Coding				
5.	OEC-I		**Open Elective-I**	3	-	-	3
6.	PCC	C0422	Embedded Systems Lab	-	-	3	1.5
7.	PCC	C0423	VLSI Design Lab	-	-	3	1.5
8.	ESC	C0556	Fundamentals of Database Management Systems Lab	-	1	2	2
9.	MC	C00M3	Quantitative Aptitude & Verbal Reasoning -I	1	1	-	0
10.	MC	C00M6	Intellectual Property Rights	3	-	-	0
			Total	**19**	**2**	**8**	**20**
			Total Contact Hours	**29**			

SEMESTER-VI							
S.No.	**Category**	**Course Code**	**Name of the course**	**Contact Hours/Week**			**Credits**
				L	**T**	**P**	
1	PCC	C0424	Digital Signal Processing	3	-	-	3
2	PCC	C0425	Control Systems	3	-	-	3
3	PCC	C0426	Antennas and Wave Propagation	3	-	-	3
4	PEC-II	C0427	Wireless and Mobile Communication	3	-	-	3
		C0428	Fundamentals of Machine Learning				
		C0429	Digital Design using FPGA				
		C0430	Fundamentals of Mixed Signal Design				
		C0431	Advanced Computer Architecture				
5	OEC-II		**Open Elective-II**	3	-	-	3
6	HSMC	C0H03	Advanced English Communication Skills Lab	-	-	2	1
7	PCC	C0432	Digital Signal Processing Lab	-	-	3	1
8	PCC	C0433	Fundamentals of Mixed Signal Design Lab	-	-	3	1
9	MC	C00M4	Quantitative Aptitude & Verbal Reasoning -II	1	1	-	0
10	MC	C00M5	Constitution of India	3	-	-	0
11	PROJ	C04P2	Industry oriented Mini project/ Internship	-	-	4	2
			Total	**19**	**1**	**12**	**20**
			Total Contact Hours	**32**			

SEMESTER-VII							
S. No.	Category	Course Code	Name of the course	Contact Hours/Week			Credits
				L	T	P	
1	PCC	C0434	5G Communications	3	1	-	4
2	PCC	C0435	IoT Architecture and its Applications	3	-	-	3
3	PEC-III	C0436	Principles of Optimization Techniques	3	-	-	3
		C0437	Low Power VLSI Design				
		C0438	Optical Communications				
		C0439	Embedded Real Time Operating Systems				
		C0440	Neural Networks and Fuzzy Logic				
4	PEC-IV	C0441	Smart Antennas	3	-	-	3
		C0442	Computer Vision and Pattern Recognition				
		C0443	Digital Image Processing				
		C0444	System On Chip Architecture				
		C0445	Advance Digital System Design				
4	OEC-III		**Open Elective - III**	3	-	-	3
5	PCC	C0446	Advanced Communication Lab	-	-	4	2
6	PCC	C0447	IoT Architecture and its Applications Lab	-	-	4	2
7	PROJ	C04P3	Project Stage –I	-	-	6	3
Total				**15**	**1**	**14**	**23**
Total Contact Hours				**30**			

SEMESTER VIII							
S.No.	Category	Course Code	Name of the course	Contact Hours/Week			Credits
				L	T	P	
1	PEC-V	C0449	Image and Video Processing Using Machine Learning	3	-	-	3
		C0450	Test and Testability				
		C0451	Satellite Communications				
		C0452	Deep Learning				
		C0453	Optical Networks				
2	PEC-VI	C0454	Wavelets & Its Applications	3	-	-	3
		C0455	ADHOC Wireless Sensor Networks				
		C0456	Microwave Communication Systems				
		C0457	Multimedia Database Management Systems				
		C0458	MEMS and Nano Electronics				
4	PROJ	C04P4	Project Stage –II including Seminar	-	-	22	9+2
Total				**6**	**-**	**22**	**17**
Total Contact Hours				**28**			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I / II Semester		
Code: C0H01	ENGLISH	L	T	P
Credits: 3	(Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security),CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)	3	-	-

Course Objectives:

The objective of this course is to improve the English Language and Literary competence of the students. The course provides requisite insights into grammar, vocabulary, prose, and short stories. Further, it also helps in developing the skills of Reading and Writing. The course also equips studentsto study their academic subjects more effectively using the theoretical and practical components of the English language and literature.

MODULE – I

Speech **:** "Go Kiss the World" by Subroto Bagchi
Poem **: "**Leisure" by W. H. Davies
Vocabulary **:** Formation of Words, Roots, Prefixes, Suffixes
Grammar **:** Articles and Prepositions
Reading **:** Skimming and Scanning
Writing **:** Introduction to Writing Skills, Characteristics of Effective Writing

MODULE – II

Short story **:** "Gift of Magi" by O' Henry
Poem **: "**No Man is an Island" by John Donne
Vocabulary **:** One Word Substitutions; Synonyms and Antonyms**Grammar :** Degrees of Comparison, Active and Passive Voice **Reading** **:** Intensive Reading and Extensive Reading
Writing **:** Paragraph Writing- Cohesive devices; Jumbled Sentences; Punctuation

MODULE – III

Essay **: "**Lucidity, Simplicity, Euphony" by W. Somerset Maugham
Poem **: "**We wear the Mask" by Paul Laurence Dunbar
Grammar **:** Tense and Aspect
Vocabulary **:** Homonyms, Homophones, Homographs
Reading **:** Reading for Topic and Theme
Writing **:** Letter Writing

MODULE – IV

Short story **:** "The Night Train at Deoli" by Ruskin Bond
Poem **: "**Gift of India" by Sarojini Naidu **Grammar** **:** Question Tags; Concord **Vocabulary:** Idiomatic

Expressions; Phrasal Verbs**Reading :**
Reading for Interpretation
Writing **:** Essay Writing, Describing, Defining and Classifying

MODULE – V
Essay **:** "Toasted English" by R. K. Narayan
Poem **:** "If" by Rudyard Kipling
Grammar **:** Direct and Indirect Speech, Misplaced Modifiers
Vocabulary **:** Redundancies and Clichés
Reading **:** Reading for Specific Purposes, Reading Comprehension practice
Writing **:** Paraphrasing & Summarizing,

Prescribed Textbook:

Reference Books:

1. Azar, Betty and Stacy A, Hagen**.** *Understanding and Using English Grammar*. 4th edition,Foundation Books, 2009.
2. Chaudhuri, Santanu S. *Learn English: A Fun Book of Functional Language***,** *Grammar andVocabulary*. Tata McGraw Hill Education, New Delhi, 2013.
3. Eastwod, John. *Oxford Guide to English Grammar*. 4th edition, Oxford University Press,1994.
4. Field, Marion**.** *Improve Your Written English.* 5th Edition. How to Books, UK, 2009.
5. Leech, Geoffrey and Svartvik, J. *A Communicative Grammar of English*. 3rd edition, Routledge, 2013.

Related Websites:

1. http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes
2. http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd.
3. http://www.zsme.tarnow.pl/jezykiobce/wp-content/uploads/2013/11/writing-letters1.pdf.

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

1. Use written and spoken English considerably well for academic purposes.
2. Communicate in Enrich accurately and fluently.
3. Employ extensive and intensive reading skills.
4. Gain confidence in writing for academic and real life situations.
5. Use standard grammar, punctuation, and spelling in technical documents.

CO-PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					1					2		2			
CO2										1		2			
CO3		1		1						2		2			
CO4					1	1			1	2		2			
CO5				1	1				1	2		2			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0B03	Linear Algebra and Applied Calculus (Common For ECE & EEE)	L	T	P
Credits: 4		3	1	-

Prerequisites: Matrices, Differentiation and Integration.

Course Objectives:

1. To learn types of matrices, Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
2. To learn concept of Eigen values and Eigen vectors of a matrix, diagonalization of a matrix, Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. To learn the concept of the mean value theorems, partial differentiation and maxima and minima.
4. To learn methods of solving differential equations and its applications to basic engineering problems.
5. To learn series solution of the given differential equations.

MODULE I: MATRIX ALGEBRA [12 PERIODS]

VECTOR SPACE, BASIS, LINEAR DEPENDENCE AND INDEPENDENCE (ONLY DEFINITIONS)

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew- Hermitian; orthogonal matrices; Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non- singular matrices by Gauss-Jordan method; solving system of Homogeneous and Non-Homogeneous linear equations, LU – Decomposition Method.

MODULE II: Eigen Values and Eigen Vectors [12 Periods]

Eigen values , Eigen vectors and their properties; Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem;.

Quadratic forms: Nature, rank, index and signature of the Quadratic Form, Linear Transformation and Orthogonal Transformation, Reduction of Quadratic form to canonical forms by Orthogonal Transformation Method. Singular Value Decomposition

Module -III: Differential Calculus [12 Periods] Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical

Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.

Functions of Several Variables: Limits, Continuity, Partial differentiation, partial derivatives of firstand second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Module –IV: Ordinary Differential Equations [12 Periods]

First Order and First Degree ODE: Exact Differential Equations, Non Exact Differential Equations, Orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.

Second and Higher Order ODE with Constant Coefficients: Introduction-Rules for finding complementary function and particular integral. Solution of Homogenous, non-homogeneous differential equations, Non-Homogeneous terms of the type e^{ax} , sin(ax), cos (ax), polynomials in x, e^{ax} V(x), x V(x), Method of variation of parameters.

Module – V: Series Solutions to the Differential Equations [12 Periods]

Motivation for series solution, Ordinary point and regular singular point of a differential equation, series solution to differential equation around zero, Frobenious Method about zero.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R K Jain Srk Iyengar ,Advanced engineering mathematics, Narosa publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.
4. Richard Bellman, Introduction to matrix Analysis, Siam, second Edition.

References Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

E – RESOURCES:

1. https://www.youtube.com/watch?v=sSjB7ccnM_I (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=h5urBuE4Xhg (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=9y_HcckJ96o (Quadratic forms)
4. http://www.math.cmu.edu/~wn0g/noll/2ch6a.pdf(Differential Calculus)
5. https://www.intmath.com/differential-equations/1-solving-des.php(Differential Equations)

NPTEL:

1. https://www.youtube.com/watch?v=NEpvTe3pFIk&list=PLLy_2iUCG87BLKl8eISe4fHKdE2_j2B_T&index=5 (Matrices – System of linear Equations)
2. https://www.youtube.com/watch?v=wrSJ5re0TAw (Eigen values and Eigen vectors)
3. https://www.youtube.com/watch?v=yuE86XeGhEA (Quadratic forms)

Course Outcomes:

1. The student will be able to find rank of a matrix and analyze solutions of system of linear equations.
2. The student will be able to find Eigen values and Eigen vectors of a matrix, diagonalization a matrix, verification of Cayley Hamilton theorem and reduce a quadratic form into a canonical form through a linear transformation.
3. The student will be able to verify mean value theorems and finding maxima and minima of function of two variables.
4. Formulate and solve the problems of first and higher order differential equations
5. The student will be able to solve series solution of given differential equation.

CO- PO Mapping

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	2	3	3				2			3
CO2	3	2	2	3	2				2			3
CO3	3	2	2	3	2				2			2
CO4	3	2	2	3	3				2			2
CO5	3	2	2	3	3				2			2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0501	**Programming for Problem Solving** (Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of the C programming language.
4. To learn the usage of structured programming approaches in solving problems

MODULE I: Introduction to Programming [10 Periods]

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

MODULE II: ARRAYS, STRINGS, STRUCTURES AND POINTERS [09 PERIODS]

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumerationdata type

MODULE III: Designing Structured Programs and Arrays [10 Periods] Designing Structured Programs-Introduction to function, Advantages, user defined functions, inter function communication-call by value, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion – recursive functions-Towers of Hanoi problem.

Arrays: Basic Concepts, Types of arrays, applications- Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods, arrays and functions.**MODULE IV: Strings and**

Pointers [09 Periods] Strings: Concepts, String Input / Output functions, arrays of strings, string manipulation functions,string conversion, C program examples.

Pointers – Basic Concepts, Pointers for inter function communication-call by reference, pointers to pointers, Pointer arithmetic, array of pointers, pointers to array, applications, pointers to void, pointers to functions, Dynamic memory allocation functions.

MODULE V: Structures and File Handling [10 Periods] Structures – Declaration, definition and initialization of structures, accessing structure elements,nested structures, arrays of structures, structures and functions, pointers to structures, self-referentialstructures, unions, difference between structures and union, typedef, bit fields, enumerated types, Cprogramming examples.

Files – Basic Concept of a file, file input / output operations, text files and binary files, file status functions (error handling), Random file access functions, command –line arguments.
C program examples.

TEXTBOOKS

1. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, OxfordUniversity Press.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, PHI/Pearson Education

REFERENCES

1. C Programming & Data Structures, B.A. Forouzan and R.F. Gilberg, Third Edition, CengageLearning
2. C for Engineers and Scientists, H. Cheng, Mc. Graw-Hill International Edition
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

E–RESOURCES

1. http://oxford university press.ac.in/eBooks/ Programming in C.
2. https://www.journals.elsevier.com/science-of-computer-programming
3. http://www.ejournalofsciences.org
4. http://onlinecourses.nptel.ac.in/iiitk_cs-101
5. http://onlinevideolecture.com/ebooks/?subject=C-Programming

Course Outcomes:

At the end of the course, students will be able to

1. Write algorithms and to draw flowcharts for solving problems and translate the algorithms/flowcharts to programs (in C language).
2. Apply different types of control structures to code and test a given logic in C programming language.
3. Decompose a problem into functions and to develop modular reusable code and Use arrays to formulate algorithms and programs for Searching and sorting problems.
4. Develop programs that make use of concepts such as strings, pointers.
5. Analyze structures, file operations and command line arguments.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2										1	3	2	2
CO2	3	2	1									1	3	2	1
CO3	3	3	1									1	3	2	1
CO4	3	1										2	3	2	1
CO5	3	3	1									2	3	2	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for all branches)	L	T	P
Credits: 3		3	-	-

Prerequisites: Nil

Course Objectives: To introduce the concept of electrical circuits and its components. To introduce the characteristics of various electronic devices. To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

MODULE I: DC Circuits **9 Periods**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws - Series, parallel, series-parallel, star-to-delta and delta-to-star transformation- analysis of simple circuits with dc excitation. Superposition, Thevenin's and Maximum Power Transfer Theorems with DC excitation.

MODULE II: AC Circuits **9 Periods**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

MODULE III: Introduction to Electrical Machines **10 Periods**

A: DC Machines : Construction & Principle of Operation of DC Generators – E.M.F Equation. Principle of operation DC Motors – Back E.M.F. - Torque equation – Brake Test -Characteristics.

B: AC Machines: Construction and Principle of operation of Transformer- EMF Equation. Construction and Principle of Operation of 3 Phase Induction Motors - Brake test on 3-Phase Induction Motor – Applications.

MODULE IV: P-N Junction Diode **10 Periods**

P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances. Zener diode operation, Zener diode as voltage regulator.

Rectifiers : P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier.

Filters : Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

MODULE V: Bipolar Junction Transistor (BJT): **10 Periods**

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations and Input-Output Characteristics, Comparison of CE, CB and CC configurations

Junction Field Effect Transistor and MOSFET: Construction, Principle of Operation, Symbol,

Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET.

Text Books

1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, **" Basic Electrical and Electronics Engineering"**, S.Chand and Company Limited, New Delhi, 1st Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, **"Electronic Devices & Circuit Theory"**, Pearson Education, 2007.

References

1. V.K. Mehtha and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand & Co., 2009.
2. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), "Electronic Devices and Circuits", 3 rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

E - Resources

1. https://www.electrical4u.com/ohms-law-equation-formula-and-limitation-of-ohms-law/
2. https://www.eeweb.com/passives
3. http://nptel.ac.in/courses/108108076/
4. http://nptel.ac.in/downloads/108105053/

Course Outcomes:

At the end of the course, students should be able to

1. Apply KCL, KVL and network theorems to analyse DC circuit.
2. Analyze the single-phase AC Circuits, the representation of alternating quantities and determining the power and power factor in these circuits.
3. Comprehend the construction and Operation of DC and AC machines.
4. Understand the operation of PN Junction diode and its application in rectifier circuits.
5. Compare the different configurations of BJT and draw the V-I characteristics of BJT, JFET and MOSFET.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0502	Programming for Problem Solving Lab (Common for CE, EEE, ME, ECE, CSE, CSE (Cyber Security), CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)	L	T	P
Credits: 1		-	1	2

Prerequisites: NIL

Software Requirements: C

[Note:The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code:Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Objectives: The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C likeoperators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To Write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files

List of Programs:

PRACTICE SESSIONS:

a. Write a simple program that prints the results of all the operators available in C (including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion andcasting. Take the values from standard input.

SIMPLE NUMERIC PROBLEMS:

a. Write a program for finding the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows inthe table. For example, for a number 5 and rows = 3, the output should be:
e. 5 x 1 = 5
f. 5 x 2 = 10

g. 5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

EXPRESSION EVALUATION:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to find the roots of a Quadratic equation.
h. Write a C program to calculate the following, where x is a fractional value. i. 1-x/2 +x^2/4-x^3/6
j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+ +x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

ARRAYS, POINTERS AND FUNCTIONS:

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in asingle dimension array.
c. Write a C program that uses functions to perform the following:
d. Addition of Two Matrices
e. Multiplication of Two Matrices
f. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
g. Write C programs that use both recursive and non-recursive functions
h. To find the factorial of a given integer.
i. To find the GCD (greatest common divisor) of two given integers.
j. To find x^n
k. Write a program for reading elements using a pointer into an array and display the values usingthe array.
l. Write a program for display values reverse order from an array using a pointer.
m. Write a program through a pointer variable to sum of n elements from an array.

FILES:

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters withtheir uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file nameand the character are supplied as command line arguments.

d. Write a C program that does the following:
It should first create a binary file and store 10 integers, where the file name and 10 values aregiven in the command line. (hint: convert the strings using atoi function)
Now the program asks for an index and a value from the user and the value at that index shouldbe changed to the new value in the file. (hint: use fseek function)
The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followedby those of the second are put in the third file).

STRINGS:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
d. To insert a sub-string into a given main string from a given position.
e. To delete n Characters from a given position in a given string.
f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn‘tcontain ch.
h. Write a C program to count the lines, words and characters in a given text.

MISCELLANEOUS:

