SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

B.E-Electronics and Communication Engineering

CURRICULUM and SYLLABI

[For students admitted in 2019-2020]

B.E / B.Tech Regulation 2019

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)
Branch: Electronics and Communication Engineering

S.No	Course Code	Course Title	L	T	P	C	Category
Theory							
1	U19ENG101B	English For Engineers - I	1	0	2	2	HS
2	U19MAT102B	Linear Algebra and Multivariable Calculus	3	1	0	4	BS
3	U19PHY103C	Engineering Physics	3	0	0	3	BS
4	U19CHE104C	Chemistry of Organic Electronics	4	0	0	4	BS
5	U19PPR105	Problem Solving using Python Programming	3	0	0	3	ES
6	U19BEE106B	Basic Electrical and Electronics Engineering	3	0	0	3	PC
Practical							
7	U19PPL111	Python Programming Laboratory	0	0	2	1	ES
8	U19BEEL113B	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	PC
9	U19GE101	Basic Aptitude - I	0	0	2	0	EEC
Total Credits						**21**	
Optional Language Elective*							
10	U19OLE1101	French	0	0	2	1	HS
11	U19OLE1102	German					
12	U19OLE1103	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Electronics and Communication Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr.M.Renuga	**Dr.R.S.Sabeenian**	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/ Electronics and Communication Engineering, First Semester BE ECE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2019 (CBCS)
Branch: Electronics and Communication Engineering

S.No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Category
		Theory					
1	U19ENG201B	English For Engineers - II	2	0	0	2	HS
2	U19MAT202C	Transforms and Differential Equations	3	1	0	4	BS
3	U19PHY203B	Physics for ECE	2	0	0	2	BS
4	U19EGR206A	Engineering Graphics	2	0	2	3	ES
5	U19EC201	Electronic Devices and Circuits	2	0	2	3	PC
6	U19EC202	Circuit Theory	3	0	0	3	PC
		Practical					
7	U19WPL212	Workshop Practice	0	0	2	1	ES
8	U19PCL208B	Physics and Chemistry Laboratory	0	0	4	2	BS
9	U19GE201	Basic Aptitude - II	0	0	2	0	EEC
					Total Credits	**20**	
		Optional Language Elective*					
11	U19OLE1201	French	0	0	2	1	HS
12	U19OLE1202	German					
13	U19OLE1203	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1.	U19MAT301C	Probability and Stochastic Processes	3	1	0	4
2.	U19EC301	Signals and Systems	3	1	0	4
3.	U19EC302	Digital Electronics	3	0	0	3
4.	U19EC303	Electronic circuits	3	0	0	3
5.	U19CS307	Programming in C	3	0	0	3
6.	U19GE303	**Mandatory Course :** Essence of Indian Traditional knowledge	2	0	0	0
Practical						
7.	U19EC304	Digital Electronics laboratory	0	0	2	1
8.	U19EC305	Electronic Circuits and Simulation laboratory	0	0	2	1
9.	U19CS308	C programing laboratory	0	0	2	1
10.	U19GE301	Soft Skills and Aptitude – I	0	0	2	1
					Total Credits	**21**

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Chairman, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

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Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1.	U19EC401	Engineering Electromagnetics	3	0	0	3
2.	U19EC402	Linear Integrated Circuits	3	0	0	3
3.	U19EC403	Digital Signal Processing	3	0	0	3
4.	U19EC404	Analog Communication Systems	3	0	0	3
5.	U19CS406	Data Structures	3	0	0	3
6.	U19GE402	**Mandatory Course :** Environment and Climate Science	2	0	0	0
Practical						
7.	U19EC405	Linear Integrated Circuits Laboratory	0	0	2	1
8.	U19EC406	Digital Signal Processing Laboratory	0	0	2	1
9.	U19CS407	Data Structures Laboratory	0	0	2	1
10.	U19GE401	Soft Skills and Aptitude – II	0	0	2	1
					Total Credits	**19**

Approved By

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HOD/Electronics and Communication Engineering, Fourth Semester BE ECE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1	U19EC501	Microprocessors and Microcontroller		3	0	0	3	45
2	U19EC502	Control Systems		3	0	0	3	45
3	U19EC503	Transmission Lines and Waveguides		3	0	0	3	45
4	U19EC504	Digital Communication		3	0	0	3	45
5	U19EC505	VLSI Design		3	0	0	3	45
6	noc21-cs61	**Elective – NPTEL Course**	Computer architecture and organization	3	0	0	3*	45
	noc21-cs56		Programming in Java					
Practical								
7	U19EC506	Microprocessors and Microcontroller laboratory		0	0	2	1	30
8	U19EC507	Communication Systems laboratory		0	0	2	1	30
9	U19EC 508	VLSI Design laboratory		0	0	2	1	30
10	U19GE501	Soft Skills and Aptitude - III		0	0	2	1	30
						Total Credits	**22**	

*****Any 1 elective to be opted by a student among 2 electives.

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1	U19EC601	Antenna and Wave Propagation		3	0	0	3	45
2	U19EC602	Digital Image Processing		3	0	0	3	45
3	U19EC603	Embedded Systems		3	0	0	3	45
4	U19EC904	**Professional Elective**	Machine learning (Lab Integrated)	2	0	2	3*	60
	U19EC909		Satellite Communication	3	0	0	3*	45
	U19EC911		IoT System architecture	3	0	0		
	U19EC913		Computer Networks	3	0	0		
6	U19BM1001	**Open Elective -I**	Hospital Management	3	0	0	3#	45
	U19CE1001		Building Services and Safety Regulations					
	U19CS1001		Big Data Analytics					
	U19CS1002		Cloud Computing					
	U19CS1004		Mobile Application Development					
	U19CS1006		Data Science					
	U19EE1002		Energy Conservation And Management					
	U19EE1003		Innovation, IPR and Entrepreneurship Development					
	U19EE1004		Renewable Energy Systems					
	U19FT1001		Fundamentals of Fashion Design					

	U19FT1002		Garment Manufacturing Technology					
	U19IT1001		Problem solving techniques using JAVA Programming					
	U19MC1003		Smart Automation					
Practical								
7	U19EC604	Digital Image Processing laboratory		0	0	2	1	30
8	U19EC605	Embedded Systems laboratory		0	0	2	1	30
9	U19EC606	Mini Project		0	0	2	1	30
10	U19GE601	Soft Skills and Aptitude - IV		0	0	2	1	30
Total Credits							**22**	

***Any 2 elective to be opted by a student among 4 professional electives**
 # Any 1 elective to be opted by a student among 13 open electives

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Chairperson, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

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HOD/Electronics and Communication Engineering, Sixth Semester BE ECE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1.	U19EC701	Wireless Communication		3	0	0	3	45
2.	U19EC702	Microwave and Optical Communication		4	0	0	4	60
3.	U19GE701	Professional Ethics and Human Values		3	0	0	3	45
4.	U19EC920	Professional Elective	Low power ASIC Design	3	0	0	3*	45
	U19EC922		Deep Learning					
5.	U19EC928	Professional Elective	IoT and Sensors	3	0	0	3*	45
	U19EC931		Wireless Adhoc Network					
6.	U19GE702	Professional Elective	Professional Readiness for Innovation, Employability and Entrepreneurship	0	0	6	3	90
7.	U19CE1004	Open Elective	Disaster Management	3	0	0	3	45
	U19CS1001		Big Data Analytics					
	U19CS1002		Cloud Computing					
	U19CS1003		Internet of Things					
	U19CS1004		Mobile Application Development					

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HOD/Electronics and Communication Engineering, Seventh Semester BE ECE Students and Staff, COE

	U19CS1006		Data Science					
	U19EE1001		Electric Mobility					
	U19EE1002		Energy Conservation and Management					
	U19EE1003		Innovation, IPR and Entrepreneurship Development					
	U19EE1004		Renewable Energy Systems					
	U19FT1001		Fundamentals of Fashion Design					
	U19FT1002		Garment Manufacturing Technology					
	U19MC1003		Smart Automation					
Practical								
8.	U19EC703	Microwave and Optical Laboratory		0	0	2	1	30
						Total Credits	**23**	

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Practical							
1	U19EC801	Project Work	0	0	24	12	360
					Total Credits	**12**	

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Chairperson, Academic Council & Principal
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HOD/Electronics and Communication Engineering, Eighth Semester BE ECE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester I under Regulations 2019 (CBCS)
Branch: Electronics and Communication Engineering

S.No	Course Code	Course Title	L	T	P	C	Category
Theory							
1	U19ENG101B	English For Engineers - I	1	0	2	2	HS
2	U19MAT102B	Linear Algebra and Multivariable Calculus	3	1	0	4	BS
3	U19PHY103C	Engineering Physics	3	0	0	3	BS
4	U19CHE104C	Chemistry of Organic Electronics	4	0	0	4	BS
5	U19PPR105	Problem Solving using Python Programming	3	0	0	3	ES
6	U19BEE106B	Basic Electrical and Electronics Engineering	3	0	0	3	PC
Practical							
7	U19PPL111	Python Programming Laboratory	0	0	2	1	ES
8	U19BEEL113B	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1	PC
9	U19GE101	Basic Aptitude - I	0	0	2	0	EEC
Total Credits						**21**	
Optional Language Elective*							
10	U19OLE1101	French	0	0	2	1	HS
11	U19OLE1102	German					
12	U19OLE1103	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

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HOD/ Electronics and Communication Engineering, First Semester BE ECE Students and Staff, COE

U19ENG101B - ENGLISH FOR ENGINEERS – I
Common to CSE, ECE, EEE, MCT, BME

L	T	P	C
1	0	2	2

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

1. Use grammatical components effectively in both written and spoken communication
2. Develop speaking skills for self-introduction, delivering speeches and technical presentation.
3. Speak effectively in real time and business situations
4. Write email, formal letters and descriptions of graphics
5. Develop skills for writing reports and proposals, and for general purpose and technical writing.

UNIT I

- General Vocabulary, Parts of speech
- Self-introduction – personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town.
- Instructions, Email – fixing an appointment, cancelling appointments, conference details, hotel accommodation, order for equipment, training programme details, paper submission for seminars and conferences
- Paragraph writing – Describing – defining – providing examples or evidences

UNIT II

- Tenses, active and passive voice
- Welcome address, vote of thanks, special address on specific topic.
- Checklists, letter writing – business communication, quotations, placing orders, complaints, replies to queries from business customers, inviting dignitaries, accepting and declining invitations

UNIT III

- Prefixes and Suffixes
- Mini presentation in small groups of two or three on office arrangements, facilities, office functions, sales, purchases, training recruitment, advertising,

applying for financial assistance, applying for a job, team work, discussion, presentation.

- Job application letter and resume, recommendations,

UNIT IV

- Modal verbs and probability, concord
- Situational Role Play - between examiner and candidate, teacher and student, customer and sales manager, hotel manager and organiser, team leader and team member, bank manager and candidate, interviewer and applicant, car driver and client, industrialist and candidate, receptionist and appointment seeker, new employee and manager, employee and employee, p.a. and manager, schedule for training
- Note making, Proposal

UNIT V

- If conditionals
- Situational Role Play - Asking for directions, seeking help with office equipment, clarifying an error in the bill, job details, buying a product, selling a product, designing a website, cancelling and fixing appointments, hotel accommodation, training facilities, dress code, conference facilities.
- Memo, technical report writing, feasibility reports, accident report, survey report

TOTAL: 45 hours

Speaking test will be conducted for 20 marks externally and evaluated along with English for Engineers – I in the End Semester Valuation.

TEXT BOOK:

- Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

Extensive Reading

- The Story of Amazon.com- Sara Gilbert, published by Jaico
- The Story of Google – Sara Gilbert, published by Jaico

Reference

- Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
- A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

U19MAT102B - LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

Common to ECE and BME

L	T	P	C
3	1	0	4

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

1. apply the concepts of vector spaces and linear transformations in real world applications
2. apply the concepts of eigen values and eigen vectors of a real matrix and their properties in diagonalization and the reduction of a real symmetric matrix from quadratic form to canonical form
3. find the Taylor's series expansion, Jacobians and the maxima and minima of functions of two variables
4. apply appropriate techniques of multiple integrals to find the area and volume
5. apply the concepts of vector differentiation and integration to determine the line, surface and volume integrals.

UNIT I - VECTOR SPACES 12

Vector Space – Linear independence and dependence of vectors – Basis – Dimension – Linear transformations (maps) – Matrix associated with a linear map – Range and kernel of a linear map – Rank-nullity theorem (without proof).

UNIT II - EIGEN VALUES AND EIGEN VECTORS 12

Eigen values and eigen vectors of real matrices – Properties of eigen values and eigen vectors – Cayley-Hamilton theorem – Diagonalization of real symmetric matrices – Reduction of quadratic form to canonical form.

UNIT III - FUNCTIONS OF SEVERAL VARIABLES 12

Functions of several variables – Partial differentiation – Total derivative – Jacobians – Taylor's theorem for function of two variables – Maxima and minima of function of two variables without constraints – Constrained maxima and minima by Lagrange's method of undetermined multipliers.

UNIT IV - MULTIPLE INTEGRALS 12

Double integrals – Change of order of integration – Change of variables from Cartesian to polar coordinates – Area as double integrals in Cartesian coordinates – Triple integrals – Volume as triple integrals in Cartesian coordinates.

UNIT V - VECTOR CALCULUS **12**

Vector differentiation: Scalar and vector valued functions – Gradient, directional derivative, divergence and curl – Scalar potential.

Vector integration: Line, surface and volume integrals – Statement of Green's, Stoke's and Gauss divergence theorems – Simple applications involving squares, rectangles, cubes and rectangular parallelopiped.

Theroy: 45 hours; Tutorial: 15 hours

TOTAL: 60 hours

TEXT BOOKS

1. T. Veerarajan, "Linear Algebra and Partial Differential Equations", McGraw Hill Publishers, 1st Edition, 2018.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCE BOOKS

1. S. Lipschutz and M. L. Lipson, "Linear Algebra", McGraw Hill Publishers, 6th Edition, 2018.
2. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
3. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.
5. B.S. Grewel, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

U19PHY103C - ENGINEERING PHYSICS
(For BE Electronics and Communication Engineering)

L	T	P	C
3	0	0	3

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

1. Discuss the dual nature of matter and radiation and the application of wave nature of particles.
2. Describe the basic components of lasers.
3. Analyse the relation between arrangement of atoms and material properties.
4. Differentiate the electrical and thermal conductivity of metals.
5. Elucidate the classification and theory of semiconducting materials.

UNIT I - QUANTUM PHYSICS 9

Origin of quantum mechanics – Limitations of classical theory - Dual nature of matter and radiation.

Particle nature of radiation - Compton effect - Explanation based on quantum theory - Expression for Compton shift (no derivation).

Wave nature of matter - de Broglie waves - Schrödinger's time independent and time dependent wave equations - Physical significance of wave function - Energy and wave function of an electron trapped in one dimensional box.

Application of wave nature of particles - Electron microscope - Comparison of optical and electron microscope - Scanning electron microscope - Limitations of electron microscope.

UNIT II - LASERS 9

Basic terms - Energy level - normal population - induced absorption (pumping) - population inversion - meta stable state - spontaneous emission - stimulated emission.

Basic *components* of a laser - Active medium - pumping technique - optical resonator **Einstein's theory** - stimulated absorption - spontaneous emission and stimulated emission.

Types of lasers - Solid lasers (Nd:YAG) - Gas lasers (CO_2 laser) - semiconductor laser (homojunction and hetero junction laser).

Holography - Construction and reconstruction of hologram.

UNIT III - CRYSTAL PHYSICS **9**

Importance of crystals - Types of crystals - Basic definitions in crystallography (Lattice –space lattice - unit cell - lattice parameters – basis - crystallographic formula) - Seven crystal systems and fourteen Bravais lattices – Lattice planes and Miller indices – Interplanar distance - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number and Atomic Packing factor for SC, BCC, FCC and HCP Structures - Polymorphism and allotropy.

Crystal imperfections - Point, line and surface defects – burger vector.

UNIT IV - CONDUCTING MATERIALS **9**

Usage of conducting materials - basic definitions (electrical resistance - conductance - resistivity - conductivity).

Classical free electron theory of metals - Postulates of classical free electron theory - microscopic form of Ohm's law - Electrical conductivity - definition and expression for electrical conductivity - Thermal conductivity - definition and expression for thermal conductivity - Wiedemann - Franz law and Lorentz number - Success and failure of classical free electron theory.

Quantum free electron theory - Drawbacks of quantum free electron theory - origin of energy bands - band theory of solids (qualitative treatment only) - Fermi energy and Fermi distribution function - Effect of temperature on Fermi function - Density of energy states - carrier concentration in metals.

UNIT V - SEMICONDUCTING MATERIALS **9**

Properties of semiconductors - Classification of semiconductors - Intrinsic and extrinsic semiconductors - Elemental and compound semiconductors.

Intrinsic semiconductor - Two types of charge carriers - Energy band diagram of intrinsic semiconductors (at T= 0 K and T > 0 K) - Expression for number of electrons in conduction band - Expression for number of holes in valence band - Law of mass action and intrinsic carrier concentration - Fermi level - Variation of Fermi level with temperature - electrical conductivity - band gap determination.

Extrinsic semiconductors - Draw backs of intrinsic semiconductors – Types of extrinsic semiconductors – 'n'-type and 'p'-type semiconductors – Energy band diagram of 'n' type and 'p' type semiconductors (at T= 0 K and T > 0 K) – Carrier concentration of extrinsic semiconductors (Qualitative Treatment only) – Hall effect – Determination of Hall coefficient – Applications.

TOTAL: 45 Hours

TEXT BOOKS

- M.N.Avadhanulu, 'Engineering Physics' S.Chand & Company Ltd, New Delhi (2015)
- B. K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning India Pvt. Ltd., Delhi, 2019

REFERENCES

- Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2018).
- Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
- Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)
- K. Bhattacharya, Poonam Tandon "Engineering Physics" Oxford University Press 2017.

U19CHE104C - CHEMISTRY OF ORGANIC ELECTRONICS
(For ECE)

L	T	P	C
4	0	0	4

Course Outcomes: At the end of the course, the student will be able to,

- Outline the basic principles and properties of organic electronic materials.
- Analyze the types of various advanced organic electronics and their uses.
- Describe the working principle of organic conducting polymeric materials.
- Demonstrate the synthetic methods of conducting polymers.
- Outline the modern applications of organic materials.

UNIT I - INTRODUCTION TO ORGANIC ELECTRONIC MATERIALS 12

Introduction to organic electronic materials and their basic properties; charge transport and energy structure of organic materials; Optical properties of organic electronic materials-energy levels, color change, light emission (fluorescence and phosphorescence) and absorption-electrochemical properties of organic electronic materials - Liquid crystalline small molecules and polymers-basic properties of liquid crystalline molecules.

UNIT II - ADVANCED MATERIALS FOR ORGANIC ELECTRONICS 12

Pentacene transistors – performance - Engineered pentacenes – Reversible functionalization – end - substituted derivatives – perifunctionalized pentacenes – Heteropentacenes - Various types of graphene nano ribbons (GNRs) - simple synthesis and structure property relationships - Electronic properties of graphene and GNRs - General applications of graphene-based materials.

UNIT III - INTRODUCTION TO CONDUCTING POLYMERIC MATERIALS 12

Conduction mechanism in conductive polymers e.g. Polyaniline (PANI) and Polypyrrole (PPY), polythiophene - Concept of Polarons and solitons. Doping process in conducting polymers- optoelectronic functions of conducting polymeric materials-Electro active (redox type) conducting polymers-Various general applications of conducting polymers.

UNIT IV - SYNTHESIS OF CONDUCTING POLYMERS 12

Synthesis, structure, morphology, conductivity doping, theory and uses of Poly (sulfur nitride), polyacetylene, polyphenylene, poly(para-phenylene), poly (phenylenevinylenes), poly(phenylene sulfide), Polypyrrole and Polythiophene, Polyaniline, Stacked Phthalocyanine polymers - Polymers with transition metals in the side-group structure and their uses.

UNIT V - MODERN APPLICATIONS OF ORGANIC MATERIALS 12

Construction working principle and applications of organic materials: Organic solar cells (OSCs) - dye sensitized solar cell, bulk heterojunction solar cell, perovskite solar cell – Organic light emitting diode (OLED) - Organic field effect transistor (OTFT) – Graphene nano ribbons (GNRs) - thermoelectric generators - basic principle - device configuration-general device fabrication techniques.

TOTAL: 60 Hours

TEXT BOOKS

- Hagen Klauk, Organic Electronics: Materials, Manufacturing and Applications, Wiley – VCH. Weinheim, 2006.
- C. Saravanan et al, "Chemistry of Organic Electronics", Sonaversity, Sona College of Technology, Salem, 2019.

REFERENCE BOOKS

- Kiichi Takemoto, Raphael M. Ottenbrite, MikiharuKamachi, "Functional Monomers and Polymers", CRC Press, New York.
- Kaiser A B, Electronic properties of conjugated polymers, basics, models and applications, Springer verlag, Berlin.
- Chilton J A and Goosey M T, Special polymers for electronics and optoelectronics, Kluwer Academic Pub. London.

U19PPR105 - PROBLEM SOLVING USING PYTHON PROGRAMMING
(Common to BME, CSE, ECE, EEE, IT and MCT)

L	T	P	C
3	0	0	3

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

1. Develop algorithmic solutions to simple computational problems
2. Write simple Python programs
3. Write programs with the various control statements and handling strings in Python
4. Develop Python programs using functions and files
5. Analyze a problem and use appropriate data structures to solve it.

UNIT I - ALGORITHMIC PROBLEM SOLVING 9

Need for computer languages, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT II - BASICS OF PYTHON PROGRAMMING 9

Introduction-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

UNIT III - CONTROL STATEMENTS AND STRINGS 9

Conditional (if), alternative (if-else), chained conditional (if-elif-else). Iteration-while, for, infinite loop, break, continue, pass, else. Strings-String slices, immutability, string methods and operations.

UNIT IV - FUNCTIONS AND FILES 9

Functions - Introduction, inbuilt functions, user defined functions, passing parameters - positional arguments, default arguments, keyword arguments, return values, local scope, global scope and recursion. Files -Text files, reading and writing files.

UNIT V - DATA STRUCTURES: LISTS, SETS, TUPLES, DICTIONARIES 9

Lists-creating lists, list operations, list methods, mutability list functions, searching and sorting, Sets-creating sets, set operations. Tuples-Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Nested Dictionaries.

TOTAL: 45 Hours

TEXT BOOK

- Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 2018.
- Allen B. Downey, "Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)

REFERENCES

- Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education, 2018.
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2013.

U19BEE106B - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to ECE and BME)

L	T	P	C
3	0	0	3

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

1. Realize the basic concepts of electrical quantities and components.
2. Understand the working of electrical machines.
3. Analyze the construction and characteristics of semiconductor devices.
4. Examine the BJT formation and its characteristics.
5. Enhance the knowledge on Special Devices

UNIT I – BASICS OF ELECTRICAL PERCEPTIONS 9

Definition of Electric Voltage, Current, Power, Power factor and Energy, Ohms law, Kirchhoff's Laws and its applications-Frequency-AC & DC Signals-types of sources-single phase-three phase- Resistance- Inductance-capacitance- Series and parallel combinations.

UNIT II - ELECTRICAL MACHINES 9

DC Generator: construction of DC Machine – working principle of DC Generator – EMF equation – Types of DC Generator. DC Motor: Working principle of DC Motor – Types of DC Motor.Transformer: Working principle of Transformer – EMF equation – Transformation ratio.

UNIT III - PN JUNCTION DIODE AND ITS APPLICATIONS 9

Energy band theory-Conductor-Insulator-Semiconductor-Doping-formation of N-type and P-type materials-PN junction Diode – V-I Characteristics- Zener diode- VI characteristics of Zener-Avalanche break down. - Zener effect-Zener diode as voltage regulator.

UNIT IV - BJT AND ITS APPLICATIONS 9

Bipolar Junction Transistor – construction-Working principle-Regions of transistor-CB, CE, CC Configurations and Characteristics –Transistor as a switch – Applications of transistor.

UNIT V - SPECIAL DEVICES 9

Construction and Characteristics of - Tunnel Diode-Varactor diode-Photo diode- Photo transistor- SCR-TRIAC-DIAC

Total: 45 hours

TEXT BOOKS

1. D P Kothari and I J Nagrath, “Basic Electrical and Electronics Engineering”, Mc Graw Hills (India) Private Limited, 2014.

REFERENCE BOOKS

1. D. Devaraj, S. K. Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson India, 2016
2. AbhiChakrabarti, Sudipta Debnath, Soumitra Kumar Mandal, “Basic Electrical & Electronics Book “,Mc Graw Hill Education; Fifth Edition, 2016.
3. Ravish Singh, “ Basic Electrical & Electronics Engineering”, McGraw Hill Education, 2014

U19PPL111 - PYTHON PROGRAMMING LABORATORY
(Common to BME, ECE, CSE, EEE, IT and MCT)

L	T	P	C
0	0	2	1

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

1. Implement the algorithms using basic control structures in Python
2. Develop Python programs to use functions, strings and data structures to solve different types of problems
3. Implement persistent storing information through file operations

LIST OF EXPERIMENTS

1. Draw flowchart using any open source software.
2. Implement programs with simple language features.
3. Implement various branching statements in python.
4. Implement various looping statements in python.
5. Develop python programs to perform various string operations like concatenation, slicing, indexing.
6. Implement user defined functions using python.
7. Implement recursion using python.
8. Develop python programs to perform operations on list and tuples
9. Implement dictionary and set in python
10. Implement python program to perform file operations.