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalidchoice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * *
                                             *
                                4 4 4 4    * *
                                           *
```

SORTING AND SEARCHING:

a. Write a C program that uses non recursive function to search for a Key value in a given
b. list of integers using linear search method.
c. Write a C program that uses non recursive function to search for a Key value in a given
d. sorted list of integers using binary search method.
e. Write a C program that implements the Bubble sort method to sort a given list of
f. integers in ascending order.
g. Write a C program that sorts the given array of integers using selection sort in descending order
h. Write a C program that sorts the given array of integers using insertion sort in ascending order
i. Write a C program that sorts a given array of names

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Outcomes:

At the end of the course, students will be able to

1. formulate the algorithms for simple problems
2. translate given algorithms to a working and correct program

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3										2	2	
CO2	3	3	3										2	2	
CO3	2	2	2										2	2	

3. correct syntax errors as reported by the compilers
4. identify and correct logical errors encountered during execution
5. represent and manipulate data with arrays, strings and structures
6. use pointers of different types
7. create, read and write to and from simple text and binary files
8. modularize the code with functions so that they can be reused

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I / II Semester		
Code: C0H02	**English Language and Communication Skills Lab**	**L**	**T**	**P**
Credits: 1	**(Common for CE, EEE, ME, ECE, CSE, CSE (C S), CSE (AI and ML), CSE (DS), CSE (IOT), AI, IT and Mi.E)**	**-**	**-**	**3**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objectives:

The course aims to develop students' intelligibility in their pronunciation of English - speech Sounds, word accent, intonation and rhythm. It also helps to improve the fluency in spoken English and make them aware of nuances of major skills, namely, listening and speaking skills. It also trains students to understand nuances of both verbal and non-verbal communication During all activities. The course enables the learners to develop their confidence levels so as to Participate in discussions, debates and public speaking. Listening Skills:

Objectives:

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language to be able to recognize them, awareness regarding stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives:

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Just A Minute (JAM) Sessions.

Syllabus: English Language and Communication Skills Lab has two parts:
a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab
The following course content is prescribed for the English Language Communication Skills Lab

Module - I:
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session; Listening: listening for sounds in context, for ideas;Speaking: ideation and translation of ideas into sentences.

Module - II:
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette; Listening: listening for specific purposes, for details; Speaking: speaking in the above situations with clarity, connectivity, maintaining voice characters.

Module - III:
CALL Lab: Word accent and Listening Comprehension-reading aloud meaningfully.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines; Listening: listening for intelligible English; Speaking: formal and informal conversations, register.

Module - IV:
CALL Lab: Intonation and Common errors in Pronunciation- reading aloud (evaluating through recording).
ICS Lab: Extempore- Public Speaking, Oral Presentation Skills; Listening: note taking and listening for speaker's tone/attitude; Speaking: organizing, connecting ideas and sentences, short forms in spoken English, errors in spoken English

Module - V:
CALL Lab: Reduction of Mother Tongue Interference and Conversation Practice
ICS Lab: Information Transfer, Debate
Minimum requirement of infrastructural facilities for EL Lab:
1. Computer Assisted Language Learning (CALL) Lab:
The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

System Requirement (Hardware component):
Computer network with Lan with minimum 60 multimedia systems with the following specifications:
a) P – IV Processor b) Speed – 2.8 GHZ c) RAM – 512 MB Minimum
d) Hard Disk – 80 GB e) Headphones of High quality
2. **Interactive Communication Skills (ICS) Lab:** The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.
Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the textbook which are loaded on the systems):

Prescribed Lab Manual:
Rani, Sudha. *English Language Communication Skills Laboratory*. 5th edition, Pearson Publication, 2014.

Reference Books:

1. Roach, Peter. English Phonetics and Phonology. 4th edition, Cambridge University Press, 2009.
2. Hughes, John and Mallett, Andrew. *Successful Presentations DVD and Student's Book Pack*. Oxford University Press, 2013.
3. Hancock, Mark. *English Pronunciation in Use* (Intermediate). 2nd edition, Cambridge University Press, 2009.
4. Karia, Akash. *Public Speaking Mastery: Speak Like a Winner*. Kindle edition, 2013.
5. Lucas, Stephen. *The Art of Public Speaking***.** 11th edition, Tata McGraw Hill, 2011.

Websites:

1. http://www.mindtools.com/CommSkll/ActiveListening.htm
2. http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity
3. http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20(2010).pdf

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

1. Understand the nuances of language through audio- visual experience and group activities.
2. Hone the accent for intelligibility
3. Realize the importance of listening skills and speaking skills and their application in real life situations.
4. Recognize significance of non-verbal communication and develop confidence to face audience and shed inhibitions.
5. Speak with clarity and confidence; thereby enhance employability skills of the students.

CO-PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		1				1		1	2	2		1			
CO2										1		1			
CO3							1		1	2		2			
CO4								1	1	2		2			
CO5										2		2			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:C0302	ENGINEERING WORKSHOP (Common for CE, EEE, ME,ECE and Min.E)	L	T	P
Credits: 1		-	-	2

COURSE OBJECTIVES:

To understand the usage of hand tools, acquire the skills in model / pattern making and familiarize with various work materials and tools.

I. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry 2.Fitting 3. Tin-Smithy
4. House-wiring 5.Foundry 6.Arc welding

II. TRADES FOR DEMONSTRATION & EXPOSURE

1. Machine shop
2. Plumbing
3. Wood working lathe
4. Identification of Electronic Components
5. Black smithy
6. Computer Peripherals

COURSE OUTCOMES

At the end of the course, students will be able to

1. Knowledge of carpentry process and methods used in the design and fabrication, installation, maintenance and repair of structures and fixtures (e.g., furniture, cabinets) to accomplish work assignments.
2. Assembling together of part and removing metals to secure the necessary joint by using fitting and welding.
3. Understand the hardware components of house wiring.
4. Understand the manufacturing process using machine shop.
5. Analyze the different types of computer Peripherals

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				2	2	1		3			3		2	
CO2	3				2	2	1		3			3		2	
CO3	3				2	2	1		3			3		2	
CO4	3				2	2	1		3			3		2	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: C0202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB (Common for all branches)	L	T	P
Credits: 1		-	-	2

Course Objectives:

To get practical knowledge about basic electrical circuits, electronic devices like Diodes, BJT, JFET and also analyze the performance of DC Motors, AC Motors and Transformers.

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Maximum Power Transfer Theorem.
3. Determination of Phase Angle for RC series circuit.
4. Brake Test on DC-Shunt Motor. Determination of Performance curves
5. Load Tests on Single Phase Transformer
6. Brake Test on Three Phase Induction Motors. Determination of Performance curves
7. V-I Characteristics of PN junction Diode
8. V-I Characteristics of Zener Diode
9. Half Wave Rectifier and Full Wave rectifier.
10. Input and Output characteristics of BJT with CE configuration
11. Input and Output characteristics of BJT with CB configuration
12. Input and Output Characteristics of JFET.

Course Outcomes:

At the end of the course, students will be able to

1. Experimentally verify the basic circuit theorems, KCL and KVL
2. Measure power, power factor and phase angle in RC circuits experimentally.
3. Acquire hands on experience of conducting various tests on dc shunt motor, single phase transformers and three phase induction motors and obtaining their performance indices using standard analytical as well as graphical methods
4. Draw the characteristics of different semiconductor devices like PN junction Diode, Zener Diode, BJT and JFET by conducting suitable experiments.
5. Experimentally verify the working of half and full wave rectifier by using PN Junction diodes.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		2		2		1	1	2	1	1	1	3	1	1
CO2	3		2		2		2	1	2	1	1	1	3	1	1
CO3	3	2	2	2	2		2	1	2	1	1	1	3	1	1
CO4	3	1	2		2		1	1	2	1	1	1	3	1	1
CO5	3	1	2		2		2	1	2	1	1	1	3	1	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0B17	**Engineering Chemistry (Common for ALL)**	**L**	**T**	**P**
Credits: 4		**3**	**1**	**-**

Course objectives:

The purpose of this course is to emphasize the relevance of fundamentals of chemical sciences in the field of engineering and to provide basic knowledge on atomic- molecular orbital's, electrochemistry, batteries, corrosion and the role of water as an engineering material in domestic-industrial use. They will also impart the knowledge of stereochemistry, understanding the chemical reaction pathway mechanisms and synthesis of drugs. Listing out various types of fuels and understanding the concept of calorific value and combustion.

Module I: Water and its treatment [10 Periods]

Introduction to water, hardness of water, causes of hardness, expression of hardness, units and types of hardness-Numerical Problems. Alkalinity of water, specifications of potable water (BIS); Estimation of temporary & permanent hardness of water by EDTA method. Boiler troubles - Scale &Sludge, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water - Internal treatment (colloidal, phosphate, carbonate and calgon conditioning). External treatment - Lime Soda process (cold & hot) and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonization.Desalination by Reverse osmosis and its significance.

Module II: Molecular structure and Theories of Bonding: [10 Periods]

Introduction to Molecular orbital Theory. Linear Combination of Atomic Orbital's (LCAO), significance of bonding and anti-bonding molecular orbital, Conditions for the formation of molecular orbital's. Molecular orbital energy level diagrams of diatomic molecules -, N_2,$O_2$and F_2. Introduction to coordination compounds-ligand-coordination number (CN) - spectrochemical series. Salient features of crystal field theory, Crystal field splitting of transition metal complexes in octahedral ($[CoF_6]^{3-}$ and $[Co(CN)_6]^{3-}$) and tetrahedral ($[NiCl_4]^{2-}$ and $[Ni(CO)_4]$) fields - magnetic properties of complexes. Band structure of solids and effect of doping on conductance.

Module III: Electrochemistry and Corrosion [17 Periods]

A. Electrochemistry:

Introduction to Electrochemistry-Conductance(Specific and Equivalent) and units. Types of cells-electrolytic & electrochemical cells (Galvanic Cells)-Electrode potential-cell potential

(EMF).Electrochemical series and its applications,Nernst equation its applications and numerical problems. Reference electrodes - Calomel Electrode and Glass electrode-determination of pH using glass electrode. Batteries: Primary (dry cells) and secondary (Lead-Acid cell, Ni-Cd cell) - applications of batteries. Fuel cells: Hydrogen - Oxygen fuel cell and its applications.

B. Corrosion: [7 Periods]

Causes and effects of corrosion: Theories of corrosion - Chemical & Electrochemical corrosion, Pilling-Bedworth rule,Types of corrosion: Galvanic and Water-line corrosion. Factors affecting rate of corrosion-Nature of metal and Nature of Environment, Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic methods). Surface coatings: Methods of metallic coatings - hot dipping (Galvanization),Electroplating (Copper) andElectroless plating (Nickel).

Module IV: Stereochemistry, Reaction mechanism& synthesis of drug molecules and NMR spectroscopy: [12 Periods]

Introduction to Isomers - classification of isomers - structural (chain, positional & functional) and stereoisomerism-geometrical (cis-trans & E-Z system) - characteristics of geometrical isomerism, optical isomerism (chirality - optical activity, specific rotation, enantiomers and diastereomers) of tartaric acid and lactic acid. Conformational isomerism ofn-Butane. Introduction to bond cleavage (homo & hetero cleavage) - reaction intermediates and their stability. Types of organic reactions - Mechanism of substitution (SN^1& SN^2) and (E_1&E_2) reactions with suitable example. Ring opening (Beckmann rearrangement), oxidation and reduction (Cannizaro reaction), cyclization (Components of Diels-Alder reaction-Mechanism of Diels-Alder reaction with suitable example) reactions. Synthesis of Paracetamol, Aspirin and their applications.

Introduction to Spectroscopy, Basic concepts of nuclear magnetic resonance spectroscopy, chemical shift and spin-spin splitting.

UNIT-V FUELS AND COMBUSTION [08 PERIODS]

Fuels: Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG.

Combustion: Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel. Determination of calorific value by Junkers gas calorimeter-Numerical problems on combustion.

Text Books:

1. P.C.Jain and Monica Jain, "**A Text Book of Engineering Chemistry"**, DhanpatRai Publications, New Delhi, 16th Edition 2014.
2. S.S. Dara and S.S. Umare, "**A Text Book of Engineering Chemistry"**, S Chand Publications, New Delhi, 12th Edition 2010.

3. A.Jaya Shree, "Text book of Engineering Chemistry", Wiley, New Delhi, 2018.

Reference Books:

1. B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath,**"Text Book of Engineering chemistry"**,Cengage Learning India Pvt.Ltd,2016.
2. M.G. Fontana and N. D. Greene, "**Corrosion Engineering"**, McGraw Hill Publications, New York, 3rd Edition, 1996.
3. K. P. C. Volhardt and N. E. Schore, **"Organic Chemistry: Structure and Function"**, 5thEdition, 2006.

Course Outcomes with BLOOM's

At the end of the course, students will be able to:

	Course Outcome	Bloom's Taxonomy Level
CO1	Understand water treatment, specifically hardness of water and purification of water by various methods.	Understand**(L2)**
CO2	Analyze microscopic chemistry in terms of atomic and molecular orbital's splitting and band theory related to conductivity	Analyze**(L4)**
CO3	Apply knowledge of electrochemical cell concept with respect to fuel cells, batteries, theories of corrosion. Applications of corrosion control methods.	Apply**(L3)**
CO4	Acquire basic knowledge on the concepts of stereochemistry, chemical reaction mechanisms that are used in the synthesis of drug molecules, interpretation of NMR in organic molecules and their uses in medical field.	Analyze **(L4)**
CO5	Acquire the knowledge of various fuels and identify a better fuel source of less pollution.	Analyze **(L4)**

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2										
CO2	2	1		2	1										
CO3	3	3	2	2	1		2								
CO4	3	1	1	1	2	1	3								
CO5	3	3	3	1			3								

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0305	ENGINEERING DRAWING (Common for All)	L	T	P
Credits: 3		2	-	2

PREREQUISITES: NIL

Course Objectives:

To develop in students, graphic skills for communication of concepts and ideas of engineering products.

MODULE I:

Introduction to Engineering Drawing, Principles of Engineering Graphics and their significance, Lettering.

Geometrical Constructions: Regular polygons only. Conic Sections: Ellipse, Parabola, Hyperbola– General method only Cycloidal Curves and Involute, tangents & normal for the curves.

Scales: Plane Scale, Diagonal scale, Vernier Scale.

MODULE II:

Orthographic Projections: Principles of Orthographic Projections – Conventions – First and Third Angle projections.

Projection of Points: Projection of points including all four quadrants.

Projection of Lines: Projection of Lines - parallel, perpendicular, inclined to reference planes and Traces.

MODULE III:

Projection of Planes: Axis inclined to both the reference plane.

Projection of Solids: Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotating object method. Axis inclined to both the reference plane.

MODULE IV:

Section of Solids: Sectioning of single solid with the cutting plane inclined to one plane and perpendicular to the other - true shape of section.

Development of Surfaces: Development of lateral surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone.

MODULE V:

Isometric Projections: Principles of Isometric Projection – Isometric Scale, Isometric Views– Conventions –Plane Figures,Simple Solids.

Transformation of Projections: Conversion of Isometric Views to Orthographic Views and vice versa–simple objects.

TEXT BOOKS

1. K.L.Narayana, S. Bheemanjaneyulu “Engineering Drawing with Auto CAD-2016” New

Age InternationalPublishers, 1st Edition, 2018.
2. N.D. Bhat, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.

REFERENCES

1. K.L.Narayana, P.Kannaiah, “Engineering Drawing”, SciTech Publishers. 2nd Edition, 2017
2. K.Venugopal,“Engineering Drawing”,NewAge International Publishers, 3rd Edition, 2014.
3. K. V. Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, 2015.
4. M.S. Kumar, “Engineering Graphics”, D.D. Publications, 2011.
5. Trymbaka Murthy, “Computer Aided Engineering Drawing", I.K. international Publishing House, 3rdEdition, 2011.

E - RESOURCES

1. http://nptel.ac.in/courses/112103019/
2. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3. https://www.wiziq.com/tutorials/engineering-drawing
4. http://freevideolectures.com/Course/3420/Engineering-Drawing
5. http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711
6. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics nit jalandhar (EG MECI102)

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0B10	Applied Physics (Common for ECE and EEE)	L	T	P
Credits: 4		3	1	-

Prerequisites: Fundamentals of Physics

Course Objectives:

1. To outline the dual nature of matter
2. To elaborate the significance of the Kronig-Penney model in classifying the materials
3. To illustrate the working of p-n junction diode, photodiode, LED and solar cell
4. To interpret the Maxwell equations.
5. To compare the working of Ruby laser, He-Ne laser and semiconductor laser, besides illustrating the working principle of optical fibre and elaborate its applications.

Module – I: Quantum mechanics [8 Periods]

Introduction, Plank's theory of black body radiation, deduction of Wien's displacement law and Ralygien's law; Louis de Broglie's concept of matter waves; Davisson and Germer experiment; G P Thomson Experiment; Heisenberg's uncertainty principle – and its application (electron cannot exist inside the nucleus); Schrodinger's time-independent wave equation; Physical significance and properties of wave function; Particle in a one-dimensional infinite potential well.

Module – II: Band theory of solids [8 Periods]

Introduction, Postulates and drawbacks' of Classical and Quantum free electron theory, Fermi Dirac distribution function; Density of energy states; Bloch theorem; Qualitative treatment of Kronig - Penney model; E Vs k relationship; Origin of energy band gap; Classification of materials into Conductors, Semiconductors and insulators; Concept of Effective mass.

Module –III: Semiconductor Physics [13 Periods]

A: Introduction, Intrinsic and Extrinsic Semiconductors; Expression for carrier concentration in intrinsic and extrinsic semiconductors; Variation of Fermi energy level in Intrinsic and extrinsic semiconductors with respect to temperature and doping concentration.

B: Direct and indirect bandgap semiconductors; Carrier generation and Recombination; Drift and Diffusion mechanisms; Equation of Continuity; P-N Junction diode, Energydiagram, V-I Characteristics; Construction and Working of Photodiode, LED & Solar cell and their applications.

Module – IV: Electromagnetic Theory [10 Periods]

Gradient of Scalar field; Divergence and Curl of Vector field and their Physical Significance; Gauss's Law of electrostatics and Gauss law of magnetostatics; Ampere's law and its modification; Faraday's law of electromagnetic induction; Induced E.M.F in a conductor; Lenz's Law; Maxwell equations in differential form; wave equation for free space

Module – V [12 Periods]

LASER: Introduction, Characteristics of LASER; Absorption, Spontaneous and Stimulated emission; Einstein's coefficients derivation; Population inversion; Pumping mechanisms; Basic components of a LASER system; Types of Laser systems; Ruby LASER, He-Ne LASER, Semiconductor diode LASER (Homo junction and hetero junction); Applications of LASER - Computers, Medical, Military.

Optical Fibers: Introduction to Optical fibers; Total Internal Reflection; Acceptance angle and acceptance cone, Numerical aperture; types of optical fibers; Losses in optical fibers - absorption

losses, scattering losses and bending losses; Applications of optical fibers - Communications, Level Sensor, LASER angioplasty.

Course Outcomes:

At the end of the course, the student will be able to

1. Explain the dual nature of the matter and evaluate the energy of a particle trapped in 1D infinite potential well.
2. Classify the materials into conductors, semiconductors and insulators based on the outcomes of Kronig - Penney model.
3. Analyze the working of semiconductor devices like PN junction diode, Photodiode, LED and Solar cell.
4. Deduce Maxwell equations in differential form.
5. Compare and contrast Ruby, He-Ne, Semiconductor Lasers and discover the working principle of optical fibers besides and elucidating their applications.

Text Books:

1. K Vijaya Kumar, S Chandralingam, "Modern Engineering Physics'' Volume I & II, S. Chand, 1st Edition, 2017.
2. Jasprit Singh, "Semiconductor Optoelectronics: Physics and Technology", McGraw-Hill, 1995.
3. B K Pandey and S. Chaturvedi, "**Engineering Physics**" Cengage Learning India Revised Edition, 2014.

Reference Books:

1. P K Palanisamy, **"Engineering Physics"**, SciTech Publication, 4th Edition, 2014.
2. R K Gaur and SL Gupta, "**Engineering Physics**" Dhanpat Rai Publications, Eighth Revised Edition, 2006.
3. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.
4. P. Bhattacharya, "**Semiconductor Optoelectronic Devices**", Prentice hall of India,1997.
5. S J Adams, "Electromagnetic Theory", Adams Press, 2013.

e-RESOURCES

1. https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering_Physics
2. https://www.livescience.com/33816-quantum-mechanics-explanation.html
3. https://nptel.ac.in/courses/115/102/115102025/

Journals :

1. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational+physics/journal/40094
2. http://www.springer.com/physics/journal/340

NPTEL VIDEOS:

1. http://nptel.ac.in/courses/113104012/
2. https://www.youtube.com/watch?v=9seDKvbaoHU&list=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidO0&index=29
3. https://nptel.ac.in/courses/108/108/108108122/
4. https://nptel.ac.in/courses/115/101/115101005

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code:C0B04	Advanced Calculus (Common for EEE & ECE)	L	T	P
Credits:4		3	1	-

Pre-requisites: Differentiation and integration,

Course Objectives: To Learn

1. The Methods of solving Partial differential equations.
2. The Beta and Gamma functions.
3. The Evaluation of multiple integrals and their applications in the allied fields.
4. The physical quantities involved in engineering problems related to vector valued functions.
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

MODULE -I: Partial Differential Equations [12 Periods]

Formation of partial differential equations by eliminating arbitrary constants or arbitrary function, solutions of first order linear(Lagrange) equations, solutions of non linear first order equations (four standard types). Equations reducible to linear, Charpits Method.

MODULE – II: Beta and Gamma Functions [12 Periods]

Introduction to Improper Integrals, Definition of Beta and Gamma function, properties and other forms. Relation between Beta and Gamma function, Evaluation of Improper Integrals.

MODULE - III: Multiple Integrals [12 Periods]

(A) Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form),.

(B) Evaluation of Triple Integrals. Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Finding areas using double integrals and Volumes using double and triple integrals.

MODULE - IV: Vector Differentiation [12 Periods]

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Scalar potential functions. Solenoidal and Irrotational vectors. Vector Identities.

MODULE – V: Vector Integration [12 periods]

Line, Surface and Volume Integrals. Green Theorem, Gauss Divergence Theorem and Stokes Theorem (without proofs) and their applications.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R K Jain Srk Iyengar ,Advanced engineering mathematics, Narosa publications.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.

Reference Books:

1. Kanti B.Datta, **Mathematical Methods of Science and Engineering**, Cengage Learning
2. Alan Jeffrey, **Mathematics for Engineers and Scientists**, 6th Ed, 2013, Chapman & Hall.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed, Pearson, Reprint, 2002.
4. S. L. Ross, **Differential Equations**, 3rd Ed., Wiley India, 1984.
5. ***Amarnath*** T, **An Elementary Course in** *Partial Differential Equations*, Narosa

Publishing House 2nd Ed, 2012.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Identify whether the given partial differential equation can be solvable with the methods or not.
2. Solve the problems which are not solvable with the usual methods and solve using Beta and Gamma functions.
3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped.
4. Finds the directional derivatives, angle between vectors understands the physical interpretation of vector, solenoidal and irrotational vectors.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

E-Resources:

a. Concerned Website links

1. https://mat.iitm.ac.in/home/sryedida/public_html/caimna/pde/first/partial.html
2. https://homepage.tudelft.nl/11r49/documents/wi4006/gammabeta.pdf
3. https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_(OpenStax)/15%3A_Multiple_Integration/15.2%3A_Double_Integrals_over_General_Regions
4. https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Calculus_(Apex)/12%3A_Functions_of_Several_Variables/12.06%3A_Directional_Derivatives
5. https://learn.lboro.ac.uk/archive/olmp/olmp_resources/pages/workbooks_1_50_jan2008/Workbook29/29_3_int_vec_thms.pdf

b. NPTEL :

1. https://www.digimat.in/nptel/courses/video/111105093/L01.html (PDE)
2. https://www.youtube.com/watch?v=JoyvDWZ0aMY (Beta & Gamma Functions)
3. https://www.youtube.com/watch?v=mIeeVrv447s (Multiple Integrals)
4. https://www.youtube.com/watch?v=M_Irtxhbq3E (Vector Differentiation)
5. https://www.youtube.com/watch?v=EtA0CK8SwkI (Vector Integral Theorems)

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	3	3				2			3
CO2	3	2	2	3	2				2			3
CO3	3	2	2	3	2				2			2
CO4	3	2	2	3	3				2			2
CO5	3	2	2	3	3				2			2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0401	ANALOG ELECTRONICS	L	T	P
Credits: 3	(Common for EEE & ECE)	3	-	-

Pre-Requisites: Applied Physics, Basic Electrical and Electronic Engineering.

Course Objectives: This course provides the knowledge of Transistor and FET Biasing Techniques, Amplifiers particularly Single Stage Amplifiers and also provides knowledge of study about different amplifiers and understands small signal analysis of different transistor configurations and study about feedback and oscillators.

MODULE I: BJT Biasing & FET Biasing [10 Periods]

BJT Biasing: Need for biasing, operating point, load line analysis, bias stabilization techniques: fixed bias, collector to base bias, self - bias, Stabilization against variations in I_{CO}, V_{BE} and β for the self -bias circuit, bias compensation techniques, thermal runaway and thermal stability.

FET Biasing: Biasing techniques: Fixed bias, Source self - bias, Voltage divider bias.

MODULE II: BJT Small Signal Analysis [10 Periods]

Small signal low frequency transistor Amplifier circuits: h-Parameter representation of a Transistor, Analysis of single stage transistor Amplifier (CE, CB, & CC) using h-parameters: voltage gain, current gain, input impedance and output impedance. Comparison of transistor configurations in terms of Ai, Ri, Av, Ro. Analysis of CE Amplifier with Emitter resistance, Millers theorem and its Dual, Simplified h-parameter Model.

MODULE III: Single Stage Amplifiers [10 Periods]

A: Classification of Amplifiers, Distortion in Amplifiers, Low Frequency response of common emitter Amplifiers, Common Base Amplifiers and Common Collector Amplifier.

B: Small signal JFET model, JFET Amplifiers: Common Drain Amplifier, Common Source Amplifier and Common Gate Amplifier.

MODULE IV: Feedback Amplifiers [10 Periods]

Feedback concept and types, Transfer Gain with feedback, General Characteristics of Negative Feedback Amplifiers, Types of Negative Feedback Connections, Method of Identifying FeedbackTopology, Stability of Feedback Amplifier.

MODULE V: Oscillators [10 Periods]

A: Constituents of an Oscillator, Barkhausen Criterion, Classification of Oscillators, Sine Wave Feedback Oscillators of LC Type - General Form of Oscillator Circuit, Hartley Oscillator, Colpitts Oscillator Sine Wave Feedback Oscillator of RC type - RC Phase Shift Oscillator, Wein Bridge Oscillator, Crystal Oscillator, Frequency Stability.

B: Introduction to FinFET- Working Principle, Structure, Advantages & Applications.

Text Books:

1. Jacob Milliman, Christos C. Halkias, SatyabrataJit, “Electronic Devices and Circuits”, McGraw Hill (India), 3rd edition, 2013.
2. Shalivahana N. Suresh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw Hill (India), 3rd edition, 2007.

Reference Books:

1. Robert Boylestad, LowisNashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall of India, 5th Edition, 1993.
2. G. K. Mithal, “Electronic Devices and Circuits”, Khanna Publications, 22nd Edition, 1999.

E-Resources:

1. http://electronicsforu.com/
2. https://www.elektormagazine.com/
3. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?reload=true&punumber=101
4. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=16
5. http://nptel.ac.in/courses/117101106/6

Course Outcomes:

At the end of the course, students will be able to:

1. Study different biasing techniques and design the DC bias circuits using BJT & FET
2. Understand the small signal analysis of different transistor configurations.
3. Understand the design of single stage Amplifiers
4. Understand the design of Feedback amplifiers and their frequency response.
5. Understand the design of various oscillators such as RC Phase Shift Oscillator, Wein Bridge Oscillator, Crystal Oscillator, LC Oscillator etc

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	2	2	1		1		3	2	3	3	2
CO2	2	3	1	2	2		2		2		1	1	3	2	2
CO3	3	2		1	1	2	1		2		2	2	2	3	2
CO4	2	3	2	1	2	2	1		3		2	3	3	2	2
CO5	1	2	2	3	2	3	3		2		2	3	2	2	3

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0553	**Basic Python Programming Lab** (Common for CE, EEE, ME, ECE, MiE)	L	T	P
Credits: 2		-	1	2

Prerequisites: NIL

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Software Requirements: Python

List of Programs:

WEEK -1:

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.

ii) Start the Python interpreter and type help() to start the online help utility.

2. Start a Python interpreter and use it as a Calculator.3.

i) Write a program to calculate compound interest when principal, rate and number of periods are given.

ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points

4. Read name, address, email and phone number of a person through keyboard and print the details.

WEEK - 2:

1. Print the below triangle using

for loop.5

4 4

3 3 3

2 2 2 2

1 1 1 1 1

2. Write a program to check whether the given input is digit or lowercase character or uppercasecharacter or a special character (use 'if-else-if' ladder)

3. Python Program to Print the Fibonacci sequence using while loop

4. Python program to print all prime numbers in a given interval (use break)

WEEK - 3:

1. i) Write a program to convert a list and tuple into arrays.

ii) Write a program to find common values between two arrays.

2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.

3. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindromeand False otherwise. Remember that you can use the built-in function len to check the length of a string.

WEEK - 4:

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sortedin ascending order and False otherwise.
2. Write a function called has_duplicates that takes a list and returns True if there is any element thatappears more than once. It should not modify the original list.

i). Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

ii) Remove the given word in all the places in a string?

iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

4. Writes a recursive function that generates all binary strings of n-bit length

WEEK - 5:

1. i) Write a python program that defines a matrix and prints

ii) Write a python program to perform addition of two square matrices

iii) Write a python program to perform multiplication of two square matrices

2. How do you make a module? Give an example of construction of a module using different geometricalshapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

WEEK-6:

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiplelevels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it forcorrectness.

WEEK- 7

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present init and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blankspaces, lower case letters and uppercase letters.

WEEK - 8:

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttonsas Submit and Reset.

TEXT BOOKS

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage

Course Outcomes

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

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3		3				1		1	2	2	1	
CO2			2		3							1	1		
CO3			2		2							3			2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I/II Semester		
Code: C0B11	Applied Physics Lab (Common for EEE, ECE,AI&ML, CSE (AI & ML), CSE (Cyb. Sec.), CSE (IoT), CSE (Data Science) ,CSE and IT)	L	T	P
Credits: 1		-	-	2

Course objectives:

The main objective of this course is to provide the necessary exposure to the practical aspects, which is an essential component for learning science.

List of Experiments:

1 **Planck's constant**
To determine Planck's constant using Photo electric effect.

2 **Energy band –gap of a semiconductor**
To determine the energy band gap of a semiconductor.

3 **V-I and P-I characteristics of light emitting diode**
Plot V-I and P-I characteristics of light emitting diode.

4 **Laser diode**
To study the Characteristics of Laser diode.

5 **Solar Cell**
To study the V-I Characteristics of solar cell.

6 **LCR Circuit**
To determination of resonant frequency, bandwidth and quality factor of RLC circuit.

7 **Numerical Aperture of an Optical fiber**
To determine the Numerical aperture of the given fiber.

8 **Bending Loss of a Fiber**
To determine the bending loss of the given fiber.

9 **Light Dependent Resistance (LDR)**
To determine the characteristics of a LDR.

10 **Stewart and Gee's experiment**
Determination of Magnetic field along the axis of current carrying circular coil.

11 **B-H Curve**
To study the magnetization of ferromagnetic material in presence of magnetic field.

12 **Sonometer**
To verify the frequency of AC Supply.

13. Construction of fundamental logic gates using discrete components and verification of truth tables

14. Verification of truth tables of fundamental logic gates using ICs

15. Construction of fundamental logic gates using universal logic gates.

Course Outcomes:

At the end of the course, students will able to

1. Develop skills to impart practical knowledge in real time solution.
2. Understand principle, concept, working, application and comparison of results with theoretical calculations.
3. Design new instruments with practical knowledge.
4. Understand measurement technology.
5. Use new instruments and real time applications in engineering studies.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech.		
Code: C0B18	Engineering Chemistry Lab (Common for ALL)	L	T	P
Credits: 1		-	-	2

Course objectives:

To provide the students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

List of Experiments:

1. Calibration of Volumetric apparatus.
2. Estimation of Total Hardness of water by EDTA Method.
3. Estimation of an acid by P^Hmetry.
4. Estimation of alkalinity of water.
5. Estimation of strength of an acid by Conductometry.
6. Estimation of strength of an acid by Potentiometry.
7. Estimation of Mn^{+2}ion in $KMnO_4$ by Colorimetry.
8. Determination of viscosity of given liquids by Ostwald's viscometer.
9. Determination of surface tension of given sample using stalagmometer.
10. Estimation of iron (II) by dichrometry.
11. Determination of rate constant of hydrolysis of methyl acetate.
12. Preparation of Aspirin.

COURSE OUTCOMES:

At the end of the course, students will be able to:

1. Acquire knowledge about the chemistry lab, kind of experiments that can be performed and the precautions to perform four types of titrations & understand the principle involved in the applications of the method.
2. Learn and apply basic technique used in chemistry laboratory for estimation hardness & alkalinity of water.
3. Understand about mineral analytic technique for estimation of ions/metal ions in minerals.
4. Apply instrumental techniques such as colorimetry, conductometry & potentiometry.
5. Learn to determine physical properties like free chlorides in water, viscosity & surface tension.

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1											
CO2	2	1	2												
CO3	2	2		1											
CO4	2	2	1												
CO5	2	1	2												

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: C0402	ANALOG ELECTRONICS LAB (Common for EEE & ECE)	L	T	P
Credits: 1		-	-	2

Course Objectives: To design different amplifiers, Feedback amplifiers and Oscillator circuits according to the given specifications.

PART - A: Implement the following Simulation using Multisim or Any equivalent open source software

1. Common Source Amplifier.
2. Common Gate Amplifier.
3. Voltage Shunt Feedback Amplifier
4. Wein Bridge Oscillator using Transistors.
5. Hartley Oscillator Using Transistors.
6. Colpitt's Oscillator Using Transistors.

PART - B: To be performed Using Discrete Electronic Components

1. Common Emitter Amplifier.
2. Common Collector Amplifier.
3. Common Drain Amplifier.
4. Voltage Series Amplifier.
5. Current Series Amplifier
6. RC Phase Shift Oscillator using Transistors.

Course Outcomes:

At the end of the course, students will be able to

1. Design Amplifiers Circuits.
2. Design Oscillator Circuits.
3. Analyze Feedback topology for amplifiers.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO2	PSO3
CO1	2	3	3	3	3		2			1	1	2	3	3	1
CO2	2	3	3	3	3		2			1	1	2	3	3	1
CO3	2	3	3	3	2		1			1		2	3	3	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0B08	COMPLEX VARIABLES AND NUMERICAL METHODS (Common for ECE & EEE)	L	T	P
Credits: 3		3	-	-

Prerequisites: Differentiation, Partial differentiation, Integration

Course Objectives:

1. To learn the concept of analyticity of a function
2. To learn the concept of evaluation of Integrals
3. To learn the Power series expansions of complex functions and evaluation of contour integrals.
4. The various numerical techniques which are indispensable tools to solve many algebraic and transcendental equations and Interpolation.
5. Numerical methods of solving the ordinary differential equations and Numerical Integration.

MODULE I: Functions of Complex variable [12 Periods]

Introduction, Complex functions and its representation on Argand plane, Concepts of limit, Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions, Milne – Thompson method.

MODULE II: Complex Integration [9 Periods]

Line integral, Evaluation along a path and by indefinite integration, Cauchy‟s integral theorem, Cauchy‟s integral formula, Generalized integral formula.

MODULE III : Power series expansions of complex functions& Contour Integration [13 periods]

(A) Radius of convergence, Expansion in Taylor‟s series, Maclaurin‟s series and Laurent series. Singular point, Isolated singular point, pole of order m, essential singularity.

(B) Residue, Evaluation of residue by formula and by Laurent series, Residue theorem, Evaluation of integrals by indentation Improper real integrals (a) $\int_{-\infty}^{\infty} f(x)dx$

(a) $\int_{0}^{2\pi} f(\cos\theta, \sin\theta)d\theta$

MODULE IV: Algebraic and Transcendental equations and Interpolation [14 periods]

(A) Solution of Algebraic and Transcendental Equations: Introduction-Errors, types of errors. Bisection Method, Method of False Position. The Iteration Method – Newton-Raphson Method

(B) Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences-Forward Differences-Backward differences – Symbolic relations and separation of symbols, Differences of a polynomial-Newton‟s formulae for interpolation, Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange’s Interpolation formula.

MODULE – V: Numerical solution of Ordinary Differential Equations and Numerical Integration [12 periods]

Numerical solution of Ordinary Differential Equations: Introduction, Solution by Taylor‟s series method, Picard‟s Method of successive Approximations, Euler‟s Method, Modified Euler‟s Method, Runge-Kutta Methods.

Numerical Integration: Trapezoidal Rule, Simpson‟s 1/3rd Rule, Simpson‟s 3/8 Rule.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R K Jain SRK Iyengar, Advanced engineering mathematics, Narosa publications.
3. M. K Jain, S R K Iyengar, R.K Jain, Numerical Methods for Scientific and Engineering Computation, New age International publishers.

Reference Books:

1. Murray Spiegel, Complex variables by Schamus outlines series.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley publications.
3. S.S.Sastry, **Introductory Methods of Numerical Analysis**, 5th Edition, PHI LearningPrivate Limited

E – RESOURCES:

1. http://nptel.ac.in/courses/104101002/downloads/lecturenotes/module1/chapter6.pdf (Numerical Differentiation and Integration)
2. https://www.youtube.com/watch?v=6vs-pymcsqk (Regula Falsi Method and Newton Raphson Method)
3. https://www.youtube.com/watch?v=1pJYZX-tgi0 (Interpolation)
4. https://www.youtube.com/watch?v=Atv3IsQsak8&pbjreload=101 (Numerical Solution of ODE)
5. https://www.youtube.com/watch?v=iviiGB5vxLA (Numerical Integration)
6. https://www.youtube.com/watch?v=HVHtGVOQySI (Functions of Complex Variables)
7. https://www.youtube.com/watch?v=v4yV2t4KBhs (Complex Integration)

NPTEL:

4. https://www.youtube.com/watch?v=WbmLBRbp0zA (Bisection Method)
5. https://www.youtube.com/watch?v=0K6olBTdcSs (Regula Falsi and Newton Raphson Method)
6. https://www.youtube.com/watch?v=KSFnfUYcxoI (Interpolation)
7. https://www.youtube.com/watch?v=QugqSa3Gl-w&t=2254s (Numerical Solution of ODE)
8. https://www.youtube.com/watch?v=NihKCpjx2_0&list=PLbMVogVj5nJRILpJJO7KrZa8Ttj4_ZAgl (Numerical Solution of ODE)
9. https://www.youtube.com/watch?v=hizXlwJO1Ck (Numerical Integration)
10. https://www.youtube.com/playlist?list=PLNKx0RorxX44HBsItvZP5CzFX1qCQOwp5 (Complex Analysis)

Course Outcomes:

1. The student will be able to apply the concept of analyticity of a function
2. The student will be able to evaluate of Integrals
3. The student will be able to find Power series expansions of complex functions and evaluation of contour integrals.
1. The student will be able to find the root of a given equation by various methods and estimate the value for the given data using interpolation.
2. The student will be able to find the numerical solutions for a given ODE‟s and evaluations of integrals using numerical techniques.

CO- PO Mapping

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
COS	**Programme Outcomes(POs)**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	3	2	2	3	3				2			1
CO2	2	2	2	3	2				2			1
CO3	2	2	2	3	2				2			1
CO4	3	2	2	3	3				2			2
CO5	2	2	2	3	3				2			2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0403	DIGITAL ELECTRONICS	L	T	P
Credits: 3	(Common for EEE & ECE)	3	-	-

Pre-Requisites: Nil

Course Objectives: This course introduces various number systems and conversion from one number system to other and also to understand different binary codes**,** the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques. Understanding the combinational logic design of various logic and switching devices and their realization**,** the basic flip flops and sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques and their realizations and to analyze a given sequential circuit by using state tables and state diagrams.

MODULE I: Number systems& Binary codes [8 Periods]

Number systems: Number Systems, Radix conversions, complement of numbers.

Binary codes: Binary codes, Weighted and non-Weighted codes, BCD code, gray code, excess 3 codes - Error detecting code, Error Correcting code, Hamming Code.

MODULE II: Boolean Algebra & Boolean functions [10 Periods]

Boolean Algebra: Postulates and Theorems - Canonical and Standard forms: SOP and POS forms, Minterms and Maxterms –

Simplification of Boolean functions: Simplification of functions: Karnaughmap (2,3,4,5,6 Variables) and Quine McCluskey method (Tabular Method) - Prime implicants, essential prime implicants.

Logic gates: NOT, OR, AND, NOR, NAND, XOR, XNOR- Universal gates

MODULE III: Combinational Logic Circuits [10 Periods]

A: Arithmetic circuits: Half adder, full adder, half subtractor, full subtractor, binary adder, Carry look ahead adder, BCD adder

B: Code conversion circuits, Comparator, Decoder, Encoder, Priority Encoder, Multiplexers and Design, De – Multiplexers, ROM, PLA, PAL.

MODULE IV: Sequential Logic Circuits - I [10 Periods]

Introduction –Latches and Flip flops: Basic Flip flop circuit, RS, D, JK and T Flip-flops – Triggering of Flip flops: Master Slave Flip flop, edge triggered flip flop – Conversion of one type of Flip flop to another, Setup time, hold time.

Analysis of Sequential Logic circuit: State Diagram, state table, reduction of state table, state Assignment –- Design procedure of sequential circuits using state diagram, state table and Flip flops. Example design Sequence detector.

MODULE V: Sequential Logic Circuits - II [10 Periods]

Registers and Counters: Shift Register, Universal Shift Register, Applications of Registers, Asynchronous counter, Synchronous counter, Mod-N Counter, binary up/down counter, Ripple counter, Johnson counter.

Finite State Machine: Introduction, FSM capabilities and Limitations, Mealy and Moore models – minimization of completely specified and incompletely specified sequential Machines. Partition techniques and Merger charts

Text Books:

5. ZviKohavi, "Switching and Finite Automata Theory",TMH, 2nd edition, 2006.
6. Morris Mano, "Digital Design", PHI, 3rd Edition, 2009.
7. A.Anand Kumar, "Switching Theory and Logic Design", PHI 2nd Edition, 2014.
8. John F.Wakerly, "Digital Design Principles & Practices", PHI/ Pearson Education Asia, 3rd Ed., 2005.

Reference Books:

3. Stephen Brown and Zvonka Vramesic, "Fundamentals of Digital Logic with VHDL Design", McGraw Hill, 2nd Edition, 2008.
4. William I. Fletcher, "An Engineering Approach to Digital Design", PHI, 1st Edition, 2009.

E-Resources:

5. https://www.researchgate.net/publication/264005171_Digital_Electronics
6. https://www.cl.cam.ac.uk/teaching/0708/DigElec/Digital_Electronics_pdf.pdf
7. http://ieeexplore.ieee.org/abstract/document/753678/
8. http://docshare01.docshare.tips/files/20257/202573063.pdf
4. http://nptel.ac.in/courses/117106086/1
5. http://nptel.ac.in/courses/117105080/
6. http://nptel.ac.in/courses/117106114/

Course Outcomes:

At the end of the course, students will be able to

6. Perform radix conversions
7. Minimize a given boolean function by using k-map or tabular method
8. Design a combinational circuit
9. Design a sequential circuit by using various flipflops
10. Analyze and minimize the circuitry of a given sequential circuit and will be able to design a sequence detector

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO S	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	1		1	1								2	2	1
CO2	2	3	3	1	1					1			3	2	2
CO3	3	2	3	2		1	1			1	2	1	3	3	2
CO4	2	2	3	3	1	1	1			1	3	1	2	2	2
CO5	1	1	3	3	1	1	1			1	3	1	3	2	2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0404	SIGNAL THEORY & STOCHASTIC PROCESSES	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course is introducing the basic concepts of signals and this course also introduces the LTI system. Introduces the Fourier series for the analysis of periodic signals, the Fourier transform for the analysis of non-periodic signals. The concept of Laplace transforms and its properties. To build an understanding of the concept of random variables, multiple random variables, random processes and their operations and To familiarize the student with the spectral characteristics of random processes and to determinelinear system response.

MODULE I: Signal Analysis: [10 Periods]

Signal Analysis: Introduction to signals and systems, Classification of signals and systems (both continuous and discrete); Operations on Signals, Approximation of a function by a set of mutually orthogonal functions, Evaluation of mean square error, Orthogonality in complex functions.