TOTAL: 30 Hours

U19BEEL113B - BASIC ELECTRICAL AND ELECTRONICS LABORATORY
(Common to ECE and BME)

L	T	P	C
0	0	2	1

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

1. Identify the active, passive components and measuring instruments.
2. Analysis the electrical quantity at the any point of circuit.
3. Design the circuit based on PN junction diode and BJT.

LIST OF EXPERIMENTS

1. Identification of active and passive electronic components.
2. Study on CRO, Ammeter, Voltmeter, Multi-meter, Function Generator, and DSO.
3. Measurement of DC and AC power supply using measuring instruments.
4. Realization and design problems on ohms law.
5. Realization and design problems on KCL, KVL.
6. Mesh and node analysis of circuits.
7. V-I characteristics analysis of PN junction diode.
8. Biasing and characteristics analysis of BJT.
9. CB, CC and CE analysis of BJT.
10. Realization of transistor as switch.

TOTAL: 30 hours

U19GE101 - BASIC APTITUDE – I
(Common to All Departments)

L	T	P	C
0	0	2	0

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

1. Solve fundamental problems in specific areas of quantitative aptitude
2. Solve basic problems in stated areas of logical reasoning
3. Demonstrate rudimentary verbal aptitude skills in English with regard to specific topics

1. Quantitative Aptitude and Logical Reasoning

Solving simple problems with reference to the following topics:

a. Numbers – HCF & LCM
b. Decimal fractions
c. Square roots & cube roots
d. Surds & Indices
e. Logarithms
f. Percentage
g. Averages
h. Coding and Decoding & Visual language

2. Verbal Aptitude

Demonstrating plain English language skills with reference to the following topics:

a. Synonyms
b. Antonyms
c. Verbal analogy
d. Editing passages
e. Sentence filler words

TOTAL: 30 hours

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester II under Regulations 2019 (CBCS)
Branch: Electronics and Communication Engineering

S.No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Category
		Theory					
1	U19ENG201B	English For Engineers - II	2	0	0	2	HS
2	U19MAT202C	Transforms and Differential Equations	3	1	0	4	BS
3	U19PHY203B	Physics for ECE	2	0	0	2	BS
4	U19EGR206A	Engineering Graphics	2	0	2	3	ES
5	U19EC201	Electronic Devices and Circuits	2	0	2	3	PC
6	U19EC202	Circuit Theory	3	0	0	3	PC
		Practical					
7	U19WPL212	Workshop Practice	0	0	2	1	ES
8	U19PCL208B	Physics and Chemistry Laboratory	0	0	4	2	BS
9	U19GE201	Basic Aptitude - II	0	0	2	0	EEC
					Total Credits	**20**	
		Optional Language Elective*					
11	U19OLE1201	French	0	0	2	1	HS
12	U19OLE1202	German					
13	U19OLE1203	Japanese					

*Students may opt for foreign languages viz., German/French/Japanese with additional one credit (Not accounted for CGPA calculation)

Approved By

Chairperson, Science and Humanities BoS	Chairperson, Electronics and Communication Engineering BoS	Member Secretary, Academic Council	Chairperson, Academic Council & Principal
Dr.M.Renuga	Dr.R.S.Sabeenian	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/ Electronics and Communication Engineering, Second Semester BE ECE Students and Staff, COE

U19ENG201B - ENGLISH FOR ENGINEERS – II

L	T	P	C
1	0	2	2

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

1. frame sentences correctly, both in written and spoken forms of language with accuracy and fluency.
2. develop and demonstrate listening skills for academic and professional purposes.
3. draw conclusions on explicit and implicit oral information.
4. develop effective reading skills and reinforce language skills required for using grammar and building vocabulary.
5. read for gathering and understanding information, following directions and giving responses.

UNIT - I

- Cause and effect expressions, adjectives, comparative adjectives
- Listening to conversations, welcome speeches, lectures and description of equipment
- Listening to different kinds of interviews (face-to-face, radio, TV and telephone interviews)
- Understanding notices, messages, timetables, advertisements, graphs, etc.
- Reading passages for specific information transfer

UNIT - II

- Prepositions and dependent prepositions
- Understanding short conversations or monologues,
- Taking down phone messages, orders, notes etc
- Listening for gist, identifying topic, context or function
- Reading documents for business and general contexts and interpreting graphical representations

UNIT - III

- Collocations
- Listening comprehension, entering information in tabular form
- Error correction, editing mistakes in grammar, vocabulary, spelling, etc.
- Reading passage with multiple choice questions, reading for gist and reading for specific information, skimming for comprehending the general idea and meaning and contents of the whole text

UNIT - IV

- Articles, adverbs
- Intensive listening exercises and completing the steps of a process.
- Listening exercises to categorise data in tables.
- Short reading passage: gap-filling exercise related to grammar, testing the understanding of prepositions, articles, auxiliary verbs, modal verbs, pronouns, relative pronouns and adverbs, short reading passage with multiple choice questions.

UNIT - V

- Pronouns
- Listening to extended speech for detail and inference
- Listening and developing hints
- Gap-filling exercise testing the knowledge of vocabulary, collocations, dependent prepositions
- Short reading passages for sentence matching exercises, picking out specific information in a short text

TOTAL: 30 Hours

The listening test will be conducted for 20 marks and reading for 20 marks internally and evaluated along with English for Engineers II in the End Semester Valuation.

TEXT BOOK

1. Technical English I & II, Dr. M. Renuga et al. Sonaversity, 2016

EXTENSIVE READING

1. Who Moved my Cheese? – Spencer Johnson-G. P. Putnam's Sons
2. Discover the Diamond in You – Arindham Chaudhari – Vikas Publishing House Pvt. Ltd

REFERENCES

1. Norman Whitby, Business Benchmark – Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2006.
2. A Course in Communication Skills, P. Kiranmai Dutt, Geetha Rajeevan, C. L. N. Prakash, published by Cambridge University Press India Pvt. Ltd.

U19MAT202C - TRANSFORMS AND DIFFERENTIAL EQUATIONS

L	T	P	C
3	1	0	4

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

1. apply the classical method to solve linear ordinary differential equations with constant coefficients.
2. apply the Laplace transforms technique and its properties to solve an ordinary differential equation.
3. express a periodic signal as an infinite sum of sine and cosine wave components using Fourier series.
4. apply the Fourier transform techniques to convert the signal in terms of the frequencies of the waves.
5. find the general and singular solutions of linear and nonlinear partial differential equations.

UNIT I - ORDINARY DIFFERENTIAL EQUATIONS **12**

Linear higher order ordinary differential equations with constant coefficients – Cauchy's and Legendre's homogeneous linear ordinary differential equations – Method of variation of parameters.

UNIT II - LAPLACE TRANSFORMS **12**

Laplace transform: Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse function – Initial and final value theorems – Transform of periodic functions.

Inverse Laplace transform: Standard results – Statement of convolution theorem and its applications – Solution of linear second order ordinary differential equations with constant coefficients using Laplace transform.

UNIT III - FOURIER SERIES **12**

General Fourier series – Dirichlet's conditions – Change of intervals – Odd and even functions – Half range sine and cosine series – Root mean square – Parseval's identity – Harmonic analysis.

UNIT IV - FOURIER TRANSFORMS **12**

Fourier transform pair – Properties – Fourier sine and cosine transforms pair – Properties –Transforms of simple functions – Parseval's identity.

UNIT V - PARTIAL DIFFERENTIAL EQUATIONS **12**

Formation of partial differential equations – Lagrange's partial differential equation – Clairaut's form of partial differential equations – Higher order linear partial differential equation with constant coefficients.

TOTAL: 60 Hours

TEXT BOOKS

1. T. Veerarajan, "Transforms and Partial Differential Equations", McGraw Hill Publishers, 3rd Edition, 2016.
2. T. Veerarajan, "Engineering Mathematics for Semesters I & II", McGraw Hill Publishers, 1st Edition, 2019.

REFERENCES

1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley Publishers, 10th Edition, Reprint, 2017.
2. C. Prasad and R. Garg, "Advanced Engineering Mathematics", Khanna Publishers, 1st Edition, 2018.
3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.
4. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill Publishers, 29th Reprint, 2017.

U19PHY203B - PHYSICS FOR ECE

L	T	P	C
2	0	0	2

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

1. illustrate the divergence and curl of electrostatic fields.
2. explain polarization process in dielectric materials and their temperature and frequency dependence and the causes of dielectric breakdown.
3. illustrate the divergence and curl of magnetic field.
4. explain the types of magnetic materials.
5. discuss the novel properties of metallic glasses and nanomaterials.

UNIT I - ELECTROSTATICS 6

Electric field - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges.

Divergence and curl of Electrostatic fields – Electric lines of forces – Electric flux – Gauss's law – Divergence of E – Applications of Gauss's law – Curl of E.

UNIT II - DIELECTRIC MATERIALS 6

Basic definitions – Electric dipole – Electric dipole moment – Electric field – Electric displacement vector - Electrical susceptibility – Dielectric constant.

Dielectric polarization - Electronic, ionic, orientation and space charge polarization - Frequency and temperature dependence of polarization - Internal field – Clausius-Mosotti relation (no derivation) - Dielectric loss - Dielectric breakdown - Uses of dielectric materials (capacitor and transformer) .

UNIT III - MAGNETOSTATICS 6

Magnetic Lorentz force – Magnetic fields – Magnetic Lorentz force – Force experienced by current carrying conductor in magnetic field.

Biot - Savart Law – Steady currents – Magnetic field due to steady current.

Divergence and Curl of B – Straight line currents – Ampere's circuital law – Divergence and curl of B – Applications of Ampere's circuital law – Comparison of Magnetostatics and electrostatics.

UNIT IV - MAGNETIC MATERIALS **6**

Basic definitions - Magnetic moment - Magnetic field - Magnetic field intensity - Magnetic permeability - Magnetization - Intensity of magnetization - Magnetic susceptibility

Types of magnetic materials - Dia , Para and Ferromagnetic materials - Domain theory and origin of domains – Anti ferromagnetic materials - Ferrites - Structure, properties and applications - hysteresis - Hard and soft magnetic materials.

UNIT V - NEW ENGINEERING MATERIALS **6**

Metallic glasses -Preparation, properties and applications.

Nanoscience and Nanotechnology - Significance of nanoscale - different types of nanostructures (0-D, 1-D, 2-D and 3-D) - Fabrication of nanomaterials - Ball milling and Chemical vapour deposition technique (CVD).

Carbon nanotubes - structure - properties and applications - fabrication - pulsed laser deposition method.

TOTAL: 30 Hours

TEXT BOOKS

1. M.N.Avadhanulu, 'Engineering Physics' S.Chand & Company Ltd, New Delhi (2015)
2. D. K. Bhattacharya, Poonam Tandon "Engineering Physics" Oxford University Press 2017.

REFERENCES

1. Engineering Physics, Sonaversity, Sona College of Technology, Salem (Revised Edition 2018).
2. B. K. Pandey and S. Chaturvedi, Engineering Physics , Cengage Learning India Pvt. Ltd., Delhi, 2019
3. Rajendran, V, and Marikani A, 'Materials science' TMH Publications, (2004) New Delhi.
4. Palanisamy P.K, 'Materials science', SciTech Publications (India) Pvt. Ltd., Chennai, Second Edition (2007)

U19EGR206A – ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

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

1. predict the construction of various curves in civil elevation, plan and machine components.
2. analyze the principles of projection of various planes by different angle to project points, lines and planes.
3. draw the principles of projection of simple solid by the axis is inclined to one reference plane by change of position method.
4. understand the interior details of complex components, machineries by sectioning the solid body. study the development of surfaces for prisms and pyramids.
5. draw the projection of three dimensional objects representation of machine structure and explain standards of orthographic views by different methods.

CONCEPTS AND CONVENTIONS (Not for Examination) **03**

Importance of graphics in engineering applications, Use of drafting instrument, BIS conventions and specifications - Size, layout and folding of drawing sheets, Lettering and dimensioning.

COMPUTER AIDED DRAFTING (Not for Examination) **03**

Importance 2d Drafting, sketching, modifying, transforming and dimensioning.

UNIT I – PLANE CURVES (Manual drafting) **06**

Curves used in engineering practices Conics – Construction of ellipse – Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II – PROJECTION OF POINTS, LINES AND PLANE SURFACES (CAD software) **12**

Projection of points – Projection of straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to one reference planes.

UNIT III – PROJECTION OF SOLIDS (CAD software) 12

Creation of 3D CAD models of pyramids, prisms and solids of revolutions-Sectional views **- (Not for Examination)**

Projection of simple solids like prisms – pyramids – cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV – SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES (CAD software) 12

Sectioning of simple solids like prisms – pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other, (Obtaining true shape of section is not required). Development of lateral surfaces of simple and truncated solids – Prisms – pyramids –cylinders and cones.

UNIT V – Conversion of Isometric Views to Orthographic Views (Manual drafting) 12

Representation of three dimensional objects – General Principles of Orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

TOTAL: 60 Hours

TEXT BOOKS

1. P. Suresh et al., "Engineering Graphics and Drawing", Sonaversity, Sona College of Technology, Salem, Revised edition, 2012.
2. K.V. Natarajan Engineering Graphics by, Chennai, 17th edition 2003.

REFERENCES

1. Dhananjay A. JoIhe, Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill Publishing Company Limited, 2008.
2. Basant Agarwal and Agarwal C.M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. K. R. Gopalakrishnana, Engineering Drawing (Vol. I & II), Subhas Publications, 1998.
4. Bertoline & Wiebe fundamentals of graphics communication III edition McGrawhill 2002.

U19EC201 – ELECTRONIC DEVICES AND CIRCUITS

L	T	P	C
2	0	2	3

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

1. bias the transistors for amplification purpose
2. analyse the working principle of fets
3. analyse the mid-frequency operation of bjt amplifier circuits
4. calculate cut-off frequencies and bandwidth of bjt amplifier circuit
5. design the different types of power supply.

UNIT I - FIELD EFFECT TRANSISTORS **06+06**

JFETs – Drain and Transfer characteristics -Current Equations - Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, Characteristics – Comparison of MOSFET with JFET.

UNIT II - TRANSISTOR BIASING **06+06**

BJT – Need for biasing – Stability factor - Fixed bias circuit, Load line and quiescent point. Variation of quiescent point due to h FE variation within manufacturers tolerance - Stability factors - Different types of biasing circuits - Method of stabilizing the Q point - Advantage of Self bias (voltage divider bias) over other types of biasing- self bias as a constant current circuit.

UNIT III - MID-BAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS **06+06**

CE, CB and CC amplifiers - Method of drawing small-signal equivalent circuit - Miller's theorem - Comparison of CB, CE and CC amplifiers and their uses - Methods of increasing input impedance using Darlington connection and bootstrapping.

UNIT IV - FREQUENCY RESPONSE OF AMPLIFIERS **06+06**

General shape of frequency response of amplifiers - Definition of cut-off frequencies and bandwidth - Low frequency analysis of amplifiers to obtain lower cut-off frequency Hybrid equivalent circuit of BJTs - High frequency analysis of BJT amplifiers to obtain upper cut-off frequency – Gain Bandwidth Product.

UNIT V - RECTIFIERS AND POWER SUPPLIES **06+06**

Classification of power supplies, Rectifiers - Half-wave, full-wave and bridge rectifiers with resistive load. Analysis for V dc and ripple voltage with C, L, LC and CLC filters.

TOTAL: 60 Hours

TEXT BOOKS

1. Millman and Halkias, " *Integrated Electronics*", 2n^{d} Edition, Tata Mc Graw Hill, 2010.
2. Anil K. Maini and Varsha Agrawal, "*Electronics Devices and Circuits*", First Edition, Wiley Publications, 2009.

REFERENCES

1. Y.N. Bapat, "*Electronic devices and circuits, Discrete and Integrated*", 3rd Edition, Tata Mc Graw Hill, 2011
2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, " *Electronic Devices and Circuits*", 2nd Edition, TMH, 2007

U19EC202 – CIRCUIT THEORY

L	T	P	C
3	0	0	3

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

1. apply basic laws to calculate the voltage, current and power for ac and dc electric circuit.
2. identify the network topologies of circuits.
3. analyze the dc circuits using network theorems.
4. analyze the resonant circuits and coupled circuits.
5. analyze the two port networks for various parameters.

UNIT I - BASICS OF CIRCUIT ANALYSIS **9**

Review on mesh and nodal analysis – Star Delta Transformation Techniques – Phase Relationship For R, L And C – Impedance, Admittance for R, L And C Elements – Concept of Duality – Dual Network – Graphs of A Network – Trees, Twig, Link and Branches – Incidence Matrix – Tie-Set Matrix Formation and Cut-Set Matrix Formation of a Graph.

UNIT II - CIRCUIT THEOREMS **9**

DC analysis : Superposition Theorem – Thevenin's Theorem – Norton's Theorem – Reciprocity Theorem – Maximum Power Transfer Theorem – Tellegen's Theorem – Millman's Theorem.

UNIT III - SERIES RESONANT CIRCUITS AND COUPLED CIRCUITS **9**

Resonances: Natural Frequency and Damping Ratio – Series Resonance – Impedance and Phase Angle of a Series Resonance Circuit – Voltages and Currents in a Series Circuit – Quality Factor.Coupled Circuits: Self-Inductance – Mutual Inductance – Dot Conversion – Coupling Coefficient – Ideal Transformer.

UNIT IV - TRANSIENTS **9**

Steady State and Transient Response – DC Response of an R-L Circuit – DC Response of an R-C Circuit – DC Response of an R-L-C Circuit – Sinusoidal Response of R-L Circuit – Sinusoidal Response of R-C Circuit – Sinusoidal Response of R-L-C Circuit.

UNIT V - TWO PORT NETWORKS **9**

Two port Network – Open Circuit Impedance (Z) Parameters – Short Circuit Admittance (Y) Parameters –Transmission (ABCD) Parameters – Hybrid (h) Parameters –Inter Relationship of Different Parameters.

TOTAL: 45 Hours

TEXT BOOK

1. A Sudhakar, Shyammohan S Palli, "*Circuits and Networks Analysis and Synthesis*", Mc-Graw Hill, 2019.

REFERENCES

1. Ravish R Singh," Networks Analysis and Synthesis", Mc-Graw Hill Education, 2019.
2. M.L. Soni and J.C. Gupta, A Course in "*Electrical Circuits Analysis"*, Dhanpat Rai & Co.(P), 2015.
3. G.K. Mithal and Ravi Mittal, *"Network Analysis"*, Khanna Khanna Pub, 2017.
4. Umesh Sinha, L.P.Singh,"Circuit and Field Theory", Tech India Publication Series, 2016.
5. Abhijit Chakrabarti, "Circuit Theory Analysis and Synthesis", Dhanpat Rai & CO. (Pvt).Ltd, Educational and technical publishers.

U19WPL212 – WORKSHOP PRACTICE

L	T	P	C
0	0	2	1

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

CO1 Familiarize with the basic of tools and equipment's used in fitting, carpentry, welding and sheet metal.

CO2 Fabricate the different simple products in above trades.

CO3 Produce different joining of metals.

List of Experiments

SECTION 1: FITTING

Tools and Equipment's- Practice in filling.

Making of Vee joint and square (T-fitting) joint.

SECTION 2: SHEET METAL

Tools and Equipment's- Practice

Making of Dust Pan and Funnel.

SECTION 3: WELDING

Tools and Equipment's – Practice

Arc welding of Butt joint and Lap Joint.

SECTION 4: CARPENTRY

Tools and Equipment's- Planning Practice

Making of Half Lap joint and Dovetail Joint.

TOTAL: 30 Hours

U19PCL208B – PHYSICS AND CHEMISTRY LABORATORY

L	T	P	C
0	0	4	2

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

1. apply the principles of optics, electricity and elasticity to determine the Engineering properties of materials.
2. analyse the given water sample to determine the amount of hardness and different types of alkalinity and determine their amount in the given water sample.
3. determine the resistivity of the given fuse wire used for house hold applications. Determine the molecular weight of various polymers, analyse the quality of brass by estimating copper and calculate the amount of chromium present in the given sample of water.

Physics Part - List of Experiments

1. Determination of the thickness of a thin wire by forming interference fringes using air wedge apparatus.
2. Determination of velocity of ultrasonic waves and compressibility of the given liquid using ultrasonic interferometer.
3. Determination of dispersive power of the prism for various pairs of colors in the mercury spectrum using a spectrometer.
4. Determination of wavelength of the laser source.
5. Determination of particle size of lycopodium powder using diode laser.
6. Determination of acceptance angle and numerical aperture of an optical fibre using diode laser.
7. Determination of the Young's modulus of the given material by non-uniform bending method.
8. Determination of rigidity modulus of the material of wire using torsion pendulum
9. Determination of specific resistance of a given wire using Carey Foster's bridge.
10. Determination of coefficient of viscosity of liquid by Poiseuille's method.

Chemistry Part - List of Experiments

1. Estimation of hardness of water sample by EDTA method.
2. Estimation of alkalinity of water sample by indicator method.
3. Estimation of copper in brass by EDTA method.
4. Estimation of HCl acid by pH metry.
5. Determination of iron content in water by spectrophotometric method.
6. Estimation of HCl by conductometry. (HCl vs NaOH)
7. Estimation of mixture of acids by conductometry. (HCl + CH_3COOH vs NaOH)
8. Estimation of ferrous ion by potentiometric titration.
9. Determination of molecular weight of a polymer by viscosity measurements.
10. Estimation of chromium in waste water.

TOTAL: 60 Hours

U19GE201 - BASIC APTITUDE - II

L	T	P	C
0	0	2	0

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

CO1 solve more elaborate problems than those in BA-I in specific areas of quantitative aptitude.

CO2 solve problems of greater intricacy than those in BA-I in stated areas of logical reasoning.

CO3 demonstrate higher than BA-I level verbal aptitude skills in English with regard to specific topics.

List of Experiments

1. QUANTITATIVE APTITUDE AND LOGICAL REASONING

Solving quantitative aptitude and logical reasoning problems with reference to the following topics:

a. Ratio and proportion
b. Partnership
c. Chain rule
d. Ages
e. Profit, loss and discount
f. Geometry
g. Area and volume
h. Data arrangement

2. VERBAL APTITUDE

Demonstrating verbal aptitude skills in English with reference to the following topics:

a. Jumbled sentences
b. Reconstructions of sentences (PQRS)
c. Sentence fillers two words
d. Idioms and phrases
e. Spotting errors
f. Writing captions for given pictures

TOTAL : 24 Hours

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester III under Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1.	U19MAT301C	Probability and Stochastic Processes	3	1	0	4
2.	U19EC301	Signals and Systems	3	1	0	4
3.	U19EC302	Digital Electronics	3	0	0	3
4.	U19EC303	Electronic circuits	3	0	0	3
5.	U19CS307	Programming in C	3	0	0	3
6.	U19GE303	**Mandatory Course :** Essence of Indian Traditional knowledge	2	0	0	0
Practical						
7.	U19EC304	Digital Electronics laboratory	0	0	2	1
8.	U19EC305	Electronic Circuits and Simulation laboratory	0	0	2	1
9.	U19CS308	C programing laboratory	0	0	2	1
10.	U19GE301	Soft Skills and Aptitude – I	0	0	2	1
					Total Credits	**21**

Approved By

Chairman, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/Electronics and Communication Engineering, Third Semester BE ECE Students and Staff, COE

U19MAT301C	**PROBABILITY AND STOCHASTIC PROCESSES**	L	T	P	C
		3	1	0	4

COURSE OUTCOMES

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

1. apply the concepts of probability, random variable and their properties to generate the moments.
2. fit the suitable distribution and its properties to the real world problems and interpret the results.
3. apply the concepts of joint probability distribution and its properties to find the covariance and transformation of random variables.
4. make a probabilistic model for characterizing a random signal.
5. find the expected frequency of the random process and analyze the response of random inputs to linear time invariant systems.

UNIT – I ONE DIMENSIONAL RANDOM VARIABLE 12

One dimensional random variable (Discrete and continuous) – Probability mass function, probability density function, moments, moment generating function and their properties.

UNIT – II THEORETICAL DISTRIBUTIONS 12

Binomial, Poisson, Uniform, Exponential and Normal distributions - Function of one dimensional random variable – Applications.

UNIT – III TWO DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation – Transformation of two dimensional random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT – IV RANDOM PROCESSES 12

Classification – First order, second order, strictly stationary, wide sense and ergodic processes – Poisson process.