Properties of LTI systems, Transfer function of an LTI system, linear systems response to Deterministic signals and Distortion less transmission..

MODULE-II: Continuous-Time Fourier series and Fourier transform: [10 Periods]

Fourier series: Representation of periodic signals, Convergence of Fourier series, Trigonometric, Exponential forms, Properties of Fourier series.

Fourier Transforms: Representation of non-periodic signals. Fourier transform of periodic signals, Inverse Fourier transforms, Properties of the Continuous-Time Fourier transforms, Convolution and multiplication properties and their effect in the frequency domain, magnitude and phase response.

MODULE-III: **Laplace Transform and Random Variables** [15 Periods]

Laplace Transform: Definition , Properties of Laplace Transform, The Laplace Transform of different signals, Region of convergence, System functions, Poles and zeros of system, Solutions to differential equations, Inverse Laplace Transform.

Random Variables: Review of Probability theory, Definition of Random Variable, Classification of Random Variables, Cumulative Distribution Function (CDF) and its properties, Probability Density function (PDF) and its Properties, Types of CDF & PDF - Uniform, Gaussian and Rayleigh.

MODULE-IV: Multiple Random Variable & Operations [10 Periods]

Multiple Random variables: Joint Distribution and its Properties, Joint Density and its Properties, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Central Limit Theorem (Without Proof).

Operations on Single & Multiple Random Variables: Expectation, Moments, Variance and

Skew, Characteristic Function, Moment Generating Function, Transformations of a Random Variable

MODULE-V: Stochastic Processes & Linear systems response to random inputs: [10 Periods]

Temporal Characteristics: The Stochastic Processes concept, classification of Processes, Deterministic and non-Deterministic Processes, Autocorrelation function and its properties, Cross correlation and its properties.

Spectral Characteristics: Power spectrum, Power spectrum density, Properties, Cross Power spectrum, Cross Power spectrum density, Properties, Relationship between Power spectrum and Autocorrelation function.

Linear systems response to random inputs: Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions. Power Density Spectrum, and Cross-Power Spectral Density of random inputs.

Text Books:

1. B. P. Lathi, "Signals Systems & Communications", BSP, 2nd Edition, 2013.
2. Peyton Z. Peebles, **"Probability, Random Variables & Random Signal Principles"**, TMH, 4th Edition, 2001.
3. P Ramakrishna Rao and Shankar Parkriya, "Signals and Systems", MGH International, 2nd Edition, 2013.

Reference Books:

1. A.V. Oppenheim, A. S. Willsky, S.H. Nawab, "Signals and Systems", PHI, 2nd Edition, 2014.
2. A. Anand Kumar, "Signals and Systems", PHI, 3rd Edition, 2013.
3. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition, 2007.
4. Y. Mallikarjuna Reddy, **"Probability Theory and Stochastic Process"**, University Press, 4th Edition, 2013.
5. Athanasius Papoulis and S. Unnikrishna Pillai, **"Probability, Random Variables and Stochastic Processes"**, TMH, 4th Edition, 2002.

E-Resources:

1. http://www.tutorialspoint.com/signals_and_systems/
2. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/
3. http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?reload=true&punumber=78
4. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8919
5. https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/lecture-notes/
6. http://nptel.ac.in/courses/IIT- MADRAS/Principles of_Communication1/Pdfs/1_5.pdf
7. http://pages.ucsd.edu/~ssaiegh/Slides8.pdf

Course Outcomes:

At the end of the course, students will be able to:

1. Represent any arbitrary signals in terms of complete sets of orthogonal functions and understand the principles of impulse functions, step function and signum function.
2. Express periodic signals in terms of Fourier series and aperiodic signals in terms of Fouriertransform.
3. Express continuous time domain signals in terms of Laplace Transform ie. Complex frequency domain (s-plain) and waveform synthesis.
4. Analyze that the random variable is always a numerical quantity and will know the importance of cdf, pdf in characterizing random variables; they can also perform all the statistical operations on single random variables
5. Understand power density spectrum and its properties and its relation with correlation.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	2	3	3	1	1	1					1	3	1	1
CO2	3	2	1	3	2	2	1					1	3	2	1
CO3	2	2	3	3	1	1	1					1	2	1	1
CO4	2	2	3	2	2	2	1					1	3	2	1
CO5	3	3	3	1	1	1	1					1	3	2	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0405	Electromagnetic Fields and Transmission Lines	L	T	P
Credits: 3		3	-	-

Pre-Requisites: vector Calculus, Engineering Physics, Applied Physics

Course Objectives: Analyze fundamental concepts of vector analysis, electrostatics and magneto statics law and their applications. Formulate the basic laws of static electricity and magnetism. Derive the wave equations for conducting and di-electric mediums to analyze the wave propagation characteristics. Analyze fundamental concepts of Transmission lines To understand the concepts of RF Lines and their characteristics, Smith Chart.

MODULE I: **[10 Periods]**

Review of coordinate systems. Coulomb's Law, Electric field due to various Charge configurations and Electric flux density. Gauss's Law and its applications. Work, Potential and Energy, The dipole. Current and Current density, Laplace and Poisson's equations. Calculation of capacitance for simple configurations.

MODULE II: **[14 Periods]**

Steady magnetic-Biot-Savart's law, Ampere's law. Stoke's theorem, Magnetic flux and magnetic flux density. Scalar and vector magnetic potentials. Electric and Magnetic fields boundary conditions. Maxwell's equations for static and time varying fields.

MODULE III: **[12 Periods]**

Uniform plane waves in free space and in conducting medium, Polarization. Instantaneous, average and complex Poynting theorem and its applications.

Reflection and Refraction: Normal and Oblique incidence on dielectrics and conducting medium.

MODULE IV: **[12 Periods]**

Overview of T and π networks. Types of Transmission Lines-Two wire lines. Primary and secondary constants. Transmission Line equations. Infinite line and characteristic impedance-Open and short circuit lines and their significance. Distortion less transmission line, Concept of loading of a transmission line, Campbell's formula.

MODULE V: **[10 Periods]**

Impedance at any point on the transmission line- Input impedance. RF and UHF lines, transmission lines as circuit elements. Properties of λ/2, λ/4 and λ/8 Lines. Reflection coefficient and VSWR. Matching: Stub matching. Smith chart and its applications.

Text Books:

1. Matthew N.O. Sadiku, Principles of Electro-magnetics, 6th edition, Oxford University Press, 2016.

2. William H. Hayt Jr. and John A. Buck, Engineering Electromagnetics, 7th edition, Tata McGraw Hill, 2006.

3. John D. Ryder, Networks Lines and Fields, 2nd edition, Pearson, 2015.

Reference Books:

4. E.C. Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems, 2nd edition, Pearson, 2015

5. K.D. Prasad, Antennas and Wave Propagation, Khanna Publications.

E-Resources:

1. https://ocw.mit.edu/courses/mathematics/18-440-probability-and-random-variables-spring-2014/lecture-notes/
2. http://nptel.ac.in/courses/IIT- MADRAS/Principles of_Communication1/Pdfs/1_5.pdf
3. http://pages.ucsd.edu/~ssaiegh/Slides8.pdf
4. http://nptel.ac.in/courses/117105085/
5. http://nptel.ac.in/courses/111104032/
6. http://www.nptelvideos.in/2012/12/probability-random-variables.html

Course Outcomes:

At the end of the course, students will be able to

1. Understand the different coordinate systems, vector calculus, coulombs law and gauss law for finding electric fields due to different charges and to formulate the capacitance for different capacitors.
2. Learn basic magnetostatics concepts and laws such as Biot-Savarts law and Amperes law, their application in finding magnetic field intensity, inductance and magnetic boundary conditions.
3. Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
4. Determine the Transmission Line parameters to characterize the distortions and estimate the characteristics for different lines.
5. Study the Smith Chart profile and stub matching features, and gain ability to practically use the same for solving practical problems.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2					1				2	2	1
CO2	3	3	2	2	2	1	1			1	1	1	3	3	2
CO3	3	3	3	2		2	2		1	1	1	2	3	3	2
CO4	3	3	2	1	3	3	2			2	1	2	2	3	2
CO5	3	3	3	2	3	3	3	1		2	1	3	3	2	3

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0406	NETWORK THEORY AND CIRCUIT ANALYSIS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Basic Electrical and Electronics Engineering

Course Objectives: This course introduces the basic concepts of transient analysis of the circuits, the basic two port network parameters. It also introduces the students the multistage Amplifier analysis and frequency response.

MODULE I: Network Theorems & Transient Analysis [11 Periods]

Network Theorems (A.C. & D.C): Norton‟s Theorem, Reciprocity Theorem, Tellegen‟s Theorem, Milliman‟s and Compensation theorems for A.C & D.C excitations.

Transient Analysis (First and Second Order Circuits): Transient Response of RL, RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

MODULE II: Two Port Networks [9 Periods]

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

MODULE III: Locus Diagrams, Resonance and Magnetic Circuits: [10 Periods]

A: Locus Diagrams, Resonance: Locus diagrams- Series and Parallel RL, RC and RLC circuits with variation of various parameters- Resonance-series and parallel circuits, concepts of Bandwidth and Quality factor.

B: Magnetic Circuits: Faraday‟s laws of electromagnetic induction, concept of self and mutual inductance, Dot convention coefficient of coupling, composite magnetic circuits, Analysis of series and parallel magnetic circuits.

MODULE IV: Multistage Amplifiers [9 Periods]

Multistage Amplifiers: Different Coupling Schemes used in Amplifiers, General Analysis of Cascaded RC Coupled BJT Amplifiers Choice of Transistor configuration in a Cascade Amplifier, RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled (DC) Amplifiers and Darlington Pair.

MODULE V: Frequency Response [9 Periods]

Frequency Response: General Frequency Considerations, High Frequency Hybrid π Model for Common Emitter Transistor Model, Emitter Follower at Higher Frequencies, Analysis and design of single tuned and double tuned amplifiers with BJT, Comparison of multistage, single tuned amplifiers and double tuned amplifiers.

Text Books:

1. William Hayt and Jack E. Kemmerly, "Engineering circuit analysis", Mc Graw Hill Company, 7th Edition.
2. B.L.Theraja and A.K. Theraja, "A Textbook of Electrical Technology Volume I", S.Chand publications.
3. S. Salivahanan, N Suresh Kumar, "Electronic Circuit Analysis", Tata McGraw Hill Education Private Limited, New Delhi, 2nd Edition, 2012..

Reference Books:

1. Electrical Circuits - A. Chakrabarhty, Dhanipat Rai & Sons.
2. S.N. Singh, "Basic Electrical Engineering", PHI.
3. K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Education.
3. G. K. Mithal, "Electronic Devices and Circuits", Khanna Publishers, New Delhi, 2nd Edition, 1998.

E-Resources:

1. http://nptel.ac.in/courses/108108076/
2. https://www.electrical4u.com/electrical-power-transformer-definition-and-types-oftransformer/
3. www.dannex.se/theory/1.html
4. ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-013-electromagnetics-and-applications-spring-2009\
5. www.tandfonline.com/toc/uemg20/current6.nptel.ac.in/courses/108104087
7. nptel.ac.in/courses/115101005

Course Outcomes:

At the end of the course, students will be able to:

1. Apply network theorem to analyze the various electrical circuits.
2. Determine the transient behavior of first and second order circuits.
3. Differentiate various types of transmission lines and its parameters
4. Understand the use of transmission lines with different lengths and also about smith chart.
5. Analyze the two port networks by determining the various parameters.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2			1					1	3	2	2
CO2	3	3	2			2			2				3		2
CO3	3	3	2	2		2			2	2			3	2	1
CO4		3			2	2					1			3	1
CO5	3	2			2	1					1		2	1	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0407	DIGITAL ELECTRONICS LAB (Common for EEE & ECE)	L	T	P
Credits: 1		-	-	2

Course Objectives: To get programming knowledge on Verilog/VHDL programming of different digital circuits and CMOS circuits

Implement the following using Verilog/VHDL or any equivalent software

1. Introduction to Verilog/VHDL and Design of all the logic gates
2. Design of Half adder, Full adder using 3 modeling styles
3. Design of Half Subtractor, Full Subtractor using 3 modeling styles
4. Design of 4X16 Decoder using two 3x8 Decoders
5. Design of 8-to-3 encoder (without and with priority).
6. Design of Multiplexer & Demultiplexer.
7. Design of comparator
8. Design of 4-bit binary to gray converter vice versa
9. Design of BCD to Excess-3 code converter and vice versa
10. Design of flip flops: SR, D, JK, T.
11. Design of 4-bit binary up/down counter.
12. Design of Johnson counter.

Equipment required for laboratory

1. Computers – Dual Core.
2. Software – Verilog/VHDL or any equivalent software

Course Outcomes:

At the end of the course, student will be able to

1. Design and verify the functionality of various combinational circuits using Verilog/VHDL coding.
2. Design and verify the functionality of various flipflops and basic sequential circuits using Verlog/VHDL coding.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		1		1	2	2	3	3	3	2
CO2	3	3	3	3	3		1		1	2	2	3	3	3	2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0408	SIGNALS AND STOCHASTIC PROCESSES LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To get knowledge on how to write program for various operation on signals, to verify various functions of random process.

Implement the following Programs using MATLAB/Octave/Equivalent Software

PART – A (Signals)

1. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulses, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Operation of Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Verification of Linearity and Time-Invariance properties of a given continuous /discrete system.
4. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
5. Convolution between Signals and Sequences.
6. Waveform Synthesis using Laplace Transform.

PART – B (Stochastic Process)

7. Generation of random variables and plot the PDF and CDF of the following distributions
   a) Uniform, Gaussian, Rayleigh,
8. Operations on Single Random Variable: Mean, Variance, Skew of different distributions.
9. Operations on Multiple Random Variables- Correlation and Covariance of any given two random variables
10. A) Calculation of Autocorrelation Function and Power-Spectral Density of a Given Random Process
    B) Calculation of Cross-Correlation Function and Cross-Power-Spectral Density of Two Random Processes
11. Calculation of Temporal Characteristics of Response of Linear-Time Invariant Systems when input is a WSS random process.
12. Calculation of Spectral Characteristics of Response of Linear-Time Invariant Systems when input is a WSS random process..

Course Outcomes:

At the end of the course student will be able to:

1. Generate different signals with different parameters.
2. Do operations on random variables.
3. Verify & do the calculation on various random process.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2	3	3				1	2		1	2	3	2
CO2	3	3	2	3	3				2	2		2	2	3	2
CO3	3	3	2	3	3				2	2		2	2	3	2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. III Semester		
Code:C0554	FUNDAMENTALS OF DATA STRUCTURES LAB (Common for CE, EEE, ME, ECE, MiE)	L	T	P
Credits: 2		-	-	4

Prerequisites: C Programming.

Course Objectives:

This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists, stacks, queues, trees and graphs along with the applications.

Software Requirements: C

List of Programs:

1 Write a program to create one dimensional array, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements

2 Write a program to create a single linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.

3 Write a program to create a circular linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.

4 Write a program to create a double linked list, with the following operations:
   a) Insertion
   b) Deletion
   c) Display the elements
   d) Count number of elements.

5 Write a program to implements stack operations using:
   a) Arrays
   b) Linked list

6 Write a program to:
   a) Evaluate Postfix expression.
   b) Convert infix expression into postfix expression

7 Write a program to implements Linear Queue operations using:
   a) Arrays
   b) Linked list

8 Write a program to implements Circular Queue operations using Arrays

9 Write a program to implements Double-ended Queue operations using Arrays

10 Write a recursive program to create a Binary Tree of integers, traverse the tree in preorder, in order and post order of the tree.

11 Write a program to create a Binary Search Tree (BST) and perform insert and search operations on it.

12 Write a program for implementing the following graph traversal algorithms:
a) Breadth First Search (BFS)
b) Depth First Search (DFS)

TEXTBOOKS

1. Jean Paul Tremblay, Paul G Sorenson, "**An Introduction to Data Structures with Applications**", Tata McGraw Hills, 2nd Edition, 1984.

2. Richard F. Gilberg, Behrouz A. Forouzan, "**Data Structures: A Pseudo code approach with C** ", Thomson (India), 2nd Edition, 2004.

REFERENCES

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, "**Fundamentals of Data Structure in C**", University Press (India), 2nd Edition, 2008..

2. A. K. Sharma, "**Data Structures using C**", Pearson, 2nd Edition, June, 2013.

3. R. Thareja, "**Data Structures using C**", Oxford University Press, 2nd Edition, 2014.

Course Outcomes:

At the end of the course, students will be able to

1. Identify the appropriate recursive algorithms and analyze the performance of algorithms.

2. Understand and implement single, double, and circular linked-lists.

3. Implement linear data structures such as Stacks and Queues using array and linked-list representations.

4. Implement non-linear data structures such as trees and graphs.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3	2										3	2	
CO2	2	2	3										2	3	
CO3		2	3											3	1
CO4		2	3										2	3	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech III Semester		
Code:C00M2	ENVIRONMENTAL SCIENCE (Common for ALL)	L	T	P
Credits: Nil		2	-	-

Pre-Requisites: Nil

Course Objectives: An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences, including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problem of environment.

MODULE I: Ecosystems: [5 Periods]

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.

Activity: Plantation.

MODULE II: Natural resources, Biodiversity and Biotic resources: [9 Periods]

A: Natural Resources: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable e-resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources–case studies. Energy resources: growing energy needs introduction to renewable and non renewable energy sources.

B: Biodiversity and Biotic resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Threats to Biodiversity (habitat loss, poaching of wildlife, man-wild life conflicts). Conservation of Biodiversity (In-situ and Ex-situ conservation),

Activity: case studies.

MODULE III: ENVIRONMENTAL POLLUTION AND CONTROL: [7 Periods]

A: Classification of pollution and pollutants, Causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards.

B: Soil Pollution, Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, Coastal pollution due to sewage and marine disposal of industrial effluents. E-waste and its management.

Activity: Field visit.

MODULE IV: Global Environmental Problems and Global effects: [6 Periods]

Greenhouse effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions/Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

Activity: Poster Making.

MODULE V: Towards sustainable future: [5 Periods]

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism(CDM).

Text Books:

1. R.Rajagopalan,"Environmental Studies from crisis to cure", Oxford University Press 2nd Edition, 2005.
2. Anubha Kaushik, C.P.Kaushik, "Environmental studies" New age International Publishers,4th Edition,2012

Reference Books:

1. Erach Bharucha,"Environmental studies" University Grants Commission, and University Press,I Edition, 2005.
2. M. Anji Reddy "Text book of Environmental Science and Technology" 3rd Edition, 2007
3. Richard T.Wright,"Environmental Science: towards a sustainable future" PHL Learning, Private Ltd. New Delhi, 2nd Edition., 2008
4. Gilbert McMasters and Wendell P.Ela,"Environmental Engineering and science", 3rd Edition, PHI Learning Pvt. Ltd.,2008.

E-Resources:

1. Journal of earth science and climatic change (OMICS International Journal).
2. Journal of pollution effects & control (OMICS International Journal).
3. nptel.ac.in/courses/120108004/ (Principles of Environment Management Lectures).
4. http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html (NPTEL online video courses IIT lectures).

Course Outcomes:

After completion of the course, students will be able to:

1. To enable the students to realize the importance of ecosystem, its structure, services. To make the students aware of Different natural functions of ecosystem, which helps to sustain the life on the earth.
2. To use natural resources more efficiently.
3. To make the students aware of the impacts of human actions on the environment, its effects and minimizing measures to mitigate them.
4. To educate the students regarding environmental issues and problems at local, national and international level.
5. To know more sustainable way of living

CO- PO, PSO Mapping

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3		1		1	2	1								
CO2	2	3	2	3	1	3		2							
CO3	3	3	2	3	2	2		1							
CO4	3	2	2	1	2	1									
CO5	2	1	1			1	3	3							

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech IV Semester		
Code:C0H08	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: EEA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager‟s responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

MODULE-I Business Environment and Managerial Economics [10 Periods]

A: Business Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Latest trends in Business Environment (Entrepreneurship).

B: Managerial Economics: Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand, Types, Significance of Elasticity of Demand, Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

MODULE II: Theory of Production and Cost Analysis [10 Periods]

A: Theory of Production: Production Function – ISOquants and ISOcosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

B: Cost Analysis: Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEA.

MODULE III: Market structures and Pricing Policies [9 Periods]

A: Introduction to Markets & Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

B: Pricing Policies & Methods: Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, PLC based pricing methods.

MODULE IV: Capital and Capital Budgeting [9 Periods]

A: Capital: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of rising finance.

B: Capital Budgeting: Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

MODULE V: Financial Accounting and Ratios [10 Periods]

A: Financial Accounting: Introduction, Accounting principles, Accounting Cycle, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

B: Financial Analysis Through Ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

Text Books:

1. Aryasri, "Managerial Economics and Financial Analysis", TMH, 2nd edition, 2005.
2. Varshney & Maheswari, "Managerial Economics", 5th edition Sultan Chand, 2003.

Reference Books:

1. H. Craig Peterson & W. Cris Lewis, "Managerial Economics", PHI, 4 Ed.
2. Domnick Salvatore, "Managerial Economics In a Global Economy", Thomson, 4th Edition.
3. Raghunatha Reddy & Narasimhachary, "Managerial Economics& Financial Analysis", 4TH edition Scitech.
4. S.N.Maheswari & S.K. Maheswari, "Financial Accounting", 6th edition Vikas.
5. Dwivedi, "Managerial Economics", Vikas, 6th Edition.

E-Resources:

1. http://www.learnerstv.com/Free-Economics-video-lecture-courses.htm
2. http://nptel.ac.in/courses/110105067/
3. http://nptel.ac.in/courses/110107073/
4. http://nptel.ac.in/courses/110101005/
5. http://nptel.ac.in/courses/109104073/

Course Outcomes:

After completion of the course, students will be able to:

1. Understand the concepts of managerial economics and their application in evaluating the demand.

2. Evaluate the production function and identifies the least cost combination to control the costs of production.

3. Understand the structures of various market types and their pricing policies.

4. Understand the types of business forms and also be able to evaluate the investments using capital budgeting techniques.

5. Understand the basic concepts of financial accounting and evaluation of company performance using ratio analysis.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1		2							1		3				
CO2	3			2	1										
CO3		1			2						3				
CO4	2	1			3										
CO5		1			2						3				

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0409	SENSORS & DEVICES	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil.

Course Objectives: To introduce the terminology, technology and its applications of sensors , To introduce Arduino which is used in many IoT devices, To introduce the Raspberry PI platform, that is widely used in IoT applications. To introduce the basics of IoT devices

MODULE I: Introduction to Sensors [10 Periods]

Introduction to Sensors, classification of Sensors, Criteria to choose a Sensor, Sensors (Light sensor, temperature sensor, force sensor, weight sensor, position sensor, Hall Effect Sensor, sound sensor, ultrasonic sensor, touch sensor, gas sensor, IR sensor, level sensor and soil moisture sensor) and its working principles.

MODULE II: Arduino & NodeMCU [10 Periods]

Introduction to Arduino, Arduino IDE, Basic Commands for Arduino, Connecting LED with Arduino, Arduino with sensors (Ultrasonic Sensor, PIR Motion Sensor, DHT11 sensor, soil moisture sensor, Gas/Smoke Sensor, LDR Sensor), RFID Reader, Introduction to Node MCU, Connecting Node MCU Board with Arduino IDE, NodeMCU with sensors (Ultrasonic Sensor, PIR Motion Sensor, DHT11 sensor, LDR sensor, soil moisture sensor).

MODULE III: Interfacing with Arduino & Node MCU [10 Periods]

Interfacing of Buzzer with Arduino, controlling servo motor with Arduino, controlling DC Motor with Arduino, Controlling Stepper motors with Arduino, Interfacing LCD with Arduino, Controlling High Power devices with Arduino using transistors, Controlling AC Power devices with Arduino using Relays, Interfacing servo motor with NodeMCU, Control DC Motor via NodeMCU, Controlling Stepper motors with NodeMCU.

MODULE IV: Raspberry Pi [10 Periods]

Introduction to Raspberry pi, Installation of libraries, Configuring Raspberry Pi, Raspberry Pi commands, Enabling SSH, Connecting Raspberry Pi using remote access, getting the static IP address of Raspberry Pi, Introduction to Python, Run a python program on Raspberry Pi, Interfaces of raspberry Pi, Programming a Raspberry Pi for connecting (LED, DHT11, Ultrasonic Sensor, LDR Sensor).

MODULE V: Introduction to IoT [10 Periods]

Introduction to Internet of Things- Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

TextBooks:

1. Rui Santos, 18+ Arduino Projects, 2nd edition, random nerdtutorial.blog
2. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh,Mahendra Swain, Internet of Things with Raspberry Pi and Arduino, CRC Press
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547 2.

ReferenceBooks:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759 3.
2. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

E-Resources:

1. https://www.edx.org/course/iot-sensors-and-devices
2. https://behrtech.com/blog/top-10-iot-sensor-types/
3. http://nptel.ac.in/courses/108101037/

Course Outcomes:

At the end of the course, students will be able to:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules.
3. Market forecast for IoT devices with a focus on sensors.
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	3	3								3	1		1
CO2	3	3	3	3								3	1		1
CO3	3	3	3	3								3	1		1
CO4	3	3	3	3								3	1		1
CO5	3	3	3	3								3	1		1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0410	MICROPROCESSOR AND MICROCONTROLLERS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Digital Electronics.

Course Objectives: :This course provides the students to understand operation and programming of 8085 Microprocessor, develops real time applications using 8086 processor, understand the basic concepts of 8051 Microcontroller and interfacing with I/O devices.

MODULE I: 8085 Architecture [8 Periods]

Introduction to Microprocessors, Architecture of 8085, registers & flag register, Pin Configuration and Functions, Generation of Control Signals: Bus Timings: De-multiplexing of address/ data bus. Instruction Set and Programming with 8085.

MODULE II: 8086 Architecture [10 Periods]

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Physical Memory Organization, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

MODULE III: Introduction to Microcontrollers: [10 Periods]

A: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

B: 8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

MODULE IV: I/O and Memory Interface [10 Periods]

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

MODULE V: ARM Architecture [10 Periods]

A: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

B: **Advanced ARM Processors:** Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture. Introduction to Intel i3, i5 and i7 Processors.

Text Books:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programing and Application with 8085"Penram,5th Edition, 2002.
2. A. K.Ray, "Advanced Micro processors and Peripherals" 3 rdTata McGraw-Hill, Edition.
3. Mazidi, Mazidi&McKinlay, "The 8051 Microcontroller and Embedded Systems using Assembly and C" 2 ndEdition, PHI .
4. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012.

Reference Books:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, AndhePallavi, Pearson, 2009

E-Resources:

1. https://www.tutorialspoint.com › Microprocessor › Microprocessor - 8085 Architecture
2. http://www.cpu-world.com/CPUs/8086/
3. https://www.journals.elsevier.com/microprocessors-and-microsystems/
4. http://rtcmagazine.com/technologies/view/Microcontrollers
5. http://nptel.ac.in/courses/106108100/
6. http://nptel.ac.in/courses/108107029/
7. nptel.ac.in/courses/106108100/

Course Outcomes:

At the end of the course, students will be able to:

1. Explain 8085 microprocessor features..
2. Develop programs using 8085 instruction set.
3. Identify peripheral devices to interface with 8086 microprocessor.
4. Get Summarize different 8051 family microcontrollers.
5. Design to interface input and output devices with 8051 microcontroller.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	1	1									1	3		
CO2	3	2	1	1	2							1	3	2	2
CO3	3	2	2	2	2							2	3	2	2
CO4	3	1	1										3		
CO5	3	3	3	2	2							2	3	2	3

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0411	ANALOG AND DIGITAL COMMUNICATIONS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Signals Theory and Stochastic Processes.

Course Objectives: This course introduces the concept of modulation and various techniques for amplitude modulation of analog signals. This course also introduces the concept of angle modulation techniques for Frequency modulation of analog signals. This course also introduces sampling, the effect of noise on communication systems and various pulse analog & digital binary modulation techniques.

MODULE I: Amplitude Modulation [10 Periods]

Introduction to communication system, Need for modulation, Amplitude Modulation, Time domain and frequency domain description of AM system, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector , Applications , advantages and limitations of AM.

MODULE II: DSBSC Modulation [13 Periods]

DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation. Comparison of AM Techniques, AM transmitter and Super heterodyne Receiver

MODULE III: Angle Modulation [12 Periods]

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth, Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM, FM Transmitter and Receiver

MODULE IV: Noise and Elements of Digital Communication Systems [13 Periods]

A. Noise: Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Noise performance analysis in AM & FM systems.

B. Sampling : Sampling theorem, types of sampling-Natural and flat-top sampling

C. Pulse Analog Modulation: Introduction, PAM, PWM, PPM Modulation and Demodulation Techniques

MODULE V: PCM and Digital Binary Carrier Modulation Schemes [12 Periods]

Pulse Digital Modulation: PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM, Noise in PCM and DM.

Digital Binary Carrier Modulation Schemes :Introduction, ASK -Modulator, Coherent ASK Detector, FSK- Modulator, Non Coherent FSK Detector, BPSK-Modulator, Coherent BPSK Detection.

Text Books:

1. H Taub& D. Schilling, GautamSahe, "Principles of Communication Systems", TMH, 3rd Edition, 2007.
2. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005

Reference Books:

2. Simon Haykin, John Wiley, "Digital Communication", 1st Edition, 2005.
3. B.P. Lathi, "Communication Systems", BS Publication, 2006.

E-Resources:

1. https://courses.engr.illinois.edu/ece458/comms2.pdf
2. http://www.ece.lehigh.edu/~jingli/teach/F2005CT/notes/AnalogCommunication.pdf
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-principles- of-digital-communications-i-fall-2006/
4. International Journal of Communication Systems - http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1131
5. Lecture Series - http://nptel.ac.in/courses/117102059/
6. Lecture Series - http://nptel.ac.in/courses/117101051/

Course Outcomes:

After completion of the course, students will be able to:

1. Understand the concepts of modulation, demodulation of various analog modulationtechniques i.e., AM, DSB and SSB.
2. Analyze the Frequency Modulation signal transmission and reception and calculate theNarrowband FM, Wideband FM.
3. Understand the concepts and working of radio transmitters, radio receivers and noiseanalysis of analog communication systems.
4. Understand the basic components of digital communication systems.
5. Understand the concepts and working of various digital binary modulation techniques.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	1	2	1	1	1					1	3	2	1
CO2	3	2	2	2	1	1	1					1	2	2	1
CO3	2	2	1	1	1	1	1					1	2	2	1
CO4	3	2	1	2	2	1	1					1	2	3	1
CO5	3	2	2	2	2	1	1					1	3	3	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0412	Pulse and Linear Integrated Circuits	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Basic Electrical and Electronic Engineering, Analog Electronics.

Course Objectives: Analyse the behavior of Linear and non-linear wave shaping circuits Analyse and design of Multivibrators¬ Understand the operation of OP-AMP and its internal circuits¬ Analyse the applications of OPAMP and 555 Timer¬ Explain the operation of various data converter circuits and PLL¬

MODULE I: [12Periods]

Linear Wave Shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators.

Non-Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Comparators,Clamping operation,clamping circuits using diode with different inputs, practical clamping circuits, Clamping circuit theorem.

MODULE II: [12Periods]

Multivibrators: Analysis and Design of fixed bias Bistable, Monostable, Astable Multivibrators.Introduction to Schmitt trigger using transistors.

Time Base Generators: General features of a time base signal, methods of generating voltage time base waveform.

MODULE III: [12Periods]

Integrated Circuits & Operational Amplifier: Introduction, Classification of IC's, IC chip size and circuit complexityOp-Amp Block diagram, ideal Op-amp, Op-amp and its features,AC and DC characteristics of Op-amp: Input and Output Offset voltages and currents, Slew rate, CMRR, PSRR. Frequency response and Compensation Techniques.

MODULE IV: [12Periods]

OPAMP Applications: Inverting and Non-Inverting Amplifiers, Adder, Subtractor, Integrator and differentiator,Comparator.

Active filters: Introduction, Butterworth filters – 1st order low pass and high pass filters, band pass, band reject and all pass filters.

MODULE V: [12Periods]

555 Timer: Functional Diagram, Monostable, Astable and Schmitt Trigger.PLL- introduction, basic principle.

Data Converters: Digital-to-analog converters (DAC): Weighted resistor DAC,R-2R ladder DAC, inverted R-2R ladder, Analog-to digital converters (ADC): parallel comparator type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

TextBooks:

1. Anand Kumar A, "Pulse and Digital Circuits", Prentice-Hall of India private Limited, New

Delhi, 2007
2. David A. Bell, Solid State Pulse circuits - PHI, 4th Edn., 2002.
3. D.Roy Chowdhury, Shail B.Jain, "Linear Integrated Circuits", 4/e, New Age International (P) Ltd., 2008.

ReferenceBooks:

1. J. Millman and H. Taub, Pulse, Digital and Switching Waveforms - McGraw-Hill, 1991.

2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Pearson,2018, 4th edition

Reference Books:

1. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Pearson,2018, 4th edition
2. D.Roy Chowdhury, Shail B.Jain, "Linear Integrated Circuits", 4/e, New Age International (P) Ltd., 2008.
3. Anand Kumar A, "Pulse and Digital Circuits", Prentice-Hall of India private Limited, New Delhi, 2007

E-Resources:

1. http://sureshq.blogspot.in/2015/12/pulse-and-digital-circuits-unit-2-and-3.html
2. http://wps.pearsoned.com/wps/media/objects/10581/10835513/Chapter4.pdf
3. http://www.radio-electronics.com/info/circuits/
4. http://electronicsforu.com/
5. http://www.serialsjournals.com/journal-detail.php?journals_id=315

Course Outcomes:

At the end of the course, students will be able to:

1. Construct different linear networks and analyse their response to different input signals.
2. Understand, Analyse and design multi vibrators and sweep circuits using transistors
3. Distinguish different types of rectifying circuits and amplifier circuits and their performance parameters.
4. Analyse DC and AC characteristics for Single/Dual input Balanced/Unbalanced output configurations using BJTs
5. Distinguish various linear and non-linear applications of Op-Amp. Analyse the operation of the most commonly used D/A and A/D converter types.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	2	3	2	1	2		1	2	2	1	3	2	2
CO2	3	2	3	1	2		2		2	2	3	1	3	2	3
CO3	3	3	3	3	2	1	2	1	2	2	1		2	2	2
CO4	3	3	3	3	2	3			3	2	2	3	3	2	3
CO5	3	3	3	2	1	1			1	1	2	1	3	2	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0413	ANALOG AND DIGITAL COMMUNICATIONS LAB	L	T	P
Credits: 1		-	-	2

Course Objectives: To get practical knowledge on analog and digital communication concepts.

List of Experiments:

PART A: Analog Communications (AC)

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Pre-emphasis & de-emphasis.
5. Time Division Multiplexing & De multiplexing
6. AGC Characteristics
7. Radio Receiver

PART B: Digital Communications (DC)

1. Pulse Amplitude Modulation and Demodulation
2. Pulse Width Modulation & Demodulation
3. Pulse Position Modulation & Demodulation
4. PCM Generation and Detection
5. Frequency shift keying. Generation and Detection
6. Phase shift keying. Generation and Detection
7. DPSK: Generation and Detection

Course Outcomes:

At the end of the course, students will be able to

1. Perform analog modulation techniques like AM, DSB-SC & SSB-SC
2. Analyze the AGC Characteristics of Radio receiver.
3. Perform Pulse and Digital Modulation techniques

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	2	2	2	1	1	1	3	3	3	2
CO2	3	3	3	3	2	1	1	1		1		3	3	3	1
CO3	3	3	3	3	2	2	2	2	1	1	1	3	3	3	2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0414	PULSE AND LINEAR INTEGRATED CIRCUITS LAB	L	T	P
Credits: 1		-	-	2

CourseObjectives:

To design linear, non linear waves haping circuits, Multivibrators using BJT's. Implement various applications using IC 741 OP AMP and IC 555.

List of Experiments:

PART-A: PulseCircuits

1. Linear wave shaping
2. Non linear wave shaping - Clippers
3. Non linear wave shaping - Clampers
4. AstableMultivibrator
5. MonostableMultivibrator
6. BistableMultivibrator

PART-B:Linear IntegratedCircuits

1. Inverting amplifier and Non-inverting amplifier using IC 741 OP-AMP
2. Integrator and Differentiator Circuits using IC 741 OP-AMP
3. Voltage Comparator using IC 741 OP-AMP
4. Wien Bridge Oscillator using IC 741 Op-Amp
5. AstableMultivibrator using IC 555 Timer
6. MonostableMultivibrator using IC 555 Timer

Course Outcomes:

At the end of the course, students will be able to

1. Understand the design of Multistage amplifiers
2. Design and calculate the efficiency of power amplifiers
3. Understand the different Pulse Circuits
4. Design and Applications of Multivibrators.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	1	3	3	3				2		1	2	3	3	
CO2	3	2	3	3	3				2		1	2	3	3	
CO3	1	1	2	3	3				1			2	2	2	
CO4	3	2	3	3	3				2		1	2	3	3	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code:C0555	OBJECT ORIENTED PROGRAMMING LAB (Common for CE, EEE, ME, ECE, MiE)	L	T	P
Credits: 2		-	-	4

Prerequisites: NIL

Course Objectives:
This course will make students able to learn and understand the concepts and features of object oriented programming and the object oriented concept like inheritance and will know how to make use of interfaces and package, to acquire the knowledge in Java‟s exception handling mechanism, multithreading.

Software Requirements: Java

List of Programs:

1. Write a Java Program to implement

a) Default Constructor

b) Parameterized constructor

2. Write a Java Program to implement

a) Method overloading

b) Constructor overloading

3. Write a Java program to implement

a) Single Inheritance

b) Multilevel Inheritance

c) Hierarchical Inheritance

4. Write Java programs that uses the following keywords…

a) this

b) super

5. Write Java programs that uses the following keywords…

a) static
b) final

6. Write a Java program to implement

   a) Method overriding.

   b) Dynamic method dispatch.

7. Write a Java program to implement

   a) abstract method

   b) Interfaces

8. Write a Java program to create user defined packages.

9. Write a Java program to implement Exception Handling using

   a) try-catch clause

   b) Multiple Catch clauses

   c) Nested try blocks

10. Write a Java program that

a) create user defined Thread by extending Thread class.
b) create user defined Thread by implementing Runnable Interface
c) create two user defined Threads i.e. Multi Threading using Thread

11. Write a Java program

a) checks whether a given string is a palindrome or not.

b) for sorting a given list of names in ascending order.

c) that reads a line if integers and then displays each integer and the sum of all integers (use string tokenizer class of java.util).

12. Write a Java program that

   a) reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) reads a file and displays the file on the screen, with a line number before each line.

TEXT BOOKS:

1. Herbert Schildt, "**Java The complete reference**", TMH, 8th edition, 2011.
2. T. Budd, "**Understanding OOP with Java**", Pearson Education, updated edition, 1998.

REFERENCES:

1.P.J. Deitel and H.M. Deitel, "**Java for Programmers**", Pearson education.

2.P. Radha Krishna, "**Object Oriented Programming through Java**", Universities Press.

3.Bruce Eckel," **Programming in Java**", Pearson Education.

4.S. Malhotra and S. Choudhary," **Programming in Java**", Oxford Univ. Press.

Course Outcomes:

At the end of the course, students will be able to

1. Differentiate structured programming and object oriented programming and know the concepts of classes, objects, members of a class.
2. Apply object oriented programming features and concepts for solving given problems using inheritance and will know how to organize files in packages and concept of interface.
3. Capable of handling run time errors using Exceptional Handling and exploring strings.
4. Develop applications for concurrent processing using Thread Concept.
5. Capable of handling IO operations using Files.

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	ProgrammeOutcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1		2	3										3	2	
CO2			3		2								2	3	
CO3		2	2		2									2	
CO4			3		3									2	
CO5		2	2		3								2	2	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. IV Semester		
Code:C04P1	**REAL TIME PROJECT/FIELD BASED PROJECT**	**L**	**T**	**P**
Credits: 1		**-**	**-**	**2**

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. IV Semester		
Code:C00M1	**GENDER SENSITIZATION**	**L**	**T**	**P**
Credits: NIL	(Common for EEE, ECE, CSE and IT)	-	-	2

Course Objectives: To develop students' sensibility with regard to issues of gender in contemporary India. To provide a critical perspective on the socialization of men and women. To introduce students to information about some key biological aspects of genders. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence. To expose students to more egalitarian interactions between men and women.

MODULE I: Understanding Gender [6 Periods]

Gender: Why Should We Study It? *(Towards a World of Equals:* Unit -1) Socialization: Making Women, Making Men *(Towards a World of Equals:* Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First Lessons in Caste. Different Masculinities. Just Relationships: Being Together as Equals *(Towards* a *World of Equals:* Unit -*12) Mary* iKorn and Onler. Love and Acid just do not Mix. Love Letters. Mothers aniJ Fathers. Further Reading: Rosa Parks-The Brave Heart.

MODULE II: Gender and Biology [6 Periods]

Missing Women: Sex Selection and Its Consequences *(Towards a World of Equals:* Unit -4) Declining Sex Ratio. Demographic Consequences. Gender Spectrum: Beyond the Binary *(Towards* a *World of Equals:* Unit -10) Two or Many? Struggles with Discrimination. Additional Reading: Our Bodies, Our Health *(Towards a World of Equals:* Unit -13)

MODULE III: Gender and Labour [7 Periods]

A: Housework: The Invisible Labour *(Towards a World* of *Equals:* Unit -3) "My Mother doesn't Work." "Share the I.oad." Women's Work: Its Politics and Economics *(Towards a* **B:** *World of Equals:* Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

MODULE IV: Issues of Violence [7 Periods]

Sexual Harassment: Say Nol *(Towards a World of Equals:* Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: *"Chdpulum.*

Domestic Violence: Speaking Out *(Towards a World of Equals:* Unit -5)

Is Home a Safe Place? When Women Unite (Film" Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence *(Towards a World of Equals:* Unit -11) Blaming the Victim-1 Fought for my Life " - Further Reading: The Caste Face of Violence.

MODULE V: Gender Studies [6 Periods]

Knowledge: Through the Lens of Gender *(Towards a Work/ of Equals:* Unit -5)

Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana. Whose History? Questions for Historians and Others *(Towards a World of Equals:* Unit -9) Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Essential Reading: All the Units In the Textbook, *"Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Mina Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thant
Note: Since it Is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

Text Books: -

1. Towards a World of Equals: A bilingual Textbook on Gender , A Suneetha -etall

Reference Books: -

1. Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. We *Were Making History...' Life Stories of Women in the ToIrmgana People's Struggle.* New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studios Journal (14 November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by -the-numbers-where-Indan-womenworkP
3. K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada. http://harooreollins.co.in/BookDetailasp?Flook Cndet,3732
4. Vimata. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5. Shatrughna, Veena et al. Women's Work and its Impact on Child Health end Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana. 'We Were Making I listory ' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.

E-Resources:

1. http://www.actforyouth.net/resources/rf/rf_gender1_1213.cfm(UNDERSTANDING GENDER)
2. https://www.simplypsychology.org/gender-biology.html(GENDERAND BIOLOGY)
3. http://www.yourarticlelibrary.com/essay/essay-on-gender-issues-in-labour-market-in-india/40442/ (GENDER AND LABOUR)
4. http://journals.sagepub.com/doi/abs/10.1177/1077801200006007004(ISSUES OF VIOLENCE)
5. http://www.nordiclabourjournal.org/emner/likestilling (GENDER AND BIOLOGY)

Course Outcomes:

After completion of the course, students will be able to:

1. Develop a better understanding of important issues related to gender in contemporary India.
2. Sensitize about the basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research,facts, everyday life, literature and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Acquire insight into the gendered division of labour and its relation to politics and economics.
5. Develop a sense of appreciation of women in all walks of life.

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Programme Outcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1						3		3	3		3	3			
CO2						3		3	3		3	3			
CO3						3		3	3		3	3			
CO4						3		3	3		3	3			
CO5						3		3	3		3	3			

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. V Semester		
Code:C0H05	MANAGEMENT FUNDAMENTALS (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization.

MODULE I: Management and Principles of Management [9 Periods]

A. **Introduction to Management:** Concepts of Management and organization-nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management.

B. **Management Theories:** Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Corporate Social responsibility.

MODULE II: Planning, Organization and types of Structures [10 Periods]