UNIT – V SPECTRAL DENSITIES AND LINEAR SYSTEMS WITH RANDOM INPUTS 12

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

Theory: **45 Hours** Tutorial: **15 Hours** Total**: 60 Hours**

TEXT BOOKS:

1. T. Veerarajan, "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", McGraw Hill Publishers, 4th Edition, 7th Reprint, 2018.
2. P. Z. Peebles Jr., "Probability, Random Variables and Random Signal Principles", McGraw Hill Publishers, 4th Edition, 37th Reprint, 2016.

REFERENCE BOOKS:

1. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons Publishers, 11th Edition, Reprint, 2019.
2. R. A. Johnson and C. B. Gupta, "Miller and Freund's, Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2018.
3. S. Ross, "A First Course in Probability", Pearson Publishers, 9th Edition, 2019.
4. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall Publishers, Reprint, 2003.
5. W. Feller, "An Introduction to Probability Theory and its Applications – Volume – I", Wiley Publishers, 3rd Edition, 2008.
6. S. S. Haykin and B. Van Veen, "Signals and Systems," Wiley Publishers, 2nd Edition, 2007.

U19EC301 **SIGNALS AND SYSTEMS** **3 1 0 4**
(Common for ECE& BME)

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Classify the signals as continuous time and discrete time signals and classify systems based on their properties
2. Determine the response of LTI system using convolution sum for DT system and Convolution Integral for CT system
3. Apply Fourier series and Fourier Transform for periodic Signals
4. Analyze system using Laplace transform and realize the structure for CT system
5. Analyze system using Z transform and realize the structure for DT system

UNIT I : CLASSIFICATION OF SIGNALS AND SYSTEMS **12**

Continuous-Time and Discrete-Time signals–The Unit Impulse Unit Step, Unit Ramp Signals and other Basic Signals – Operation of Signals -Time Shifting – Time Reversal – Amplitude Scaling – Time Scaling – Signal Addition – Multiplications –Classification of signals- Continuous-Time and Discrete-Time Systems– Basic System Properties - Systems With and Without Memory – Causality – Stability – Time Invariance – Linearity.

UNIT II: LINEAR TIME- INVARIANT SYSTEMS **12**

Continuous-Time LTI Systems: The Convolution Integral - graphical and analytical approach – Properties of Linear Time-Invariant Systems – Solution of Differential Equations.

Discrete-Time LTI system: The Convolution sum-tabulation method-matrix multiplication method-graphical and analytical approach – Solution of Difference Equations.

UNIT III: ANALYSIS OF CT SIGNALS USING FOURIER SERIES & FOURIER TRANSFORM **12**

Fourier Series Representation (Trigonometric and Exponential) of Continuous-Time Periodic Signals – Properties of Continuous-Time Fourier Series – Representation of Aperiodic Signals: The Continuous-Time Fourier Transform – The Fourier Transform for Periodic Signals – Properties of the Continuous-Time Fourier Transform.

UNIT IV: ANALYSIS OF SIGNALS AND SYSTEMS USING LAPLACE TRANSFORM **12**

The Laplace Transform – The Region of Convergence for Laplace Transform– The Inverse Laplace Transform using Partial fraction– Properties of the Laplace Transform–System Function and Block Diagram Representations-Direct Form I and Direct Form II.

UNIT V: ANALYSIS OF SIGNALS AND SYSTEMS USING Z-TRANSFORM **12**

The Z-Transform – The Region of Convergence for the Z-Transform –The Inverse Z-Transform using Partial fraction and Long division method– Properties of the Z-Transform – System Function and Block Diagram Representations-Direct Form I and Direct Form II.

Lecture: 45 Tutorial:15 Total hours : 60

TEXT BOOKS

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, "*Signals and Systems*", 2nd E, Prentice Hall India, 2010
2. A.Anand Kumar, "*Signals and Systems*", 3rd Edition, Prentice Hall India,2013

REFERENCE BOOKS

1. M .J. Roberts, "*Signals & Systems Analysis using Transform Methods & MATLAB*", Tata McGraw Hill, 2007
2. Haykin, Simon, and Barry Van Veen. "*Signals and systems",* John Wiley & Sons, 2007.
3. A. NagoorKani, "*Signals & Systems*", Tata McGraw Hill, 2010
4. John G. Proakis, Dimitris G. Manolakis, "*Digital Signal Processing, Principles, Algorithms, and Applications*", 4th E, PHI, 2007
5. Robert A. Gable, Richard A. Roberts, "*Signals & Linear Systems*", 3rd E, John Wiley, 1995
6. Edward W Kamen& Bonnie's Heck, "*Fundamentals of Signals and Systems*", Pearson Education, 2007

U19EC302 **DIGITAL ELECTRONICS** **3 0 0 3**

COURSE OUTCOMES:

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

1. Explain number systems, logic gates, logic functions and simplify Boolean expressions
2. Design and analyze combinational logic circuits
3. Design of sequential logic circuits
4. Design and implement shift registers and counters.
5. Implementation of combinational circuits using Programmable Logic Devices

UNIT I NUMBER SYSTEM, BOOLEAN ALGEBRA AND LOGIC GATES **09**

Review of Number systems – Boolean Algebra – Basic Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Digital Logic Gates - NAND and NOR Implementation – Simplification of Boolean functions using K-Map Method – Four Variable K-map – POS Simplification – Don't Care Conditions – Tabulation method– TTL – ECL – CMOS Logic Circuits.

UNIT II COMBINATIONAL LOGIC CIRCUITS **09**

Analysis Procedures – Design Procedures – BCD to Excess-3-Parallel Adders and Subtractors – BCD Adder –Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Demultiplexers – Introduction to Verilog HDL – Verilog HDL code for 2 bit adder – 2:1 Multiplexer.

UNIT III SEQUENTIAL LOGIC CIRCUITS **09**

Flip-Flops – SR – D- JK-T– Master Slave JK Flip-Flop – Conversion of Flip Flops – Design of Clocked Sequential Circuits – State Diagram – State Table – State Reduction and Assignment

UNIT IV REGISTERS AND COUNTERS **09**

Registers – Shift Registers – SISO – SIPO – PIPO — Synchronous Counters – Up-down Binary Counter – Ring Counter – Johnson Counters – Asynchronous Counters – Asynchronous Design Procedure – Race Free State Assignment – Hazards

UNIT V MEMORY AND PROGRAMMABLE LOGIC **09**

Classification of memories: RAM - Static and Dynamic RAM, ROM - PROM, EPROM, EEPROM - Memory Decoding – Read/Write access - Implementation of combinational logic using PROM - Programmable Logic Array – Programmable Array Logic.

Lecture: 45, Tutorial: 00, Total: 45 Hours

TEXT BOOK

1. M. Morris Mano and Michael D. Ciletti – '*Digital Design with an Introduction to the Verilog HDL*', 6th Edition, Pearson Education, 2018

REFERENCE BOOKS

1. John F Wakerly – '*Digital Design Principles and Practices*', 4th Edition, Prentice Hall India, 2008.
2. Schilling, Herbert Taub and Donald, 'Digital Integrated Electronics', Tata McGraw-Hill, 2008.
3. A.Anandkumar, 'Fundamentals of digital circuits, 4th Edition, Prentice Hall India, Paper back'2016.
4. Jayaram Bhasker, '*A Verilog HDL Primer'*, 2nd E, BS publications, Paper back'2008.

U19EC303 **ELECTRONIC CIRCUITS** **3 0 0 3**

COURSE OUTCOMES:

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

1. Design negative feedback amplifier circuits.
2. Analyze tuned amplifiers circuits and describe the working of Signal Generators.
3. Analyze the operation of multivibrators and wave shaping circuits.
4. Design and analyze multistage amplifiers.
5. Describe the types of power amplifiers.

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UNIT I : FEEDBACK AMPLIFIERS **09**

Classification of amplifiers – Feedback concept – Transfer gain with feedback – General characteristics of negative feedback –Negative feedback topologies -Voltage Series feedback – Current Series feedback – Voltage Shunt feedback – Current Shunt feedback - Input resistance – Output resistance – Method of identifying of feedback topology and feedback factor – Nyquist criterion for stability of feedback amplifiers

UNIT II : TUNED AMPLIFIERS AND OSCILLATORS **09**

Tuned amplifiers - Q factor – Single tuned – Double tuned – Stagger tuned – Class C tuned - Classification of Oscillators – Barkhausen criterion – General form of LC oscillators – Hartley oscillator-Colpitts oscillators - Clapp oscillators – Analysis of RC oscillators-RC phase shift oscillators-Wien bridge oscillators – Crystal oscillators – Frequency stability of oscillators.

UNIT III : WAVE SHAPING AND MULTIVIBRATOR CIRCUITS **09**

RC and RL integrator and differentiator circuits - Diode clippers – series and parallel – Diode clampers – positive and negative - Schmitt trigger circuit – Collector coupled multivibrators – Astable multivibrator – Monostable multivibrator - Bistable multivibrator – waveform analysis.

UNIT IV : MULTISTAGE AMPLIFIERS **09**

Different coupling schemes – General analysis of cascade amplifier - Bandpass of cascaded stages – RC coupled amplifier – Low frequency response of RC coupled stage – Effect of an emitter bypass capacitor on low frequency response – Transformer coupled amplifier – Direct coupled amplifier – Differential amplifier.

UNIT V : LARGE SIGNAL AMPLIFIERS **09**

Classification based on biasing condition - Class A large signal amplifiers – Transformer coupled audio power amplifier – Efficiency – Push-Pull amplifiers – Class B amplifiers – efficiency - Class AB operation – Class D amplifier – Class S amplifier.

Lecture: 45, Tutorial: 00, Total: 45 Hours

TEXT BOOKS

1. Salivahanan, Suresh Kumar and Vallavaraj, “Electronic Devices and Circuits”, TMH, 3rd edition 2012.

REFERENCE BOOKS

1.Dr.Sanjay Sharma – “Electronic Principles”- S.K.Kataria and sons-third edition 2014.

2.J. Millman and A.Grabel, “Micro Electronics”, second edition, 2009

3.A.S.Sedra and K.C. Smith, “Micro Electronic Circuits”, Oxford press, fourth edition, 1998.

4.J. Millman and Halkias, “Integrated Electronics”, second edition, 2010.

U19CS307 PROGRAMMING IN C 3 0 0 3

COURSE OUTCOMES

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

1. Write simple C programs using console input and output functions
2. Write C programs using arrays, decision making and looping statements
3. Design and develop simple application using functions and pointers.
4. Design and develop real-time applications using structures and unions
5. Design and develop real-time applications using file operation

UNIT I BASICS OF C PROGRAMMING 9

Introduction to programming paradigms - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process

UNIT II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array – Two dimensional arrays – multi-dimensional array- String – string built-in functions – Sorting- Searching

UNIT III FUNCTIONS AND POINTERS 9

Introduction to functions: Function prototype, function definition, function call-Call by Value-Call by reference – Recursion – user defined functions versus built-in functions- Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – pointers to an array – function pointer-indirect pointer.

UNIT IV STRUCTURES 9

Structure – Structure definition-Nested structures – Pointer and Structures – Array of structures – Self-referential structures – bit fields- Union-Dynamic memory allocation - Singly linked list – typedef.

UNIT V FILE PROCESSING 9

Files – Types of file- File Primitives- File access mode- Sequential file access - Random file access - Command line arguments-introduction to TSR programs

TEXT BOOK

1. Ben Clemens “21st Century C ”, Second Edition ,Oreilly Media Inc,2014
2. Deitel and Deitel, “C How to Program”, Pearson Education, New Delhi, 2011.

REFERENCE BOOKS

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.
2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications, 14th edition, 2016.
3. Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
4. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. E. Balagurusamy, “Programming in ANSI C”, seventh edition, Tata McGraw Hill, 2016.

U19EC304 DIGITAL ELECTRONICS LABORATORY 0 0 2 1

COURSE OUTCOMES

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

1. Design and implement combinational circuits using logic gates and breadboards
2. Design and implement counter circuits using Flip flops and breadboards
3. Design and implement Shift Registers using Flip flops and breadboards

List of Experiments:

1. Design and implementation of
   (a) Half Adder and Full Adder, Half Subtractor and Full Subtractor
   (b) 4-bit Parallel Adder cum Subtractor
   (c) BCD adder
   (d) Magnitude Comparator

2. Design and implementation of
   (a) Code Converters – Binary to Gray and Gray to Binary
   b) BCD to Excess 3 and Excess 3 to BCD

3. Design and implementation of
   (a) 4:1 / 8:1 Multiplexer
   (b) 1:4 / 1:8 Demultiplexer
   (c) Decoder – BCD to Seven Segment
   (d) Encoder – 4×2 Priority Encoder
   (e) Parity Generator and Checker

4. Design and implementation of
   (a) 3-bit Asynchronous Counter
   (b) 3-bit Synchronous Counter
   (c) 4-bit Ring Counter
   (d) 4-bit Johnson Counter

5. Design and implementation of
   (a) Shift Registers – SISO, SIPO and PIPO

U19EC305 ELECTRONIC CIRCUITS AND SIMULATION LABORATORY 0 0 2 1

Course outcomes

At the end of each experiment, the students will be able to –

1. Realize feedback amplifiers and power ampliifers from various parameters.
2. Design and test Oscillator, multivibrator and wave shaping circuits using BJT
3. Obtain the frequency response from single stage, two stage amplifiers and differential amplifier.