A. **Planning:** Need for planning- -Steps in the process of Planning-Advantages and limitation of planning. Types of planning - Vision, Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Management by Objectives (MBO).

B. **Organization and types of Structures:** Basic concepts related to Organization – Departmentation and Decentralization, Types of Organizations- Line organization, Line and staff organization, functional organization, committee organization, matrix organization, Virtual Organization, Cellular Organization, boundary less organization, inverted pyramid structure, lean and flat Organization structure.

MODULE III: Staffing and Controlling [10Periods]

A. **Staffing:** Basic concepts of HRM, functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development. Performance Appraisal, Job Evaluation and Merit Rating.

B. **Controlling:** process of controlling, types of controlling, managing productivity, Quality Control: chart, R chart, C chart, P chart, (simple Problems), Deming's contribution to quality.

MODULE IV: Operations and Materials Management [9 Periods]

A. **Operations Management:** Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement.

B. **Materials Management:** Objectives, need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

MODULE V: Project Management and Contemporary Practices [10 Periods]

A. **Project Management (PERT/CPM):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

B. **Contemporary Management Practices:** Basic concepts of ERP, Just-In-Time (JIT) System, Total Quality Management (TQM), six sigma and Capability Maturity Model (CMM) Levels, Bench marking, Balanced Score card.

Text Books:

1. Aryasri, Management Science, 4th edition TMH, 2004.
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 6th Ed, 2004.

Reference Books:

1. Kotler Philip & Keller Kevin Lane, "Marketing Management", PHI, 12th edition, 2005
2. Koontz &Weihrich, "Essentials of Management", TMH, 6th edition, 2005.
3. Thomas N.Duening& John M. Ivancevich "Management - Principles and Guidelines", Biztantra, 5thedition 2003.
4. Memoria & S.V. Gauker, "Personnel Management", Himalaya, 25th edition, 2005
5. Samuel C. Certo, "Modern Management", PHI, 9th edition, 2005.

E-Resources:

1. http://freevideolectures.com/Course/2689/Management-Science
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=human-resource-management
3. http://www.onlinevideolecture.com/?course=mba-programs&subject=marketing-fundamental
4. http://freevideolectures.com/Course/2371/Project-and-Production-Management
5. http://nptel.ac.in/courses/110105034/

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Understand the various concepts, principles and theories of management.	Understand
CO2	Understand the basic concepts of planning and various structures of organizations.	Understand
CO3	Understand the process of staffing and controlling	Understand
CO4	Understand the process of operations management. Also learn the concepts of materials management and marketing management at an organization.	Understand
CO5	Understand the various contemporary management practices. Also the project management techniques.	Understand

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1						1	1	2	3	1	3				
CO2						1	1	2	2	1	3	1			
CO3						1	1	2	2	1	3	2			
CO4			2	1		1	1	2	1		3	2			
CO5			2			1	1	2	1	1	3	2			

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) -: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0415	EMBEDDED SYSTEMS	L	T	P
Credits: 3		3	-	-

Course Objectives:

- To present the characteristics, Quality Attributes and design lifecycle of Embedded Systems,
- To highlight the principles of processor technologies, IC technologies, general- purpose processors and Memory selection,
- To know the Embedded Programming methods.
- To Know about the Operating system basics, principles and its functionalities,
- To know about the task communication and the methods in choosing the Real time operating system.

Module –I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Module-II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS). **Memory:** ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Module – III

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages

Module – IV

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Module – V

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill

Reference Books:

1. Embedded Systems - Raj Kamal, MC GRAW HILL EDUCATION.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013 4. An Embedded Software Primer - David E. Simon, Pearson Education2017, 3rd edition, reprint, McGraw Hill Education, India.
4. Steve Heath, Embedded Systems Design, 2013, 3rd edition, EDN Series, United States.
5. Jane W. S. Liu, Real time systems, 2013, reprint, Pearson Education, UK

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

COs	Description	Blooms Taxonomy Level
CO1	Comprehend the applications, examples, characteristics, design challenges related to Embedded Systems.	Analyze
CO2	Understand general-purpose processing and its principles; select a microprocessor/Microcontroller for a particular application.	Apply
CO3	Understand the process of programming with the Embedded Systems.	Apply
CO4	Design and implement Real time operating system for embedded systems.	Apply
CO5	Develop real-time working prototypes and procedure to choose an Real time Operating System.	Understand

Co-Po Mapping:

CO	Program Outcomes												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**	**PS03**
CO1	3	2	-	-	-							-	3	-	-
CO2	3	-	-	3	-							2	-	-	3
CO3	3	2	3	3	3							-	-	3	-
CO4	2	-	-	-	3							-	2	2	-
CO5	2	3	3	2	3							3	-	3	-

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0416	CMOS VLSI DESIGN	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Analog Circuits, Switching Theory & Logic Design / Digital Logic Design

Course Objectives: The course aims to enable the students

- To visualize IC Fabrication steps and various IC technologies
- To understand electrical properties of MOS, CMOS and Bi CMOS circuits.
- To draw integrated circuit layouts following design rules.
- To understand Basic Circuit Concepts, Gate Level Design, Basic architectures of Data path subsystems, Application Specific Integrated Circuits, of CPLDs and FPGAs.

MODULE I: IC Fabrication and Technologies [8 Periods]

IC Fabrication: Steps in Fabrication-Oxidation, Lithography, Diffusion, Ion implantation, Encapsulation and Metallization.

IC Technologies – Review of Enhancement and Depletion MOS transistors, NMOS, PMOS & CMOS fabrications, Comparison of NMOS, CMOS & BiCMOS technologies.

MODULE II: Basic Electrical Parameters [10 Periods]

I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage (V_t), transconductance (g_m), output conductance(g_{ds}) & figure of merit(w_o),Pass transistor, NMOS Inverter, Determination of pull-up to pull-down ratios, various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters, Latch-up in CMOS circuits.

MODULE III: VLSI Circuit Design Processes [10 Periods]

A. VLSI Design Flow, MOS Layers, Stick Diagrams, Lambda based Design Rules and Layout, 2 µm CMOS Design rules for wires, Contacts and Transistors.

B. Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits- Scaling models, Scaling function for device parameters, Limitations of Scaling.

MODULE IV: Basic Circuit Concepts and Gate Level Design [10 Periods]

Basic Circuit Concepts: Sheet Resistance R_s and Gate Capacitance C_g, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

Gate Level Design: Logic Gates using CMOS and complex gates, Switch logic, Alternate gate circuits – Pseudo NMOS logic, Dynamic CMOS logic, Clocked CMOS logic(C^2MOS) and Cascaded Voltage Switch logic(CVSL).

MODULE V: Data Path Subsystems, ASIC's and PLD's [10 Periods]

Data Path Subsystems: Subsystem Design – Barrel Shifter, Carry Select and Carry look Ahead Adder, Serial-Parallel and Braun Array Multiplier.

Application Specific Integrated Circuits – Channel gate array, Channel less gate array and structured gate array.

Programmable Logic Devices - Architectures of CPLDs and FPGAs.

Text Books:

1. Kamran Eshraghian, Douglas A. Pucknell, "Essentials of VLSI circuits and systems", PHI, 1st Edition, 2005.
2. K. Lal Kishore, VSV. Prabhakar, "VLSI Design", I. K international Publishing House Private Ltd, 2009.

Reference Books:

1. Neil H. E Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design - A circuits and systems perspective", Pearson Education, 3rd Edition, 2009.

E-Resources:

1. https://www.ece.uic.edu/~dutt/courses/ece565/lect-notes.html
2. http://www.egr.msu.edu/classes/ece410/mason/files/Ch2.pdf
3. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=92
4. https://www.journals.elsevier.com/integration-the-vlsi-journal/
5. http://nptel.ac.in/courses/117106093/
6. http://nptel.ac.in/courses/117101058/

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Understand the Enhancement and Depletion mode transistors and describe the steps involved in IC fabrication.	Understand
CO2	Know the electrical properties of MOS Transistors and analyze the inverters in MOS transistors	Understand
CO3	Illustrate any circuit using stick diagrams and layouts for NMOS, CMOS and BiCMOS and draw different types of logic gates using CMOS inverter and their transfer characteristics	Apply
CO4	Describe Basic Circuit Concepts like resistance, capacitance and the effect of it, various Gate Level Designs.	Analyze
CO5	Design building blocks of data path using gates and Design simple memories using MOS transistors and the architectures of Application Specific Integrated Circuits, of CPLDs and FPGAs.	Analyze

CO-PO-PSO's mapping:

CO	Program Outcomes												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**	**PS03**
CO1	3	2	2	1	3							2	2	2	3
CO2	3	2	1	1	2							1	2	2	3
CO3	3	2	2	1	2							2	3	3	3
CO4	3	2	2	1	2							2	3	3	3
CO5	3	1	1	1	3							2	3	3	3

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) -: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech V Semester		
Code: C0417	ELECTRONIC MEASUREMENTS AND INSTRUMENTION *(Professional Elective-I)*	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Basic Electrical and Electronics Engineering

Course Objectives:

- This course introduces measurement techniques
- Different types of instruments and their operation like signal generators, wave analyzers, cathode ray oscilloscope
- Special purpose oscilloscopes, different types of transducers, DC & AC bridges.

MODULE I: Measurement Errors and Measuring Instruments [10 Periods]

Measurements and Errors: Block Schematics of Measuring Systems, Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Measuring Instruments: D' Arsonval Movement, DC Voltmeters, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Electronic Voltmeters, Digital Voltmeters: Ramp type, Staircase Ramp, Dual Slope Integrating type, Integrating type, Successive Approximation type.

MODULE II: Signal Generators and Analyzers [10 Periods]

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications.

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Logic Analyzer.

MODULE III: Oscilloscopes [10 Periods]

A. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

B. Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs. Recorders:Strip Chart, X-Y Oscillographic recorders

MODULE IV: DC and AC Bridges [8 Periods]

Wheat stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges, Resonance Bridge, The Owen Bridge, De'Sauty Bridge, Wagner's Earth (Ground) Connection, and Types of Detectors.

MODULE V: Transducers [10 Periods]

Definition, Classification, Principle of Analogue transducer: Resistive (Strain Gauge, POT, Thermistor and RTD), Capacitive, Piezoelectric, Thermocouple and Inductive (LVDT) and RVDT) transducer, Working principle of Digital Transducer and Optical transducer.Photo sensitive Transducer.Applications of transducers - Velocity, Force, Pressure Measurement.Data Acquisition Systems.

Text Books:

1. H. S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition 2004.
2. A.K. Sawhney, "Electrical and Electronic Measurements and Instrumentation".

Reference Books:

1. K. Lal Kishore, "Electronic Measurements and Instrumentation", Pearson Education, 2010.
2. David A. Bell, "Electronic Instrumentation and Measurements", Oxford Univ. Press, 1997.

E-Resources:

1. https://docs.google.com/file/d/0B21HoBq6u9TsMlFHYVpUbjJYdzQ/view
2. https://www.slideshare.net/saurabhmaheshwari944/seminar-ppt-on-transducer
3. https://rodzah.files.wordpress.com/2011/07/topic_4_dc_bridges.pdf
4. https://www.mepits.com/tutorial/303/Instrumentation/Sensors
5. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5289
6. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=19

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Outline the characteristics, errors in measurement systems and different types of basic measuring instruments.	Understand
CO2	Infer the types, specifications and applications of signal analyzers and generators	Understand
CO3	Interpret the internal blocks of CRO and operation ,applications of different CRO's.	Understand
CO4	Classify the different types of transducers and their applications	Understand
CO5	Identify the values of R,L,C components in bridge circuits.	Applying

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3		2	2							1	3		2
CO2	3	2	3	3	2							1	3		2
CO3	3	2	1	1								1	3	2	
CO4	3	1	2	1									3	2	
CO5	3	2	1									1	3	2	

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0418	COMPUTER ORGANIZATION AND OPERATING SYSTEMS *(Professional Elective-I)*	L	T	P
Credits: 3		3	-	-

Course Objectives: This course will make students

- To understand the basic structure and operation of digital computer,
- To study the micro programmed control, I/O organizations and serial communication of peripheral devices
- To study the overview of operating systems & memory management components,
- To demonstrate the knowledge of functions of management scheduling, file system and interfaces, security and deadlocks.

MODULE I **[10 Periods]**

Basic Structure of Computers: Computer Types, Functional UNIT, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

MODULE II **[09 Periods]**

Micro Programmed Control: Control Memory, Address Sequencing, Micro program Examples, Design of Control Unit, Hard Wired Control, The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories, Secondary Storage, Introduction to RAID - RAID 0 to RAID 6.

MODULE III **[10 Periods]**

A. **Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input –Output Processor (IOP)
B. **Serial Communication:** Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols - RS232, USB, IEEE1394.

MODULE IV **[10 Periods]**

Operating Systems Overview: Overview of Computer Operating System Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating System Structures, Operating System Services and Systems Calls, System Programs, Operating System Generation, Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory - Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing, Principles of Deadlock - System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Deadlock Recovery.

MODULE V **[9 Periods]**

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection. File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Text Books:

1. Carl Hamacher, ZvonksVranesic, SafeaZaky, "Computer Organization", McGraw Hill, 5th Edition
2. M.Moris Mano, "Computer Systems Architecture", Pearson Education,3rd Edition
3. Abraham Silberchatz,Peter B. Galvin, Greg Gagne, "Operating System Principles" 8th Edition, John Wiley.

Reference Books:

1. William Stallings, "Computer Organization and Architecture", Pearson Education,6th Edition
2. Andrew S. Tanenbaum, "Structured Computer Organization",PHI,4th Edition
3. SivaraamaDandamudi, "Fundamentals of Computer Organization and Design", Springer Int. Edition.
4. Stallings, "Operating Systems – Internals and Design Principles", Pearson Education,6th Edition 2009
5. Andrew S Tanenbaum, "Modern Operating Systems", Pearson/PHI, 2nd edition
6. B.L.Stuart, "Principles of Operating Systems", Cengage Learning, India Edition

E-Resources:

1. https://www.scribd.com/doc/129430301/Hamacher-Computer-Organization-5th-Ed
2. https://archive.org/details/2005OperatingSystemConcepts7thEditionAbrahamSilberschatz
3. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-Eh9eBOsT1ELoYpKlg_xngrkluevXOJL-s1TbxS8q2icgUs3hL4_KAi5So5FgXcVg
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7xAYUzYSlXl4znudlsolr-e7wQNrNXLxbgGFxbkoyx1iN3YbHuFrzI2jc_70rWMEwQ
5. http://nptel.ac.in/courses/106106092/
6. http://nptel.ac.in/courses/106108101/

Course Outcomes:

After the completion of the course the students will be able to

Cos	Description	Blooms Taxonomy Level
CO1	Develop the structure of digital computer Arithmetic operations of binary number system	Analyze
CO2	Classify the micro programmed control and memory operations	Apply
CO3	Design input & output organization serial communication	Analyze
CO4	Understand the operating systems overview and memory management techniques impact of instruction set architecture of computer design	Understand
CO5	Examine various file systems interfaces and implementation	Analyze

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO10	PO1 1	PO12	PS0 1	PS02	PS0 3
CO1	2	2	1	1									3	1	1
CO2	2	2	1	1								1	3	3	1
CO3	2	1	2	1								2	3	1	2
CO4	1	1	2	1	1							2	3	1	1
CO5	1	2	2	1	1							2	3	3	2

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) -: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0419	DATA COMMUNICATIONS AND COMPUTER NETWORKS *(Professional Elective-I)*	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil

Course Objectives: This course provides students

- To understand the fundamental concepts of computer networking and communications make use of IEEE standards in the construction of LAN,
- Build the skills of subnetting and supernetting,
- To explain the concepts of protocols of Transport Layer, QoS and Congestion control mechanisms and demonstrate different protocols of Application Layer.

MODULE I: Basics of Networking and Physical layer [10 Periods]

Basics of Networking - Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, TCP/IP model.

Physical layer - Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks**.**

MODULE II: Data link layer [11 Periods]

Functionalities of Data link layer - Introduction, Framing, Error Detection and Correction – Parity – LRC – CRC- Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. Random access, Controlled access, Channelization, Collision Free Protocols.

LAN - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11

MODULE III: Network Layer [09 Periods]

A. **Basics of Network Layer -** Logical Addressing, Internetworking, Tunneling, Address mapping,
B. **Communication Protocols -** ICMP, IGMP, Forwarding, Unicast Routing Protocols, Multicast Routing Protocols.

MODULE IV: Transport Layer [09 Periods]

Connection Oriented and Connectionless Protocols - Process to Process Delivery, UDP and TCP protocols, SCTP.

Congestion Control - Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks**.**

MODULE V: Application layer [09 Periods]

DNS - Domain name space, DNS in internet, Electronic mail

Protocols and Network Security - FTP, WWW, HTTP, SNMP, Network Security, Cryptography.

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 4thEdition, TMH, 2006.
2. Andrew S Tanenbaum, "Computer Networks", 4th Edition, Pearson Education/PHI.

Reference Books:

1. P.C.Gupta, "Data communications and computer Networks", PHI.
2. S.Keshav, "An Engineering Approach to Computer Networks", 2nd Edition, Pearson Education.
3. W.A. Shay, "Understanding communications and Networks", 3rd Edition, Cengage Learning.
4. James F.Kurose& Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Edition, Pearson Education.

E-Resources

1. https://www.saylor.org/site/wp-content/uploads/2012/02/Computer-Networking-Principles-Bonaventure-1-30-31-OTC1.pdf
2. http://ebook-dl.com/downloadbook/230
3. https://doi.org/10.1016/0169-7552(89)90019-6
4. http://nptel.ac.in/courses/106105081/

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Interpret the basic computer network terminology, functionalities of layers in ISO-OSI and TCP/IP reference model and different switching techniques in communication networks	Understand
CO2	Select various datalink layer design issues and compare MAC layer protocols	Apply
CO3	Compare and select suitable routing algorithm for a given computer network	Analyze
CO4	Analyze transport layer protocols for a given application and provide QoS	Analyze
CO5	Outline the application layer protocols and network security issues & techniques	Understand

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS0 1	PS0 2	PS0 3
CO1	3	2	2	1		2	3	3				1	3	2	1
CO2	3	3	3	2	1	2	3	3				2	3	3	2
CO3	3	3	3	2	1	2	3	3				2	3	3	2
CO4	3	2	2	1		2	3	3				2	3	3	2
CO5	3	1	1			2	3	3				2	3	3	2

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. V Semester		
Code: C0420	Advanced Programmable Logic Device Architectures	L	T	P
Credits: 3	*(Professional Elective-I)*	3	-	-

Pre-Requisites: Digital Electronics

Course Objectives:

- Students learn about the architecture and different technologies of programmable logic devices (FPGAs).
- Students develop and understanding of the available prefabricated IP blocks on modern FPGAs and learn how to use them in their designs.
- Students learn how to write hardware descriptions for combinational blocks and sequential units including state machines in Verilog.

UNIT I Programmable Logic Device [9 Periods]

Introduction, ROM, PLD, PLA, PAL, GAL– Features, CPLD- Commercially available CPLD - Altera series – Max 5000/7000 series - Cypres FLASH 370 Device Technology, Lattice LSI's Architectures – 3000 Series –Applications of CPLDs, Speed Performance and in system programmability.

UNIT II FPGA ARCHITECTURE [9 Periods]

FPGAs- Logic blocks, Routing architecture, programmable interconnect, Mapping for FPGAs, Xilinx FPGA Architecture: Xilinx XC3000, XC4000 – Altera Architecture: FLEX 8000, One hot encoding, Case studies: Xilinx Virtex II Pro.

UNIT III Finite State Machines [9 Periods]

Top down Approach to Design, State diagram, State Transition Table, State assignments for FPGAs, Case study Mealy & Moore Machines, Pipelining, FSM issues-Starring state, Power on Reset, State diagram optimization, fault Tolerance.

UNIT IV VHDL for Synthesis [9 Periods]

Introduction, data flow, behavioral, structural models, operators, process, concurrent statements, Sequential Statements, Loops, Modeling Delays, Sequential Circuits, FSM Coding, Library, Packages, Functions, Procedures, Test bench.

UNIT V Digital Front End Design Tools [9 Periods]

Digital Front End Design Tools for FPGAs & ASICs: Using Mentor Graphics EDA Tool ("FPGA Advantage") – Design Flow Using FPGAs – Guidelines and Case Studies of paraller adder, multiplexers, counters, CMOS design using Mentor graphics Tools.

Text Books:

1. P.K.Chan& S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall (Pte), 1994.
2. M. J. S. Smith, "Application Specific Integrated Circuits," Addition – Wesley Longman Inc., 1997.
3. VHDL Primer, J. Bhasker, American Telephone and Telegraph Company, Bell Laboratories Division, P T R Prentice Hall, Englewood Cliffs, New Jersey07632
4. Douglas L. Perry, VHDL: Programming by Example, McGraw-Hill Education, Fouth Edition.
5. S.Trimberger, Edr., Field Programmable Gate Array Technology, Kluwer, Academic Publications, 1994.

Reference Books

1. Jon F Wakerly, Digital Design: Principles and Practices, Prentice Hall.

2. Kevin Skahil, VHDL for programmable logic, Addison Wesley.
3. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995.
4. S.Brown, R.Francis, J.Rose, Z.Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.

COURSE OUTCOMES:

CO Nos.	Description	Bloom Taxonomy Level
CO1	Illustrate the features of Programmable Logic Devices, CPLD, performance and its applications.	Understanding
CO2	Summarize the various FPGA architectures, programmable interconnects and one hot encoding.	Understanding
CO3	Explain the VLSI system design experience using FSM.	Applying
CO4	Account for the syntax and behavior of the VHDL language	Understanding
CO5	Explain the Digital Front End Digital Design Tools for FPGAs & ASICs	Understanding

CO-PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	-	-	3	2	-
CO2	3	1	2	3	-	-	-	-	-	-	-	1	3	-
CO3	2	1	3	2	-	-	-	-	-	-	-	1	1	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	2	-
CO5	2	2	3	3	-	-	-	-	-	-	-	3	1	-

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0421	**Information Theory & Coding**	L	T	P
Credits: 3	*(Professional Elective –II)*	3	-	-

Pre-Requisites: Signal Theory and Stochastic Processes.

Course Objectives:

- To introduce the concept of information content of a message /source
- To differentiate between the information content available with the source and the information gained by the observer
- To differentiate between source coding and channel coding
- To introduce the principles of Error detection and Error correction

MODULEI: Information Theory and Source Coding [10Periods]

Introduction to Information Theory, Source Coding Theorem, Huffman Coding, Shannon-Fano-Elias Coding, Arithmetic Coding, The Lempel-Ziv Algorithm, Run Length Encoding, Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem.

MODULEII: Linear Block Codes for Error Correction [9 Periods]

Error Correcting Codes, Matrix Description of Linear Block, decoding of a Linear Block Code, Error Probability after Coding, Hamming Codes, Low Density Parity Check (LDPC) Codes, Maximum Distance Separable (MDS) Codes, Space Time Block Codes

MODULEIII: Cyclic Codes [9Periods]

Introduction to Cyclic Codes,A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Quasi-Cyclic Codes and Shortened Cyclic Codes, Burst Error Correction, Fire Codes, Golay Codes, Cyclic Redundancy Check (CRC) Codes.

MODULEIV: Bose–Chaudhuri Hocquenghem (BCH) Codes [10Periods]

Introduction to BCH Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials in Terms of Minimal Polynomials, Some Examples of BCH Codes, Decoding of BCH Codes, Reed-Solomon Codes, Implementation of Reed-Solomon Encoders and Decoders

MODULEV: Convolutional Codes [10Periods]

Introduction to Convolutional Codes, Tree Codes and Trellis Codes,Polynomial Description of Convolutional Codes, Matrix Description of Convolutional Codes, Viterbi Decoding of Convolutional Codes, Distance Bounds for Convolutional Codes, Turbo Codes, Turbo Decoding.

TextBooks:

1. Ranjan Bose, “Information Theory, Coding and Cryptography”, Tata McGraw-Hill, Second Edition, 2002.
2. P. S. Satyanarayana, “Concepts of Information Theory and Coding”, Dynaram Publication, 2005.

ReferenceBooks:

1. Richard B. Wells, “Applied Coding and Information Theory for Engineers”, Pearson Education, LPE, First Indian Reprint, 2004.
2. Richard E. Blahut, “Algebraic Codes for Data Transmission”, Cambridge University Press, 2003.
3. Shu Lin and Daniel J.Costello, “Error Control Coding – Fundamentals and Applications”, Second Edition, 2004.
4. Thomas M Cover and Joy A Thomas, “Elements of Information Theory” MGH 2006.

E-Resources:

1. https://www.edx.org/course/information theory

CourseOutcomes:

At the end ofthecourse,studentswillbeable to:

1. Learn measurement of information and errors.
2. Obtain knowledge in designing various source codes and channel codes
3. Design encoders and decoders for block and cyclic codes
4. Understand the significance of codes in various applications

CO-PO,PSOMapping (3/2/1indicatesstrengthofcorrelation)3-Strong, 2-Medium,1-Weak															
COS	**ProgrammeOutcomes(POs)**												**PSOs**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	3	3								3	1		1
CO2	3	3	3	3								3	1		1
CO3	3	3	3	3								3	1		1
CO4	3	3	3	3								3	1		1
CO5	3	3	3	3								3	1		1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0422	EMBEDDED SYSTEMS LAB	L	T	P
Credits: 1.5				3

Course Objectives: To introduce programming skills Embedded Systems and Real Time Operating Systems

List of Experiments

1. MCU-DAC interfacing and generation of ramp wave
2. Interfacing of ADC and data transfer by software polling, study of aliasing
3. ADC triggering through timer(On Chip Timer)
4. Interrupt driven data transfer from ADC
5. LCD - MCU interfacing and displaying a string
6. Keyboard-MCU interfacing take a input from keypad and display on LCD
7. Interface a LED matrix and display a number on the matrix.
8. Serial Communication between micro controller and PC.
9. Interfacing 4x4 switch matrix with the microcontroller
10. Temperature control using microcontroller
11. RTOS Based Parameter Monitoring and Controlling System.
    a. Collecting the data from sensor interfaced with microcontroller.
    b. Interfacing display devices/actuators with microcontroller.
    c. Inter task/process communication between task/process.
12. RTOS Based Data transfer between microcontrollers using Communication Protocol.
    a. Creating tasks for interfacing sensors with microcontroller.
    b. Creating tasks for interfacing display unit/actuators with microcontroller. (can be implemented by I2C protocol
    c. CAN Bus communication between controllers

COs	Outcomes	Blooms Taxonomy Level
CO1	Understand and the fundamentals of Embedded C	Understand
CO2	Apply the programming knowledge for interfacing	Apply
CO3	Develop the programs for Serial Communication	Apply
CO4	Develop the programs for Real Time Operating systems	Apply

CO-PO,PSO mapping

2: Moderate (Medium) **3**: Substantial (High) **-**: None

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	1	1									1	3		
CO2	3	2	1	1	2							1	3	2	2
CO3	3	2	2	2	2							2	3	2	2
CO4	3	1	1										3		

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0423	VLSI DESIGN LAB	L	T	P
Credits: 1.5		-	-	3

Course Objectives : To get programming knowledge on Verilog /VHDL programming of different digital circuits and CMOS circuits, Design of Digital Circuits using CADANCE, SYNOPSIS, mentor graphics or any equivalent software.

List of Experiments:

1. Design of Sequence Detector using Melay Machines on FPGA Board Using Verilog HDL.
2. Design and Implementation of SIPO shift registers on FPGA Board Using Verilog HDL.
3. Design of Sequence Detector using Moore Machines on FPGA Board Using Verilog HDL.
4. Design of Barrel shifter.
5. Design of Carry select adder using Verilog HDL.
6. Design of Serial Multiplier
7. Design of Booth Multiplier
8. Schematic and Layout of CMOS Inverter.
9. Schematic and Layout of CMOS NOR Gates.
10. Schematic and Layout of CMOS NAND Gates.
11. Schematic of CMOS 1-bit Full Adder.

Software required

1. Verilog/VHDL or any equivalent software
2. Mentor Graphics, CADENCE, SYNOPSIS or any equivalent software.

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Write Verilog programs for Combinational and sequential logics.	Apply
CO2	Perform simulation, synthesis and implementation of various digital logics Circuits	Analyze
CO3	Write Verilog Codes and implement various logic circuits on FPGA boards	Apply
CO4	Design Schematic for logic circuits and perform physical verification	Apply
CO5	Design layouts for logic circuits and perform physical verification.	Apply

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	1			3			2	3	2		1	3	2	1
CO2	3	1			3			2	3	2		1	3	2	1
CO3	3	1			3			2	3	2		1	3	3	1
CO4	3	1			3			2	3	2		1	3	3	1
CO5	3	1			3			2	3	2		1	3	3	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C0556	Fundamentals of Database Management Systems Lab (Common for CE, EEE, ME, ECE, MiE)	L	T	P
Credits: 2		-	1	2

Prerequisites: Database Management Systems

Course Objectives: This course enables the students to practice the concepts learnt in the subject DBMS by developing a database for an example project. The student is expected to practice the querying a relational database i.e., "Mysql" with various functionalities of SQL and PL/SQL statements using a sample database.

Sample Database: Railway Reservation System -(Redesigning IRCTC database)

Train (train Number, name, source, destination, start_time, reach_time, traveltime, distance, class, days, type)

Ticket (PNRNo, Transactionid, from_station, To_station, date_of_journey, class date_of_booking, total_ticket_fare, train number)

Passenger (PNR No, Serial no, Name, Age, Reservation_status)

Train_Route(Train No, route no, station_code, name, arrival_time, depart_time, distance, day)

Train_Ticket_fare(Train No, class, base_fare, reservation_charge, superfast_charge, other_charge, tatkal_charge, service_tax)

List of experiments:

1	SQL Data Definition Language Commands: Create all the tables specified above. Make underlined columns as primary key. (use number, number(m,n), varchar(n), date, time, timestamp data types appropriately) Insert at least 5 rows to each table. (Check www.irctc.co.in website for actual data)
2	SQL Data Manipulation Language Commands: 1. Change the name of the Passenger table to Passenger_Details. 2. List all train details. 3. List all passenger details. 4. Give a list of trains in ascending order of number. 5. List the senior citizen passengers details. 6. List the station names where code starts with 'M'. 7. List the trains details within a range of numbers. 8. Change the super fast charge value in train fare as zero, if it is null. 9. List the passenger names whose tickets are not confirmed. 10. Remove all the rows from Passenger table permanently.
3	Create (Alter table to add constraint) the necessary foreign keys by identifying the relationships in the table. 1) Add a suitable constraint to train table to always have train no in the range 10001 to 99999. 2) Add a suitable constraint for the column of station name, so that does not take duplicates. 3) Change the data type of arrival time, depart time (date -> timestamp or timestamp to date), and do the necessary process for updating the table with new values. 4) Add a suitable constraint for the class column that it should take values only as 1A, 2A, 3A, SL, C. 5) Add a not null constraint for the column distance in train_route.
4	Designing Employee Database with MySQL (Create and insert data in EMP table, DEPT table and SALGRADE table)
5	Multi row functions, GROUP By clause, HAVING clause, ORDER BY clause in SQL on sample database.

6	Use Join Query 1. Find the train names that stop in 'Katpadi'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name (and train name) who have booked for the train that starts from 'Chennai'. 4. Display the trains names, each type of class and the total fare for each type of class. 5. Display all the train details and the ticket details (if booked any).
7	Use Nested Query(in Operators) 1. Find the train names that stop in 'Warangal'. 2. Find the train names that are superfast and the service tax is zero. 3. Find the Passenger name who has booked for the train that starts from 'Secunderabad'. 4. Find the trains names that have all the AC coaches and the base fare is less than 3000 for each case.
8	Create sample Views and practice basic operation
9	Write a PL/SQL procedures to practice Conditional Statements
10	Write a PL/SQL procedures to practice Iterative Statements
11	Implementing simple trigger
12	Implementing simple cursor

Equipment required for laboratory

i. Computers
ii. Mysql software

Course Outcomes: After successful completion of this course, student will be able to

COs	Description	Blooms Taxonomy Level
CO 1	Understand the components of DBMS & design database using ER model	Understand
CO 2	Construct database using SQL and extract data from database using Relational algebra & SQL queries	Create
CO 3	Apply the normalization process for effective database design	Apply
CO 4	Analyze components of transaction processing, recovery strategies of DBMS	Analyze
CO 5	Examine different Concurrency control Mechanisms of DBMS	Evaluate

CO- PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	3	2	-	-	-	-	-	3	3		3	2
CO2	3	3	-	2	3	-	-	-	-	-	3	3	2	3	2
CO3	3	2		2	3	-	-	-	-	-	3	3	2	3	2
CO4	2	1	2	2	3	-	-	-	-	-	3	3	1	3	2
CO5	2	1	2	2	3	-	-	-	-	-	3	3	1	3	2

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C00M3	Quantitative Aptitude and Verbal Reasoning-I	L	T	P
Credits: 0		1	1	-

Course objectives:

The Quantitative Aptitude course is designed to equip students with essential mathematical and analytical skills required for various competitive exams, academic pursuits, and real-world problem-solving scenarios. The primary objective of this course is to enhance participants' numerical ability and logical reasoning, enabling them to tackle quantitative questions with confidence and efficiency.

MODULE – I **[8 Periods]**

Quants: Percentages, Profit and Loss. Percentages- Percentage Increase/Decrease; Results on Population; Results on Depreciation. Profit & Loss- Cost Price; Selling Price: Profit or Gain; Gain Percentage; Loss Percentage.

Verbal: **Sentence Completion:** Sentence Completion- Formats of Question; Strategies to solve sentence completion questionsProactive and reactive solving, Identifying clues- Signposts, Types of signposts, Root words, Sentence structure clues.

Logical: Blood Relation Blood Relations- Classification of blood relations, Pointing a person, Equation related problems.

MODULE - II **[6 Periods]**

Quants: Interests Interests- Types of interest; Simple interest; principle; Rate of interest; compound interest; interest is compounded Annually; interest is compounded Half-yearly; interest is compounded Quarterly; Rates are different for different years, say R1%, R2%, R3% for 1st, 2nd and 3rd year respectively; Present worth of Rs. x due n years.

Verbal: Articles, Interrogatives Articles- Types of articles, Countable nouns, Uncountable nouns, Usage of articles, Omission of articles. Interrogatives- Definition, Types of Interrogatives, Question Tags.

Logical: Clocks : Clocks: Introduction, Derivation of angles, Angles between hands of the clock, Hands together, Hands at angular distance, Gain & Loss problems.

MODULE – III **[6 Periods]**

Quants: Ratio and Proportion, Averages : Ratios & Proportion- The ratio of two quantities a and b in the same units; Proportion; The equality of two ratios is called proportion; Fourth Proportional; Mean Proportional; Comparison of Ratios; Duplicate Ratios; Variations. Averages- Average Speed, Weighted average.

Verbal: Idioms and Miscellaneous Vocabulary Idioms- Idioms and phrasal verbs, Word Analogy, Patterns of questions on Word Analogy; Miscellaneous Vocabulary**.**

Logical: Coding and Decoding Coding and Decoding- Number Series, Alphabet Series, Analogy, Odd Man Out, Visual Reasoning.

MODULE - IV **[6 Periods]**

Quants: Time and Work; Time & Work- Work from Days: Calculate the one-day work; Days from Work: Shortcut to calculate the work in given time.

Verbal: Voices and Speech Voices- Introduction- Sentence, Parts of a sentence, Voice of a sentence, Types of voices, Identifying the voice of a sentence, Changing the voice of a sentence. Speech- Direct & Indirect, Identifying the speech, Change of Speech.

Logical: Directions Directions - Introduction, Direction based questions, Shadow based problems.

MODULE - V **[6 Periods]**

Quants: Mixtures and Alligations

Alligation- Mean Price; Rule of Alligation; a container contains x of liquid from which y units are taken out and replaced by water;

Verbal: Reading Comprehension Reading Comprehension- Speed reading strategies; Reading Comprehension - types of questions, tackling strategies.

Logical: Cubes Cubes- Cube & cuboid concepts, 3-2-1-0 faced problems.

Text Books:

1. "Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal
2. "How to Prepare for Quantitative Aptitude for the CAT" by Arun Sharma
3. "Fast Track Objective Arithmetic" by Rajesh Verma

Reference Books:

1. "Magical Book on Quicker Maths" by M. Tyra
2. "Quantitative Aptitude Quantum CAT" by Sarvesh K. Verma

e-Resources:

Concerned Website links:

1. Khan Academy (https://www.khanacademy.org/):
2. MathIsFun (https://www.mathsisfun.com/) 3. GMAT Club (https://gmatclub.com/)
4. IndiaBIX (https://www.indiabix.com/)
5. Studytonight (https://www.studytonight.com/)

Course Outcomes:

After completion of the course students will be able to:

1. Develop Strong Mathematical Foundations: Gain a comprehensive understanding of fundamental mathematical concepts, including arithmetic, algebra, geometry, and data interpretation, providing a solid basis for tackling quantitative problems.
2. Enhance Problem-Solving Skills: Learn diverse problem-solving techniques and strategies to approach quantitative questions in a systematic manner, enabling efficient and accurate solutions.
3. Improve Speed and Accuracy on Averages: Practice through a variety of exercises and timed quizzes to enhance computational speed and precision, vital for competitive exams and time-sensitive tasks.
4. Master Time and work: Acquire skills in interpreting data from time and work scenarios decisions based on the given information.
5. Build Allegation and mixtures: Strengthen logical reasoning abilities to analyze and deduce patterns, aiding in solving complex quantitative problems.

CO-PO MAPPING

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs)**												**PSOs**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2							2					
CO2	1	2	2							2					
CO3	1	2	2							2					
CO4	1	2	2							2					
CO5	1	2	2							2					

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. V Semester		
Code: C00M6	INTELLECTUAL PROPERTY RIGHTS	L	T	P
Credits: 0		1	1	-

MODULE– I Introduction to Intellectual property:
Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

MODULE – II Trade Marks
Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

MODULE – III Law of copy rights:
Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

MODULE – IV Trade Secrets: Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, protection for submission, trade secretes litigation. Unfair competition: Misappropriation right of publicity, false advertising.

MODULE – V New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES: 1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning. 2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0424	DIGITAL SIGNAL PROCESSING	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Signals & Systems.

Course Objectives: This course introduces the processing of Discrete time signals using various transforming techniques and structures of IIR and FIR filters and also the concept of Multi-rate Digital signal Processing.

MODULE I: Discrete Time Signals, Systems and DTFT [12 Periods]

Discrete Time Signals, Systems: Discrete time signals & discrete time systems, time response & frequency response analysis of Discrete Time Linear time invariant Systems, Discrete time systems described by difference equations. Convolution of Discrete Time sequences.

Discrete Time Fourier Transform: Introduction to DTFT and Properties of DTFT

MODULE II: Transforms [8 Periods]

Discrete Fourier Transform (DFT): Definition and Properties of Discrete Fourier Transform, Inverse DFT, Linear Convolution of sequences using DFT/IDFT and Circular Convolution, Problems on DFT.

Fast Fourier Transforms (FFT): Definition, Radix-2 Decimation in Time (DIT) and Decimation in Frequency (DIF) FFT Algorithms and Inverse FFT, Problems on FFT.

MODULE III: IIR Digital Filters [10 Periods]

A. Analog Filter Approximation: Analog filter design, Butterworth and Chebyshev Approximation techniques

B. IIR Digital filter Techniques: Impulse Invariant and Bilinear Transformation Methods, Design of IIR Digital filters from Analog filters and Spectral Transformations, Realization of IIR filters.

MODULE IV: FIR Digital Filters [10 Periods]

Characteristics of FIR Digital Filters, Frequency Response, Design of Linear phase FIR Digital Filters using Fourier series and Window Techniques- Rectangular, Triangular, Blackman, Hamming and Hanning Windows, Comparison of IIR & FIR filters.

MODULE V: Multirate DSP and DSP Processors [8 Periods]

Multirate Digital Signal Processing: Definition and Applications of Multirate DSP, Decimation, Interpolation, Sampling rate conversion by a rational Factor I/D, Multi Stage Implementation of Sampling rate Conversion

DSP Processors: Introduction, Special Features of Digital Signal Processors, Architecture and features of TMS320C54XX processor.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", Pearson Education / PHI, 4th Edition, 2007.
2. A.Nagoorkani, "Digital signal processing", Tata McGraw Hill, 2nd Edition, 2012.
3. Avtar Singh and S. Srinivasan, Digital Signal Processing Implementations Using DSP Microprocessors – with Examples from TMS320C54xx, CENGAGE Learning, India, 1st Edition, 2008.

Reference Books:

1. Shalivahana, VallavaRaju, GnanaPriya, "Digital Signal Processing", TATA McGraw Hill, 2nd Edition, 2010.
2. Alan V. Oppenheim, Ronald W. Schafer, "Digital Signal Processing", PHI Education, 2006.

E-Resources:

1. https://archive.org/details/DIGITALSIGNALPROCESSING.
2. http://freevideolectures.com/Course/2339/Digital-Signal-Processing-IITKharagpur
3. https://www.youtube.com/watch?v=6dFnpz_AEyA
4. http://nptel.ac.in/courses/117102060/

Course Outcomes:

After the completion of the course the students will be able to

COs	Outcomes	Blooms Taxanomy Level
CO1	Analyze the linear discrete time systems in time domain and frequency domain using difference equations.	Analyze
CO2	Exploit the properties of discrete Fourier transforms and implement DFT using fast Fourier transform	Apply
CO3	Design and realize Infinite Impulse Response Filters	Apply
CO4	Design and realize Finite Impulse Response Filters	Apply
CO5	Discuss the Architecture of TMS320CXX Processor and multirate signal processing operations	Understand

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	2	1	1	1	1								3	3	1
CO2	2	2	2	2	2							2	3	3	1
CO3	3	2	2	2	3							2	3	3	2
CO4	3	2	2	2	3							2	3	3	2
CO5	3	2	2	2	3							2	3	3	3

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. IV Semester		
Code: C0425	CONTROL SYSTEMS	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Nil.

Course Objectives: This course introduces different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response. It also emphasis on analysis of system performance in time and frequency domain and techniques for improving the performance.

MODULE I: Introduction [10 Periods]

Concepts of Control Systems - Open Loop and closed loop control systems and their differences - Different examples of control systems - Classification of control systems, Feedback Characteristics, Effects of feedback, Mathematical models – Differential equations, Impulse Response and transfer functions.

Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula. Synchros, AC & DC servo motors and stepper motor.

MODULE II: Time Response Analysis [9 Periods]

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

MODULE III: Stability Analysis in S-Domain [9 Periods]

A: The concept of stability – Routh's stability criterion – Qualitative stability and conditional stability – Limitations of Routh's stability.

B: Root Locus Technique: The root locus concept - Construction of root loci - Effects of adding poles and zeros to G(s) H(s) on the root loci.

MODULE IV: Frequency Response Analysis [10 Periods]

Introduction, Frequency domain specifications - Bode diagrams - Determination of frequency domain specifications and Phase margin and Gain margin - Stability analysis from Bode Plots - Polar Plots - Nyquist Plots.

Compensation Techniques: Lag, Lead and Lead -Lag Controllers design in frequency Domain**.**

MODULE V: State Space Analysis of Continuous Systems [10 Periods]

Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization - Solving the Time invariant state equations - State Transition Matrix and it's Properties – Concepts of Controllability and observability.

Text Books:

1. I.J.Nagrath and M.Gopal, "Control Systems Engineering", New Age International Publishers, 5th Edition, 2007.
2. Benjamin.C. Kuo, "Automatic Control Systems", Prentice Hall of India, 7th Edition, 1995.

Reference Books:

1. A.Nagoor kani, "Control Systems", RBA Publications, 2nd Edition, 2006.
2. M.Gopal, "Control System: Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Joseph J Distefano, "Schaum's Outline Series of Feedback and Control Systems", Tata McGraw Hill, 2nd Edition, 2014.
4. K. Ogata, "Modern Control Engineering", Pearson Education, New Delhi, 5th Edition, 2010.
5. M. Gopal, "Control Systems, Principles & Design", Tata McGraw Hill, 4th Edition, 2012.

E-Resources:

1. https://www.electrical4u.com/control-engineering-historical-review-and-types-of-control-engineering/
2. http://ieeecss.org/CSM/library/2011.html
3. http://nptel.ac.in/courses/108101037/

Course Outcomes with BLOOM's Taxonomy

CO	Course Outcomes	Bloom's Taxonomy Level
CO1	Apply transfer function models to analyze physical systems.	Apply
CO2	Determine the transient and steady state behavior of systems subjected to standard test signals.	Understand
CO3	Analyze the linear systems for absolute and relative stability in time and frequency domain.	Analyze
CO4	Analyze the stability of the linear system in frequency domain and design compensators.	Analyze
CO5	Familiarize with state space analysis and system properties like Controllability and Observability.	Understand

Mapping COs with POs and PSOs

CO	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3			3						3	3		3
CO2	3	3	2			1						3	2		2
CO3	3	3	3									3	3		3
CO4	3	3	3	3							3	1	3	3	1
CO5	3	3	1								2	3	3		2

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High)

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech VI Semester		
Code: C0426	ANTENNAS & WAVE PROPAGATION	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Electromagnetic wave theory

Course Objectives: This course introduces

- Basic concepts of Antennas, its radiation mechanism and its fields
- VHF, UHF and Microwave Antennas with the design structures and operation
- Procedure to measure various Antenna parameters
- Different EM wave propagation techniques in free space.

MODULE I: Antenna Basics [8 Periods]

Introduction: Antenna Radiation Mechanism, Radiation Field Zones, Antenna Theorems, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity - Gain-Resolution, Antenna Aperture Area, Effective Height. Front-to-back Ratio, Antenna Impedance, Antenna Efficiency, FriisTransmission formula, Illustrative Problems.

MODULE II: Thin Linear Wire Antennas [14 Periods]