List of experiments

1. Design the current series feedback amplifier and calculate the parameters (Gain, Input impedance, Output Impedance, Bandwidth) with and without feedback condition.
2. Design the Voltage shunt feedback amplifier and calculate the parameters (Gain, Input impedance, Output Impedance, Bandwidth) with and without feedback condition.
3. Design RC Phase shift oscillator and obtain the waveform for the frequency of 5 KHz.
4. Design Wien Bridge oscillator and obtain the waveform for the frequency of 10 KHz
5. Design LC oscillator(Hartley and Colpitts) and obtain the waveform for the frequency of 250 KHz.
6. Construct differentiator and integrator circuit by using passive element. Obtain waveform for following input signal
   (i) Sine waveform
   (ii) Square waveform
   (iii) Triangular waveform
7. Design and construct the following passive clipper and clamper circuit. Obtain the output waveform
   (i) Series clipper
   (ii) Shunt clipper
   (iii) Combinational clipper
   (iv) Clamping circuit
8. Design multivibrators (Astable ,Monostable and Bistable) using BJT and Obtain the output waveform for the time period of 250 μs.
9. Obtain the frequency response of' a two stage RC coupled amplifier
10. Design and test a differential amplifier in
    (i) Common mode
    (ii) Difference mode
11. Design Class A amplifier and Class B power amplifiers. Observe the output waveform and measure its efficiency.
12. Simulation using PSPICE:
    RC phase shift, Hartley, Colpitts oscillators,
    Integrator, differentiator,
    Clippers and Clampers,
    Astable multivibrator, Monostable multivibrator

U19CS308 C PROGRAMMING LABORATORY 0 0 2 1

COURSE OUTCOMES:

After successful completion of the course, the students would be able to

1. Design and develop simple programs using branching, looping statements
2. Develop programs using functions, arrays, structures and string handling
3. Write programs using pointers and dynamic memory allocation and file handling

List of Experiments:

1. Programs using Input, Output and assignment statements.
2. Programs using Branching statements
3. Programs using Looping statements
4. Programs using Functions
5. Programs using Arrays
6. Programs using Structures
7. Programs using Strings
8. Programs using Pointers (both data pointers and function pointers)
9. Programs using dynamic memory allocation
10. Programs using Recursion
11. Programs using Files

TOTAL : 30 hours

Semester-III	U19 GE301- SOFT SKILLS AND APTITUDE – I	L T P C Marks 0 0 2 1 100
Course Outcomes **At the end of the course the student will be able to:**		
1. Demonstrate capabilities in specific soft-skill areas using hands-on and/or case-study approaches		
2. Solve problems of greater intricacy in stated areas of quantitative aptitude and logical reasoning		
3. Demonstrate higher levels of verbal aptitude skills in English with regard to specific topics		
1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics**: a. Attitude building b. Dealing with criticism c. Innovation and creativity d. Problem solving and decision making **e.** Public speaking **f.** Group discussions	
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. **Vedic Maths:** Fast arithmetic, multiplications technique, Criss cross, Base technique, Square root, Cube root, Surds, Indices, Simplification. b. **Numbers:** Types, Power cycle, Divisibility, Prime factors & multiples, HCF & LCM, Remainder theorem, Unit digit, highest power. c. **Averages:** Basics of averages and weighted average. d. **Percentages**: Basics of percentage and Successive percentages. e. **Ratio and proportion:** Basics of R &P, Alligations, Mixture and Partnership. f. **Profit ,Loss and Discount**: Basic & Advanced PLD g. **Data Interpretation**: Tables, Bar diagram, Venn diagram, Line graphs, Pie charts, Caselets, Mixed varieties, Network diagram and other forms of data interpretation. h. **Syllogism:** Six set syllogism using Venn diagram and tick and cross method	
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Verbal analogy b. Tenses c. Prepositions d. Reading comprehension e. Choosing correct / incorrect sentences f. Describing pictures g. Error spotting	

Department of Placement Training
Sona College of Technology.
Salem-636 005.

SEMESTER – III

MANDATORY COURSE

U19GE303 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

(Common for IT, ECE and BME)

L	T	P	C
2	0	0	0

Course Outcomes

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

1. understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
2. show an ability to comment critically on curriculum proposals that aim to promote science citizenship/scientific literacy
3. communicate using common medical and psychological terminology, including the skill to discuss commonly used medications, supplements, and surgical procedures
4. use effective oral and written language skills to communicate scientific data and ideas
5. describe the fundamentals of yoga and its importance

Unit I 6

- Introduction to Vedas
- Traditional methodology of Veda – Sat Angas
- Types of Vedas and their application
- Sub Veda – Ayurveda - their modern day application

Unit II 6

- Basics of Applied Vedic Science
- Modern day application of Vedas and procedure
- Ancient Indian Scientific thoughts
- Introduction to the Vedic language "Sanskrit"

UNIT – III- Modern science 6

- Introduction – modern science
- Objectives – modern science
- Architecture in ancient India

UNIT – IV Technology 6

- India's contribution to science and technology (from ancient to modern)
- Nobel laureates of Indian origin and their contribution
- India in space
- Latest achievement from Jan – 2017

20.05.2020 **B.E. / B.Tech. Regulations 2019**

UNIT – V- Yoga and Holistic Health Care 6

- Fundamentals of yoga and holistic health
- Human biology
- Diet and nutrition
- Life management
- Contemporary yogic models – case study

References

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016.
4. Roshan Dalal The Vedas: An Introduction to Hinduism's Sacred Texts, Penguin Books 2014. ISBN 13: 9780143066385
5. Raja Ram Mohan Roy, Vedic Physics, Mount Meru Publication ISBN : 9781988207049

Total: 30 HOURS

20/5/20
Dr. M. Raja
Course Coordinator / Sciences

20.5.2020
Dr. C. Shanthi
HOD / Sciences

20/5
Dr. M. Renuga
Chairperson BOS,
Science and Humanities

20.05.2020 **B.E. / B.Tech. Regulations 2019**

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester IV under Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1.	U19EC401	Engineering Electromagnetics	3	0	0	3
2.	U19EC402	Linear Integrated Circuits	3	0	0	3
3.	U19EC403	Digital Signal Processing	3	0	0	3
4.	U19EC404	Analog Communication Systems	3	0	0	3
5.	U19CS406	Data Structures	3	0	0	3
6.	U19GE402	**Mandatory Course :** Environment and Climate Science	2	0	0	0
Practical						
7.	U19EC405	Linear Integrated Circuits Laboratory	0	0	2	1
8.	U19EC406	Digital Signal Processing Laboratory	0	0	2	1
9.	U19CS407	Data Structures Laboratory	0	0	2	1
10.	U19GE401	Soft Skills and Aptitude – II	0	0	2	1
					Total Credits	**19**

Approved By

Chairperson, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Electronics and Communication Engineering, Fourth Semester BE ECE Students and Staff, COE

U19EC401 **ENGINEERING ELECTROMAGNETICS** **L T P C**

3 0 0 3

COURSE OUTCOMES

At the end of each unit, the students will be able to

1. Apply the concepts of coordinate system to analyze the geometrical parameters of objects and field quantities.
2. Apply the concepts of electrostatics to evaluate the capacitance of parallel plate, coaxial and spherical capacitors.
3. Apply the concepts of magnetostatics to evaluate the inductance of solenoid, toroid and coaxial transmission line.
4. Analyze electromagnetic wave propagation in various guiding medium.
5. Apply EMI and EMC concepts to solve different implications of EM radiation in practical applicaitions

UNIT I **INTRODUCTION TO COORDINATE SYSTEMS** 9

Introduction-Cartesian Co-ordinate System – Vector Components and Unit Vector- Cylindrical Coordinate System – Spherical Coordinate System – transformation of vectors from rectangular coordinates to cylindrical coordinates, cylindrical coordinates to rectangular coordinates, rectangular coordinates to spherical coordinates, spherical coordinates to rectangular coordinates, cylindrical coordinates to spherical coordinates, spherical coordinates to cylindrical coordinates- Curl and Divergence- Divergence theorem and Stokes theorem.

UNIT II **STATIC ELECTRIC FIELD** 9

Energy Expended in Moving a Point Charge in an Electric Field– Definition of Potential Difference and Potential – Potential Gradient – Potential Field of a Point Charge –Electric field intensity for Dipole – Gauss law for static field- Boundary Conditions for Perfect Dielectric Material – Capacitance – Capacitance for parallel sheet, coaxial and spherical geometries – Derivation of

UNIT III **STATIC MAGNETIC FIELD** 9

Introduction to magneto statics- Inductance- Inductance of a solenoid-inductance of a Toroid-Energy stored in an inductor- Inductance of a coaxial cable- Inductance of a two wire transmission line- Energy density in a magnetic field- Boundary conditions for a magnetic field- scalar and magnetic vector potential.

UNIT IV **TIME VARYING FIELDS AND PLANE WAVE** 9

Faraday's Law – Displacement Current – Maxwell's Equation in Point Form – Maxwell's Equation in Integral Form - Poynting's Theorem- EM waves-plane wave-uniform plane wave- derivation of a wave equation for a free space in terms of E & H-Wave equation for a conducting medium-Wave Propagation in good conductor-Skin Effect.

UNIT V PRACTICAL IMPLICATIONS OF EM RADIATION

Introduction to EMI and EMC- The Case Study of Electromagnetic Exposure in Railways, the case study of EMI on medical equipment, A Case Study of EMI Elimination and Ground Noise Reduction Using Ground Noise Filters, a case study on EMI in Printed circuit boards.

Lecture: 45 Hours, Tutorial: - , Practical: - , Total: 45 Hours

TEXT BOOK

1. Matthew N. O. Sadiku and S. V. Kulkarani, "Principles of Electromagnetics", 6 Edition Oxford University Press, 2015

REFERENCE BOOKS

1. W. H. Hayt and J. A. Buck, "Engineering Electromagnetics", TATA McGraw-Hill, 9th Edition, 2019
2. David K Cheng, " Field and wave Electromagnetics", Pearson edition, 2004
3. John D. Kraus and Daniel A. Fleisch, "Electromagnetics with Applications", 5th Edition, McGraw Hill International Editon, 1999.
4. E. C. Jordan and K. G. Balmain, "Electromagnetic waves and Radiating Systems", Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1968.

U19EC402 **LINEAR INTEGRATED CIRCUITS**

L	T	P	C
3	0	0	3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Analyze and understand the fundamental operations of Analog ICs.
2. Design analog circuits using Op-Amps.
3. Describe the working of Signal Generators.
4. Explain the working of Voltage Reference and Regulator circuits.
5. Analyze the operation of Analog to Digital and Digital to Analog operations.

UNIT I **STATIC AND DYNAMIC OP AMP LIMITATIONS.** **9**

Simplified Op Amp circuit diagram – Constant current source(current mirror) –Widlar current source–Wilson current source– Input Bias and Offset Currents – Input Offset Voltage–Input Offset Error Compensation –Open loop response – Closed loop response – Input and output Impedances – ,Internal frequency Compensation– External frequency Compensation. Active filters – The Transfer function – First-order Active filters – Standard Second order Responses.

UNIT II **OPERATIONAL AMPLIFIER FUNDAMENTALS AND APPLICATIONS** **9**

Amplifier Fundamentals – The Operational Amplifier – Ideal Op Amp – Basic Op Amp configurations – Non inverting Amplifier – Voltage follower – Inverting Amplifier – Ideal Op Amp circuit Analysis – Summing Amplifier – Difference Amplifier – Differentiator – Integrator– Negative Feedback– Feedback in Op Amp circuits – The Loop Gain – Circuits with Resistive feedback – Current to Voltage converters – Voltage to Current converters – Differential Amplifiers, Instrumentation Amplifiers.

UNIT III **OPAMP NONLINEAR CIRCUITS AND SIGNAL GENERATORS.** **9**

Voltage comparators – Comparator Applications – Schmitt Triggers – Precision Rectifiers – Analog switches – Peak Detectors – Sample-and-Hold Amplifiers – Log/ Antilog amplifiers – Signal Generators – Sine wave generators – Multivibrators – Astable Multivibrators – Monostable Multivibrators – Monolithic Timers(555) – 555 Timer as an Astable Multivibrator – 555 Timer as an Monostable Multivibrator – Triangular wave generators – Saw tooth wave generators.