Maxwell's equations, Retarded Potentials – Helmholtz Theorem. Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height.

Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre - fed Antennas of Different Lengths. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment) - Illustrative Problems.

MODULE III: Antenna Arrays and Non resonant Radiators [14 Periods]

A: Antenna Arrays: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources –Uniform and Non Uniform Excitations, Uniform Linear Arrays – BroadsideArrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, Principle of Pattern Multiplication, Binomial Arrays, Illustrative Problems.

B: VHF & UHF Antennas: Yagi - Uda Array, Folded Dipoles, and their Characteristics, V-antennas, Helical Antennas - Helical Geometry, Helix Modes, Practical Design Considerations for Mono filar, Illustrative Problems.

MODULE IV: Microwave Antennas [14 Periods]

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics.

Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, PatternCharacteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

Horn Antennas: Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

Antenna Measurements: Introduction, Types of Measurement - Near and Far Fields, Sources of Errors, Pattern Measurement, Directivity Measurement, Gain Measurement (by Comparison, Absolute and 3 - Antenna Methods).

MODULE V: Wave Propagation [14 Periods]

Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.
Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

Text Books:

1. J. D. Kraus, R. J. Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation",TMH, New Delhi, (Special Indian Edition), 4th Edition, 2010.

Reference Books:

1. C. A. Balanis, John Wiley & Sons, "Antenna Theory", 3rd Edition, 2005.
2. John D. Kraus, "Antennas", McGraw-Hill (International Edition), 2nd Edition, 1988.
3. E. C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems",PHI, 2nd Edition, 2000.

E-Resources:

1. http://www.radio-electronics.com/info/antennas/
2. https://www.tutorialspoint.com/antenna_theory/
3. http://www.bookrix.com/_ebook-prabhakar-sharma-antenna-and-wave-propagation/
4. http://www.creativeworld9.com/2011/02/learn-antennas-and-wave-propagation.html
5. http://nptel.ac.in/courses/117101056/48
6. http://nptel.ac.in/courses/117107035/

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

COs	Description	Blooms Taxonomy Level
CO1	Understand the basic antenna terminology and significance of different parameters in antenna design.	Understanding
CO2	Analyze the working of wire antennas such as half wave, quarter wave and loop antennas.	Analyzing
CO3	Analyze the types of antenna arrays and quantitative analysis of their radiated electric field.	Analyzing
CO4	Analyze the characteristics, features and applications of various microwave antennas.	Analyzing
CO5	Outline the factors and their effects involved in the propagation of radio waves.	Understanding

CO- PO, PSO Mapping:

(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3			3	2								3		
CO2	3			1	2								2	3	
CO3	3	2	2	2	2								3	3	1
CO4	3	2	2	2	2		1						3	3	1
CO5	3	2	2	2	2	2							2		1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech VI Semester		
Code: C0427	WIRELESS AND MOBILE COMMUNICATION *(Professional Elective -II)*	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Analog & Digital Communications, Cellular and mobile communication.

Course Objectives: This course provides

- UnderstandingtheBasicsofcurrentandfuturegenerationWirelesscommunication systems.
- Describesthevariousmultiplexingtechniquesusedinwirelesscommunication systems.
- Study of fundamentals of multi antenna architecture in advanced communication systems.
- Providingabasicunderstandingofthekeytechnologiesof5Gand beyond 5G communication systems.
- Discussthechallengesof5Gsystemsandsystemimplementationusingmachine learning techniques.

MODULEI:Evolution of Wireless Communication [9 Periods]

Overview of wireless communication, cellular communication, goals, and vision of the current(3G,4G)andnextgenerationwirelesscommunicationsystems(5G,6G),Radio wave propagation: Flat fading and Frequency selective fading, Performance metrics.

MODULE II: Multiplexing Techniques [10 Periods]

Orthogonal frequency division multiplexing (OFDM), FFT/IFFT processing in OFDM, Cyclic Prefix in OFDM, Single Carrier Frequency Division Multiple Access (SCFDMA), Non Orthogonal Multiple Access (NOMA), Resource allocation.

MODULEIII:**Multiple Antenna Techniques [10 Periods]**

The crowded spectrum, need for high data rate, Multiple input multiple output (MIMO) systems – Array Gain, Diversity Gain,Spatial multiplexing, Beamforming, Space Time Block Codes (STBC), diversity- multiplexing trade-off, Massive MIMO.

MODULE IV:Future Generation Challenges and Applications [10 Periods]

Cognitive radio, Spectrum sensing, Spectrum sharing ,mm Wave Communication, Relay Communication, Channel estimation: SISO, MISO, MIMO.

MODULEV: Fundamentals of 5G Architecture [10 Periods]

Differencebetween4Gand5G,5GArchitecture,Planningof5GNetwork,QualityofService, Radio Network, Requirements, Security, SIM in 5G Era, Specifications, Standardization, Terminal States, Machine Learning in 5G, Future Generations (where is the6G?).

Text Books:

1. R.VannithambyandS.Talwar,Towards5G:Applications,Requirementsand CandidateTechnologies.JohnWilley&Sons,WestSussex,2017.
2. Manish,M.,Devendra,G.,Pattanayak,P.,Ha,N.,5GandBeyondWirelessSystems PHY Layer Perspective,

Springer Series in WirelessTechnology.
3.Aditya K Jagannathm, “Principles of Modern Wireless Communications”, McGrawHill, 2017.

Reference Text Books:

1. T.S.Rappaport,R.W.HeathJr.,R.C.Daniels,andJ.M.Murdock,MillimeterWave Wireless Communication., Pearson Education,2015.
2. M.Vaezi,Z.Ding,andH.V.Poor,MultipleAccesstechniquesfor5GWireless Networks and Beyond., Springer Nature, Switzerland,2019.

E-Resources:

1. https://www.digimat.in/nptel/courses/video/108105134/L01.html
2. https://www.youtube.com/watch?v=U6WMPXwCKHs
3. https://www.youtube.com/watch?v=E0pVWF1mJOM

Course Outcomes: At the end of the course, students will be able to

COs	**Description**	Blooms Taxonomy level
CO1	Distinguishandunderstandthemajorcellularcommunicationstandards (3G/4G/5G/6Gsystems).	Understand
CO2	Characterizeandanalyzevariousmodulationandmultiplexing techniques e.g. OFDMA, NOMAetc.	Understand
CO3	Understanding of multiple antenna trans receiver systems and its inherent challenges.	Analyze
CO4	Understanding of advanced communication technologies for design of future generation systems.	Analyze
CO5	Explore the future generation 5G techniques e.g. Radio Network, Requirements, Security etc.	Apply

CO-PO Mapping:

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COS	**Program Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	1	1									3	1	1
CO2	3	2	1	2	2		1					1	3	1	1
CO3	3	2	2	3	3		1	1					3	2	3
CO4	3	3	2	3	3		1	1		2	1	1	3	2	3
CO5	3	3	2	3	3		1	1		3	1	1	3	2	3

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech VI Semester		
Code: C0428	FUNDAMENTALS OF MACHINE LEARNING *(Professional Elective -II)*	L	T	P
Credits: 3		3	-	-

Pre-Requisites: Probability Theory and Stochastic Processes, Engineering Mathematics

Course Objectives: This course covers a wide variety of topics in machine learning. The primary goal is for students to gain a deep understanding of the concepts, techniques, and mathematical frameworks used by experts in machine learning.

MODULE I: Introduction to Machine Learning [9 Periods]

Introduction to Artificial Intelligence and Machine Learning, Machine Learning Techniques, Examples of ML Applications, Learning associations - Apriori Algorithm, Data Preprocessing.

MODULE II: Supervised Learning [10 Periods]

Regression: Linear Regression, Logistic Regression, Regularization, SVM, Maximum Marginal classifier, kernels, Introduction to a decision tree, random forests, and Boosting.

Classification: Naïve Bayes, Evaluating a Classification model- Cross-Entropy Loss, Confusion Matrix, Classification errors.

MODULE III: Unsupervised learning [10 Periods]

A: Introduction to-Clustering, K-means, Expectation Maximization-EM, Hierarchical Clustering, other forms of clustering.

B: Mixture of Gaussians-Factor analysis- PCA (Principal components analysis)-ICA (Independent components analysis)

MODULE IV:Semi-Supervised learning [10 Periods]

Types of SSL (introduction only), Generative Model- Generative Model for Text, Low Density Separation-Transductive SVM, Self-training, Co-training, Graph-Based Methods, Large Scale Algorithms, Risks of semi-supervised learning.

MODULE V: Reinforcement Learning and Control [10Periods]

MDPs, Bellman equations- Value iteration and policy iteration- Linear quadratic regulation (LQR) LQG- Q-learning- Value function approximation. Current problems in machine learning.

Text Books:

1. EthemAlpaydin, "Introduction to Machine Learning", 3rd Edition, MIT Press,2014.
2. Chapelle, Olivier, Bernhard, Zien Alexander "Semi-supervised learning" Cambridge, MIT Press 2006.

Reference Books:

1. MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003.
2. Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc17_cs26/
2. https://www.springer.com/computer/ai/journal/10994.
3. https://mitpress.mit.edu/books/fundamentals-machine-learning-predictive-data-analytics.
4. https://www.javatpoint.com/machine-learning.

Course Outcomes: At the end of the course, students will be able to

COs	**Description**	**Blooms Taxonomy level**
CO1	Develop competence in the understanding of machine learning techniques and explore types of ML techniques and applications.	Understand
CO2	Describes the various regression and classification techniques to solve supervised learning problems.	Apply
CO3	Associate the basic concepts of unsupervised learning and explore fundamental techniques.	Analyze
CO4	Understanding of various semi-supervised learning algorithms.	Understand
CO5	Defines major concepts of reinforcement learning and their applications	Analyze

CO-PO Mapping:

CO	**Program Outcomes**												**PSO**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**	**PS03**
CO1	3	1	1	1		1						3	3	1	
CO2	3	3	2	3		1						3	3	2	
CO3	3	3	2	3		1						3	3	2	
CO4	3	3	2	3		1						3	3	2	
CO5	3	3	2	3		1						3	3	2	

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0429	DIGITAL DESIGN USING FPGA	L	T	P
Credits: 3	*(Professional Elective -II)*	3	-	-

Pre-Requisites: Digital Electronics, Verilog

Course Objectives:

- This course provides the knowledge and hands-on experience in designing digital logic blocks in FPGA.
- To meet design requirements, designers must understand the FPGA fabric and how they affect the actual design of the logic functions.

MODULE I **[8 Periods]**

FPGA-Based Systems - Digital Design and FPGAs, FPGA-Based System Design, VLSI Technology-Manufacturing Processes, Transistor Characteristics, Packages and Pads.

MODULE II **[8 Periods]**

FPGA Fabrics- Introduction, FPGA Architectures, SRAM-Based FPGAs, Permanently Programmed FPGAs, Chip I/O, Circuit Design of FPGA Fabrics.

MODULE III **[12 Periods]**

Combinational Logic- Logic Design Process, Hardware Description Languages- Verilog, Combinational Network Delay, Power and Energy Optimization, Arithmetic Logic, Logic Implementation for FPGAs, Physical Design for FPGAs.

MODULE IV **[12 Periods]**

Sequential Machines, Sequential Machine Design Process, Sequential Design Styles, Rules for Clocking, Performance Analysis of Flip-Flop-Based Systems, Latch-Based Systems, Clock Skew, Retiming

MODULE V **[8 Periods]**

Large-Scale Systems- Introduction, Busses, Platform FPGAs, Multi-FPGA Systems, Novel Architectures.

Text Books:

1. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.
2. Morris Mano, Logic and computer design fundamentals‖,4-edition,Pearson education,2008.
3. Samir Palnitkar, ―Verilog HDL: A guide to digital design and synthesis‖ Pearson Education India, 2010.

Reference Books:

2. M.J.S. Smith, “Application Specific Integrated Circuits”, Pearson, 2000.
3. Peter Ashenden, “Digital Design using VHDL”, Elsevier, 2007.
4. Peter Ashenden, “Digital Design using Verilog”, Elsevier, 2007. 4. W. Wolf, “FPGA based system design”, Pearson, 2004.

E-Resources:

1. https://nptel.ac.in/courses/117/108/117108040/
2. http://www.nitttrc.edu.in/nptel/courses/video/117108040/L40.html
3. https://www.coursera.org/learn/digital-design-with-fpgas
4. https://digilent.com/reference/learn/programmable-logic/courses/intro-to-digitaldesign/start#:~:text=A%20major%20revolution%20in%20digital,of%20thousands%20of%20flip%2Dflops.

Course Outcomes: At the end of the course, students will be able to

COs	Description	Blooms Taxonomy level
CO1	Explain the design process using FPGA.	Understand
CO2	Explain various architectures of FPGA.	Understand
CO3	Design combinational logics.	Apply
CO4	Design sequential machines.	Apply
CO5	Explain various Large-Scale Systems.	Analyze

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	3									3	3	3	2
CO2	3	3	3									3	3	1	1
CO3	3	3	3									3	3	3	2
CO4	3	3	3									3	3	2	2
CO5	2	3	3									3	3	3	3

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) -: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech VI Sem		
Code: C0430	**Fundamentals of Mixed Signal Design**	**L**	**T**	**P**
Credits: 3	*(Professional Elective - II)*	**3**	**-**	**-**

PREREQUISITES: Electronic Devices & Circuits, VLSI Design

OBJECTIVE: Develop a comprehensive skill set in mixed signal circuit design, encompassing NMOS, PMOS, and CMOS characteristics, switched capacitor circuit fundamentals, data converter principles, Nyquist rate A/D converters, and oversampling converter architectures. Master theoretical concepts, hone practical design abilities, and apply knowledge to address real-world challenges in mixed signal circuit design.

Module - I: INTRODUCTION TO ANALOG CIRCUIT DESIGN [9 Periods]

NMOS, PMOS and CMOS I/V characteristics, Common Source Amplifier with resistive load (Only Voltage Gain), simple CMOS current mirror, common-source amplifier(single stage active load), MOS differential pair and gain stage.

Module – II: SWITCHED CAPACITOR CIRCUITS [9 Periods]

Basic Building Blocks- Op-Amps, Capacitors, Switches, Non-overlapping Clocks, Resistor Equivalence of a Switched Capacitor, Parasitic-Sensitive Integrator, Parasitic-Insensitive Integrators, Noise in Switched-Capacitor Circuits.

Module - III: DATA CONVERTER FUNDAMENTALS [9 Periods]

Ideal D/A Converter, Ideal A/D Converter, Quantization Noise, Performance Limitations-Resolution, Offset and Gain Error, Accuracy and Linearity, Nyquist-rate D/A converters-Resistor String Converters, Binary-Weighted Resistor Converters.

Module - IV: NYQUIST RATE A/D CONVERTERS [9 Periods]

Successive-Approximation Converters- DAC-Based Successive Approximation, Flash/Parallel Converters, Issues in Designing Flash A/D Converters, Two-Step A/D Converters, Two-Step Converter with Digital Error Correction.

Module - V: OVERSAMPLING CONVERTERS [9 Periods]

Oversampling without Noise Shaping- Quantization Noise Modelling, White Noise Assumption, Oversampling Advantage, Advantage of 1-Bit D/A Converters, Oversampling with Noise Shaping- Noise-Shaped Delta-Sigma Modulator, System Architecture of Delta-Sigma A/D Converters and D/A Converters.

TEXT BOOKS:

1. Tony Chan Carusone David A. Johns Kenneth W. Martin, **Analog Integrated Circuit Design**, 2nd ed., Wiley StudentEdition, 2013.

2. Behzad Razavi, **Design of Analog CMOS Integrated Circuits,** TMH Edition,2002.

REFERENCE BOOKS:

1. Rudy Van De Plassche, **CMOS Integrated Analog-to- Digital and Digital-to-Analog converters,** Kluwer Academic Publishers, 2003.
2. Richard Schreier, **Understanding Delta-Sigma Data converters,** WileyInterscience, 2005.
3. R. Jacob Baker, **CMOS Mixed-Signal Circuit Design,** Wiley Interscience, 2009.

COURSE OUTCOMES:

After completion of the course, students will be able to:

COs	Description	Blooms Taxonomy Level
CO1	Understand I/V characteristics of MOSFETs and apply this understanding to design amplifier circuits.	Understand
CO2	Apply knowledge to design switched-capacitor circuits and mitigate the impact of parasitics in switched-capacitor circuits.	Apply
CO3	Comprehend the principles of ideal D/A and A/D converters and evaluate the design principles of Nyquist-rate D/A converters.	Apply
CO4	Analyze and assess the performance and limitations of Nyquist-rate A/D converters.	Analyze
CO5	Understand the principles, advantages and limitations of Oversampling converters	Understand

CO-PO-PSO's mapping:

CO	Program Outcomes												PSO		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**	**PS03**
CO1	3	2	2	1	3							2	2	2	3
CO2	3	2	1	1	2							1	2	2	3
CO3	3	2	2	1	2							2	3	3	3
CO4	3	2	2	1	2							2	3	3	3
CO5	3	1	1	1	3							2	3	3	3

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) **-**: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0431	**Advanced Computer Architecture** *(Professional Elective –II)*	L	T	P
Credits: 3		3	-	-

Pre-Requisite: Computer Organization and Operating Systems

Course Objectives: To make students know about the Parallelism concepts in Programming

- To give the students an elaborate idea about the different memory systems and buses
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multi-computers.
- To study about data flow computer architectures

Unit-I Theory of Parallelism **[8 Periods]**

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

Unit-II Principals of Scalable performance **[8 Periods]**

Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

Unit-III Bus Cache and Shared memory **[8 Periods]**

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared- Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

Unit-IV Parallel and Scalable Architectures **[8 Periods]**

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5,

Unit-V Scalable **[8 Periods]**

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

TEXT BOOK:

1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

REFERENCE BOOKS:

1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.

Course Outcomes: At the end of the course Student able to analyze

CO	Description	Blooms Taxonomy level
CO1	Demonstrate concepts of parallelism in hardware/software	Understand
CO2	Discuss memory organization and mapping techniques	Understand
CO3	Describe architectural features of advanced processors.	Apply
CO4	Interpret performance of different pipelined processors	Apply
CO5	Explain data flow in arithmetic algorithms.	Analyze

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	2	2	1	1									3	1	1
CO2	2	2	1	1								1	3	3	1
CO3	2	1	2	1								2	3	1	2
CO4	1	1	2	1	1							2	3	1	1
CO5	1	2	2	1	1							2	3	3	2

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) -: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code: C0H03	**Advanced English Communication Skills Lab** *(Professional Elective –II)*	L	T	P
Credits: 1		3	-	-

1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and inter personal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- Torespondappropriatelyindifferentsocio-culturalandprofessionalcontexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips- Benefits of Reading–Methods and Techniques of Reading
   – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings fromContext,InferringMeaning-CriticalReading—ReadingComprehension–ExercisesforPractice.
2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing –Improving Writing Skills-Structure and presentation of different types of writing–Free Writing and Structured Writing-Letter Writing–Writing a Letter of Application–Resume vs. Curriculum Vitae–Writing a Résumé**–**Styles of Résumé-e-Correspondence–Emails–Blog Writing-(N) etiquette-Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing–Exercises for Practice.
3. **Activities on Presentation Skills -** Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk–Oral presentations (individual and group) through JAM sessions-PPTs–Importance of Presentation Skills–Planning, Preparing, Rehearsing and Making a Presentation–Dealing with Glosso phobia or Stage Fear –Understanding Nuances of Delivery –Presentations through Posters/Projects/Reports–Check list for Making a Presentation and Rubrics of Evaluation

– **Activities on Group Discussion(GD):**Types of GD and GD as a part of a Selection Procedure-Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas–Do's and Don'ts-GD Strategies Exercises for Practice.

4. **Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference &Video-conference- Mock Interviews.

4. Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T.V, a digital stereo & Camcorder
- Head phones of High quality

5. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL&GRE**(KAPLAN ,AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner'sDictionary**,10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA' s key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dream tech

6. Books Recommended:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E.(2015).*Engineering English.* Orient Black Swan Pvt. Ltd.
3. Bailey,Stephen.(2018).Academic*Writing:AHandbookforInternationalStudents.*(5th Edition).Routledge.
4. Koneru,Aruna.(2016).*ProfessionalCommunication*.McGrawHillEducation(India)Pvt.Ltd.
5. Raman,Meenakshi&Sharma,Sangeeta.(2022).*TechnicalCommunication,PrinciplesandPractice.*(4TH Edition) Oxford University Press.
6. Anderson,PaulV.(2007).*TechnicalCommunication***.**CengageLearningPvt.Ltd.NewDelhi.
7. McCarthy,Michael;O'Dell,Felicity&Redman,Stuart.(2017).*EnglishVocabularyinUse* Series. Cambridge University Press
8. Sen,Leela.(2009).*CommunicationSkills.*PHILearningPvtLtd.,NewDelhi.
9. Elbow, Peter.(1998).*Writing with Power.* Oxford University Press.
10. Goleman,Daniel.(2013).*EmotionalIntelligence*:*WhyitcanmattermorethanIQ.* Blooms bury Publishing.

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:C0432	**DIGITAL SIGNAL PROCESSING LAB**	**L**	**T**	**P**
Credits: 1.5		**-**	**-**	**3**

Course Objectives: To learn programming for various digital signal processing concepts.

List of Experiments:

1. Verification of linearity and Time Invariance Properties of a given Discrete-Time System
2. Generation of Sinusoidal waveform / signal based on recursive difference equation.
3. Computation of Unit Sample, Unit Step and Sinusoidal responses of the given LTI Discrete-Time System
4. To find frequency response of a given first order Discrete-Time system.
5. To find DFT / IDFT of given Discrete-Time signal.
6. Linear convolution using DFT & IDFT method.
7. Circular Convolution using Matrix Method.
8. Implementation of FFT and Power spectrum of given sequence.
9. Implementation of IIR Low pass & High Pass filter for a given sequence
10. Implementation of FIR Low pass filter for a given sequence.
11. Implementation of FIR High Pass filter for a given sequence.
12. Implementation of Decimation and Interpolation Process.

Software Required:

MATLAB / Lab view / OCTAVE / Equivalent Software

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Identify the Signals/Sequences or other parameters need to be generated to accomplish the LTI System	Apply
CO2	Demonstrate the program with syntax and framing of procedure	Analyze
CO3	Examine the observation made by execution of written program	Analyze
CO4	Illustrate the results with neat sketches	Understand
CO5	Understand the concepts of transforms and filter design techniques, by attempting the quiz or viva.	Understand

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	2	2	1	3							2	3	3	3
CO2	3	2	2	1	3							2	3	3	3
CO3	3	2	3	2	3							2	3	3	3
CO4	3	3	2	3	3							2	3	3	3
CO5	3	3	2	3	3							3	3	3	3

1: Slight (Low) **2**: Moderate (Medium) **3**: Substantial (High) -: None

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. VI Semester		
Code:C0433	Fundamentals of Mixed Signal Design Lab	L	T	P
Credits: 1.5		-	-	3

Course Objectives: Design of various Mixed Signal Circuits.

List of Experiments:

1. Inverter
2. XOR gate
3. 2:1 Multiplexer
4. Full adder
5. General logical Expression
6. Current Mirror
7. Common Drain Amplifier
8. Differential Amplifier
9. Operational Amplifier
10. Class AB Amplifier
11. R-2R DAC
12. CMOS Comparator

Software Required:

Mentor Graphics

Course Outcomes:

After the completion of the course the students will be able to

COs	Description	Blooms Taxonomy Level
CO1	Write Verilog programs for Combinational and sequential logics.	Apply
CO2	Perform simulation, synthesis and implementation of various digital logics Circuits	Analyze
CO3	Write Verilog Codes and implement various logic circuits on FPGA boards	Apply
CO4	Design Schematic for logic circuits and perform physical verification	Apply
CO5	Design layouts for logic circuits and perform physical verification.	Apply

CO-PO-PSO's Mapping:

CO	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	1			3			2	3	2		1	3	2	1
CO2	3	1			3			2	3	2		1	3	2	1
CO3	3	1			3			2	3	2		1	3	3	1
CO4	3	1			3			2	3	2		1	3	3	1
CO5	3	1			3			2	3	2		1	3	3	1

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: C00M4	QUANTITATIVE APTITUDE AND VERBAL RESONING -II	L	T	P
Credits: 0		1	1	-

2022-23 Onwards (MR-22)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. VI Semester		
Code: C00M5	CONSTITUTION OF INDIA	L	T	P
Credits: 0		1	1	-

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21