UNIT IV **VOLTAGE REFERENCES, REGULATORS AND ANALOG MULTIPLIERS.** **9**

Performance specifications – Voltage References – Band gap voltage references – Voltage Reference Applications – Linear regulators – protections – Monolithic voltage regulators – Linear regulator Applications – Switching regulators – basic topologies – Efficiency – Monolithic switching regulator – Voltage mode control – Current mode control – Analog multiplier –Analysis of four quadrants and Variable transconductance multiplier.

UNIT V D-A AND A-D CONVERTERS, PHASE LOCKED LOOP. 9

Performance specifications – D-A conversion techniques – Weighted resistor DACs – R-2R Ladders – Current mode R-2R Ladder – Voltage mode R-2R Ladder – Multiplying DAC Applications – A-D conversion techniques – Successive approximation converters – Flash converters – integrating type converters – Over sampling converters – Phase locked loops, Monolithic PLL, Special ICs-Isolation Amplifier IC and Opto Coupler IC.

Lecture: 45 Hours, Tutorial: - , Practical: - , Total: 45 Hours

TEXT BOOKS

1. D.Roy Choudhry,Shail jain –"Linear Integrated Circuits"-New age Pub,2018.

2. Sergio Franco –"Design with Operational Amplifiers and Analog Integrated Circuits"-Tata Mc Graw Hill, -2015.

REFERENCE BOOKS

1. S.Salivahanan and V.S.Kanchana Bhaskaran-"Linear Integrated Circuits "-Tata Mc Graw – Hill -2018.

2. Ramakant A.Gayakwad,"Op-Amp and Linear ICs"- Prentice Hall/Pearson Education-2015.

3. Gray and Meyer-"Analysis and Design of Analog Integrated Circuits", Wiley international, 2009.

U19EC403	DIGITAL SIGNAL PROCESSING	L	T	P	C
		2	1	0	3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Describe DFT , FFT and to perform its computations
2. Design FIR digital filters using various techniques
3. Design IIR digital filters using different techniques.
4. Analyse the finite word length effects in signal processing
5. Describe the fundamentals of digital signal processors

UNIT I DISCRETE FOURIER TRANSFORM AND FFT **9**

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Fast convolution- overlap save method and overlap add method.

UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS **9**

Review of design of analog Butterworth and Chebychev Filters – Design of IIR digital filters using impulse invariance technique – Design of IIR digital filters using bilinear transformation – pre warping – Frequency transformation in digital domain – Realization cascade and parallel form.

UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS

9

Amplitude and phase responses of FIR filters – Linear phase filters – Windowing techniques for design of linear phase FIR filters: Rectangular- Hamming- Hanning- Gibbs phenomenon –Principle of frequency sampling technique. Realization of FIR filters- Linear and cascade form.

UNIT IV FINITE WORD LENGTH EFFECTS **9**

Quantization noise – derivation for quantization noise power- comparison – truncation and rounding error – input quantization error-coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

UNIT V DIGITAL SIGNAL PROCESSORS **9**

Architectural Features – Von Neumann architecture- Harvard architecture- Bus Architecture and Memory- Multiplier- Shifter- MAC Unit- ALU- Addressing Modes – Address Generation Unit - pipelining- Overview of instruction set of TMS320C54XX. Introduction of TMS320C6748 Processor.

Lecture: 30 Hours, Tutorial:15 , Practical: - , Total: 45 Hours

TEXT BOOKS

1 John G Proakis- Dimtris G Manolakis-" Digital Signal Processing Principles-Algorithms and Application"- Pearson/PHI- 4th Edition- 2014

2 B.Venkataramani & M-Bhaskar- "Digital Signal Processor Architecture- Programming and Application"- TMH 2017

REFERENCE BOOKS

1 Allan V.Openheim, Ronald W.Sehafer & John R.Buck, "Discrete Time Signal Processing"- second edition Pearson/Prentice Hall, 2014.

2 P.Ramesh Babu, **"**Digital Signal Processing"-SCITECH-2017.

3 S.K.Mitra, "Digital Signal Processing- A Computer based approach"- Tata McGraw-Hill- 2006- New Delhi.

4 S.Salivahanan, A.Vallavaraj, Gnanapriya, "Digital Signal processing" - McGraw Hill / TMH,2019.

U19EC404 ANALOG COMMUNICATION SYSTEMS L T P C

3 0 0 3

COURSE OUTCOMES

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

1. Describe the generation and detection methods of various AM systems.
2. Explain the Modulation and demodulation methods of FM systems.
3. Classify the types of noise and its effect on communication system.
4. Analyze the noise performance of various Analog modulation systems
5. Know the purpose of information theory and the significance of source coding.

UNIT I: AMPLITUDE MODULATION SYSTEMS 09

Principles of Amplitude Modulation – Mathematical Expression for Single Tone AM – Power Relations in AM – Types of AM – DSBSC-SSBSC and VSB – Generation and Detection Methods – Comparison of Various AM Systems – AM transmitters - Low Level and High Level Modulation – AM Receivers – TRF, Super-heterodyne Radio Receiver.

UNIT II: ANGLE MODULATION SYSTEMS 09

Phase and Frequency Modulation – Principles of FM – Expression for Single Tone FM –

Frequency Analysis of FM – Transmission Bandwidth of FM – NBFM and WBFM Generation Methods – Direct Method and Indirect (Armstrong) Method of FM Generation –FM Demodulators – FM Transmitters and Receivers.

UNIT III: NOISE THEORY 09

Noise – Thermal Noise and Shot Noise – Narrow Band Noise and its Representation using InPhase and Quadrature Components – Noise Figure and its Expression in Terms of SNR – Overall Noise Figure Calculation for Cascaded Amplifiers – Friss Formula – Noise Temperature – Noise Bandwidth – Equivalent Noise Resistance.

UNIT IV: PERFORMANCE OF CW MODULATION SYSTEMS 09

Channel SNR – Output SNR – Figure of Merit – Noise in DSBSC and SSBSC Systems using

Coherent Detection – Noise in AM System using Envelope Detection – Noise Performance

Analysis in FM System – FM Threshold Effect – Threshold Improvement in Discriminators –

Pre-Emphasis and De-Emphasis in FM – Noise Performance Comparison between CW

Modulation Systems.

UNIT V: INFORMATION THEORY AND CODING 09

Amount of Information – Entropy – Information Rate – Source Coding Theorem, Code variance, Redundancy – Shannon-Fano Coding – Huffman Coding , Channel Capacity – BCC – BEC – BSC – Channel capacity Theorem (Shannon's Theorem) –– Bandwidth – SNR Trade-Off – Mutual Information

Lecture: 45 Hours, Tutorial: - , Practical: - , Total: 45 Hours

TEXT BOOKS

1. Simon Haykins, "Communication Systems", John Wiley & Sons, 4th Edition, 2016.

2. R.P. Singh and S.D. Sapre, "Communication Systems– Analog and Digital", Tata McGrawHill,3rd Edition, 2014.

REFERENCE BOOKS

1. Wayne Tomasi, "Electronic Communication Systems", 5/e, Pearson Education, 2011.
2. H.Taub, D L Schilling, G Saha, "Principles of Communication", 3/e, 2011.
3. Dr. Sanjay Sharma, "Analog Communication systems", S.K. Kataria & sons, 6thedition, 2013.

U19CS406 DATA STRUCTURES L T P C

3 0 0 3

COURSE OUTCOMES

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

1. Implement abstract data types for linear data structures
2. Solve real world problems using stack and queue linear data structures
3. Apply various non-linear tree data structures in real time applications
4. Design algorithms to solve common graph problems
5. Analyze various searching, sorting and hashing techniques

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation - Singly linked lists - Circularly linked lists - Doubly-linked lists – Applications of lists

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations– Evaluating arithmetic expressions - Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Double ended queue – Applications of Stacks and queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Trees – Traversals – Binary Trees – Expression trees – Applications of trees – Binary search trees - AVL Trees – B-Tree – Heap – Applications of heap -Tries.

UNIT IV NON LINEAR DATA STRUCTURES – GRAPHS 9

Graphs - Representation of graph – Graph traversals – Breadth-first traversal – Depth-first traversal – Minimum Spanning Trees: Prim's algorithm, Kruskal's algorithm – Shortest path algorithms: Dijkstra's algorithm- Applications of Graphs: Topological Sort.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching - Linear Search – Binary Search, Sorting – Bubble sort– Insertion sort – Merge sort, Hashing - Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Lecture: 45 Hours, Tutorial: - , Practical: - , Total: 45 Hours

TEXT BOOK

1. Mark Allen Weiss, "Data structures and Algorithm Analysis in C", Pearson Education, New Delhi, Second Edition, 2012.

REFERENCES BOOKS

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest , Clifford Stein, "Introduction to Algorithms" ,3rd Edition, MIT Press, 2010.
2. Jean Paul Tremblay and Sorenson, "An Introduction to Data Structures with Applications", McGraw Hill Publishing Company, New Delhi, Second Edition, 2007.
3. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tanenbaum, "Data Structures using C and C++", Prentice Hall of India/ Pearson Education, New Delhi, 2006.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Silicon Press, New Jersey, Second Edition, 2005

Total Hours: 30

U19EC405	LINEAR INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OUTCOMES

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

1. Design circuits using Op-amp, PLL and Timer ICs for various applications.
2. Design analog filters using Op-amp.
3. Design voltage regulators using IC 723.

List of Experiments:

1. Design of Inverting and Non-Inverting amplifier using Opamp (IC 741).
2. Design of Integrator and Differentiator using Opamp (IC 741).
3. Design of Differential amplifier to find CMRR using Opamp (IC 741).
4. Design of Astable and Monostable multivibrator using Opamp IC 741.
5. Design of Schmitt triggers using Opamp (IC 741).
6. Design of Low pass and High pass filters using Opamp (IC 741).
7. Design of Band pass filters using Opamp (IC 741).
8. Design of RC phase shift and Wein bridge oscillators using Opamp(IC 741).
9. Design of Astable and Monostable multivibrators using IC 555.
10. Design of low and high voltage regulator using IC 723.

Total Hours: 30

U19EC406 DIGITAL SIGNAL PROCESSING LABORATORY

L	T	P	C
0	0	2	1

COURSE OUTCOMES

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

1. Perform convolution, sampling and FFT operations using MATLAB and DSP Processor
2. Design FIR and IIR filters using MATLAB and DSP Processor
3. Perform arithmetic operations and generation of signals using DSP Processor

List of Experiments

Using MATLAB

1. Generation of Discrete time signals
2. Linear and Circular convolution
3. Auto and Cross Correlation
4. Sampling and effect of Aliasing
5. Design of FIR Filters
6. Design of IIR Filters
7. DFT and FFT
8. Up sampling and Down sampling

Using TMS320C54 Processor

9. Arithmetic operations using DSP
10. Sampling of input signal and display
11. Implementation of FIR Filters
12. Implementation of IIR Filters
13. Linear convolution
14. Generation of Signals
15. Calculation of FFT
16. Study of TMS320C6748 Processor.

Total Hours: 30

U19CS407 DATA STRUCTURES LABORATORY

L	T	P	C
0	0	2	1

COURSE OUTCOMES

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

1. Design and develop simple programs using data structures
2. Apply non-linear data structures for various real time applications
3. Design shortest path algorithm for various real life applications

LIST OF EXPERIMENTS

1. Implementation of Lists ,Stacks and Queues
2. Implementation of Binary Tree and Traversal Techniques
3. Implementation of Binary Search Trees
4. Implementation of AVL Trees
5. Implementation of B-trees
6. Implementation of graphs using BFS and DFS.
7. Implementation of Prim's algorithm.
8. Implementation of Kruskal's algorithm
9. Implementation of Dijkstra's algorithm
10. Implementation of Hashing and Collision Resolution Technique.
11. Implementation of Heap
12. Implement of Sorting and searching Techinques

Total Hours: 30

`

Semester – IV	U19GE401 SOFT SKILLS AND APTITUDE – II	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

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

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve problems of increasing difficulty than those in SSA-I in given areas of quantitative aptitude and logical reasoning and score 65-70% marks in company-specific internal tests
3. Demonstrate greater than SSA-I level of verbal aptitude skills in English with regard to given topics and score 65-70% marks in company-specific internal tests

1.Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. SWOT b. Goal setting c. Time management d. Stress management e. Interpersonal skills and Intrapersonal skills f. Presentation skills g. Group discussions
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Equations: Basics of equations , Linear, Quadratic Equations of Higher Degree and Problem on ages. b. Logarithms, Inequalities and Modulus c. Sequence and Series: Arithmetic Progression, Geometric Progression, Harmonic Progression, and Special Series. d. Time and Work: Pipes & Cistern and Work Equivalence. e. Time, Speed and Distance: Average Speed, Relative Speed, Boats & Streams, Races and Circular tracks and Escalators. f. Arithmetic and Critical Reasoning: Arrangement, Sequencing, Scheduling, Network Diagram, Binary Logic, and Logical Connection. h. Binary number System.- Binary to decimal, Octal, Hexadecimal
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Critical reasoning b. Theme detection c. Verbal analogy d. Prepositions e. Articles f. Cloze test g. Company specific aptitude questions

Department of Placement Training

Sona College of Technology, Salem **Department of Sciences (Chemistry)**

SEMESTER – IV

MANDATORY COURSE

U19GE402 - ENVIRONMENT AND CLIMATE SCIENCE

(Common for MCT, IT,FT,ECE and BME)

L	T	P	C
2	0	0	0

Course Outcomes:

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

1. state the importance of the acute need for environmental awareness and discuss significant aspects of natural resources like forests, water and food resources.
2. explain the concepts of an ecosystem and provide an overview of biodiversity and its conservation.
3. explain environmental based pollution their causes, effects and their remedial measures
4. discuss their causes, effects and the control measures of Global Warming, Acid Rain, Ozone Layer Depletion
5. describe the effect of climate change due to pollution

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 6

Definition, Scope and Importance Forest Resources:- Use and over - exploitation, deforestation, Case Studies, Water Resources:- Use and Over-Utilization of Surface and ground water , Floods, Drought, Food Resources- Effects of Modern Agriculture, Fertilizer- Pesticide Problems–Role of an Individual in Conservation of Natural Resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 6

Structure and Function of an Ecosystem– Energy Flow in the Ecosystem -Food Chains, Food Webs and Ecological Pyramids.

Introduction to Biodiversity –Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values –India as a Mega-Diversity Nation — Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity.

UNIT III ENVIRONMENTAL POLLUTION 6

Definition – Causes, Effects and Control Measures of:- (A) Air Pollution (B) Water Pollution (C) Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution, Solid Waste Management- Effects and Control Measures of Acid Rain,– Role of an Individual in Prevention of Pollution..

23.01.2021 **B.E. / B.Tech. Regulations 2019**

UNIT IV CLIMATE CHANGE ON THE ENVIRONMENT 6

Sustainable Development- - Climate Change- Causes and effects of Global Warming - Effect of global warming in food supply, plants, sea, coral reef, forest, agriculture, economy - Kyoto Protocol in reduction of greenhouse gases - Ozone Layer Depletion - mechanism, effects and control measures- Montreal Protocol to protect ozone layer depletion - Rain Water Harvesting - .Effect of climate change due to air pollution Case study - CNG vehicles in Delhi

UNIT V EFFECT OF CLIMATE CHANGE ON POLLUTION 6

Fungal diseases in forests and agricultural crops due to climatic fluctuations - Growing energy needs - effect of climate change due to non-renewable energy resources. Renewable energy resources in the prevention of climatic changes- Effect of climatic changes in ground water table, garments, monuments, buildings, consumption of energy, agriculture and in electric power sector - Carbon credit - carbon footprint - disaster management -Role of an individual to reduce climate change.

TOTAL: 30 HOURS

Text Books:

1. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co. 2018
2. Anubha Kaushik and Kaushik, "Environmental Science and Engineering" New Age International Publication, 4th Multicolour Edition, New Delhi, 2014.

References:

1. S. Radjarejesri et al., "Environmental Science" Sonaversity, Sona College of Technology, Salem, 2018.
2. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
3. Erach, B., "The Biodiversity of India", Mapin Publishing P.Ltd.,Ahmedabad, India.
4. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 2005, University Grands Commission, Universities Press India Private Limited, Hyderguda, Hyderabad – 500029.

23/1/21
Dr. M. Raja
Course Coordinator / Sciences

23/1/2021
Dr. C. Shanthi
HOD / Sciences

Dr. M. Renuga
Chairperson BOS,
Science and Humanities

23.01.2021 **B.E. / B.Tech. Regulations 2019**

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester V Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1	U19EC501	Microprocessors and Microcontroller		3	0	0	3	45
2	U19EC502	Control Systems		3	0	0	3	45
3	U19EC503	Transmission Lines and Waveguides		3	0	0	3	45
4	U19EC504	Digital Communication		3	0	0	3	45
5	U19EC505	VLSI Design		3	0	0	3	45
6	noc21-cs61	**Elective – NPTEL Course**	Computer architecture and organization	3	0	0	3*	45
	noc21-cs56		Programming in Java					
Practical								
7	U19EC506	Microprocessors and Microcontroller laboratory		0	0	2	1	30
8	U19EC507	Communication Systems laboratory		0	0	2	1	30
9	U19EC 508	VLSI Design laboratory		0	0	2	1	30
10	U19GE501	Soft Skills and Aptitude - III		0	0	2	1	30
						Total Credits	**22**	

*****Any 1 elective to be opted by a student among 2 electives.

Approved By

Chairperson, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electronics and Communication Engineering, Fifth Semester BE ECE Students and Staff, COE

U19EC501 MICROPROCESSORS AND MICROCONTROLLER 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to

1) Develop assembly language program to solve mathematical problems using 8bit and 16 bit microprocessors.
2) Create a multiprocessor system with 8086 microprocessor
3) Interface I/O and memory devices with 8086 microprocessor
4) Analyze the architecture and signals of 8051 microcontroller
5) Develop a real time system using 8051 microcontroller

Pre-requisite

Digital Electronics

CO/PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	3	3	2	3	3	1	1	2	1	3	3
CO2	1	2	2	3	2	1	2	3	1	1	2	1	3	2
CO3	2	2	3	2	3	1	2	2	1	1	1	1	3	3
CO4	2	2	2	3	3	3	2	3	1	1	2	1	3	2
CO5	1	2	3	3	3	3	3	2	1	1	1	3	3	2

Unit I 8 BIT AND 16 BIT MICROPROCESSORS **9**

8085 Microprocessor Architecture – Instruction Set – Addressing Modes – Assembly Language Programming. 8086 Microprocessor Architecture – Addressing Modes – Instruction Set – Assembly Language Programming.

Unit II MULTIPROCESSOR CONFIGURATION **9**

Introduction to Assembler Directives – Stacks – Procedures – Macros – Interrupts and Interrupt Service Routines – Multiprocessor Configurations – Coprocessor – Closely Coupled and Loosely Coupled Configurations

Unit III PERIPHERAL INTERFACING WITH 8086µP **9**

Memory Interfacing and I/O Interfacing – Parallel Communication Interface – Serial Communication Interface – D/A and A/D Interface – Timer – Keyboard /Display Controller – Interrupt Controller – DMA Controller – Programming and Applications

Unit IV 8051 MICROCONTROLLER **9**

Introduction – Evolution of Microcontroller - Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction Set - Addressing Modes - Assembly Language Programming – RS232 Bus – Inter Integrated Circuit

Unit V INTERFACING WITH MICROCONTROLLER **9**

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD and Keyboard Interfacing – ADC- DAC and Sensor Interfacing – External Memory Interface – Case study on interfacing stepper motor- Case study on room temperature monitor.

TOTAL: 45 HOURS

Text Book

1) Soumitra Kumar Mandal, “Microprocessors and Microcontrollers, Architecture, Programming and Interfacing using 8085, 8086 and 8051”, McGraw-Hill Companies, 2018.

2) Mohammed Ali Mazidi and Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems”, Edition-2, Pearson Education Asia, New Delhi, 2008.

References

1) Douglas V Hall, "Microprocessor and Interfacing: Programming and Interfacing", Edition-3Tata McGraw-Hill Companies, 2019

2) A.K. Ray and K.M.Burchandi, "Intel Microprocessors Architecture Programming and Interfacing", McGraw Hill International Edition, 2006.

3) Kenneth J Ayala, "The 8051 Microcontroller Architecture Programming and Application", Edition3, Penram International Publishers (India), New Delhi, 2007.

4) Ramesh S Gaonkar, "Microprocessor Architecture, Programming and application with 8085", 4th Edition, Penram International Publishing, New Delhi, 2002

5) M. Rafi Quazzaman, "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall of India, Pvt. Ltd., New Delhi, 2003

U19EC502 **CONTROL SYSTEMS** **3 0 0 3**

Course Outcomes

After successful completion of this course, the students should be able to

1) Derive the transfer function of a given system using mathematical models
2) Determine the time response of systems and analyze the steady state error
3) Calculate the frequency domain specifications using frequency response plots
4) Determine and analyze the stability of given system
5) Solve the state equations using state space model and obtain the Controllability & Observability of the given system

Pre-requisite

Signals and Systems

CO/PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3	1	3	2	1	2	2	2	3	2
CO2	3	3	1	3	3	1	3	2	1	2	2	1	3	2
CO3	3	3	1	3	2	2	3	2	2	3	3	2	3	2
CO4	3	2	1	3	2	2	3	2	2	3	3	1	3	2
CO5	3	2	1	3	2	2	3	2	2	3	2	1	3	2

Unit I **BASIC CONCEPTS AND SYSTEM REPRESENTATION** **9**

Introduction - Open Loop and Closed Loop Systems - Mathematical Model of Control Systems - Transfer Functions - Mechanical Translational System - Mechanical Rotational Systems - Block Diagram Algebra - Signal Flow Graph - Mason's Gain Formula.

Unit II TIME RESPONSE ANALYSIS **9**

Time Response - Standard Test Signals - Type and Order of Control System - Time Response of First Order System for Unit Step - Unit Ramp and Impulse Input - Time Response of Second Order System for Unit Step Input - Time Domain Specifications - Steady State Error and Static Error Constants - Controllers – P - PI and PID.

Unit III FREQUENCY RESPONSE ANALYSIS **9**

Frequency Response - Frequency Domain Specifications - Resonant Peak - Resonant Frequency - Bandwidth- Cut-Off Rate - Gain Margin and Phase Margin - Frequency Response Plots - Polar Plot - Bode Plot - M and N Circles - Nichol's Chart.

Unit IV STABILITY ANALYSIS **9**

The Concepts of Stability - Necessary Conditions for Stability - Relative Stability - Routh Hurwitz Stability Criterion - Root Locus - Effect of Addition of Poles - Effect of Addition of Zeros - Nyquist Stability Criterion.

Unit V COMPENSATORS AND STATE SPACE ANALYSIS **9**

Compensators: Introduction - Types – Lag - Lead and Lag-Lead Design using Bode Plots.

State Space Analysis: Concepts of State - State Variables and State Model for Linear Continuous Time Systems - Controllability and Observability.

TOTAL: 45 HOURS

Text Book

1) Samarajit Gosh, *"Control Systems Theory and Applications",* 2nd New Edition, Pearson publications, 2017

2) I.J.Nagrath and M.Gopal, *"Control Systems Engineering",* 6th Edition, New Age International (P) Ltd, Publishers, 2017.

References

1) M.Gopal, *"Control Systems, Principles and Design",* 4th Edition, Tata McGraw Hill, New Delhi, 2014

2) A.Nagoorkani, *"Control Systems Engineering",* 3rd Edition, RBA Publications, 2017

3) S.Palani, *"Control Systems Engineering",* 3rd Edition, Tata McGraw Hill, 2015

4) Pankaj Swarnkar," *Automatic Control Systems*", 8th Edition, Satya Prakashan Publications,2019.

U19EC503 TRANSMISSION LINES AND WAVEGUIDES 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to

1) Analyse electromagnetic wave propagation in generic transmission line geometries.
2) Design impedance matching transmission line and calculate the reflection coefficient, SWR, using smith chart
3) Analyse guided waves and their field pattern between parallel planes of perfect conductors.
4) Design and measure the various propagating modes of rectangular wave guides.
5) Derive the field equation of circular waveguides and resonators

Pre-requisite

Engineering Electromagnetics

CO/PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	1					2	2	3	3
CO2	3	3	2	3	3	1					2	2	3	3
CO3	3	3	2	3	3	1					2	2	3	3
CO4	3	3	2	3	3	1					2	2	3	3
CO5	3	3	2	3	3	1					2	2	3	3

Unit I TRANSMISSION LINE THEORY 9

Different Types of Transmission Lines – Characteristic Impedance – Propagation Constant- T and ∏ Section Equivalent to Lines – General Solution of the Transmission Line – Standard forms for Voltage and Current of a line terminated by an Impedance – Physical Significance of the equation and the Infinite Line – Standard forms for the Input Impedance of a Transmission Line Terminated by an Impedance – Reflection Coefficient – Wavelength and Velocity of Propagation - Waveform Distortion – Distortion Less Transmission Line – The Telephone Cable – Line Loading - Campbell's Equation - Input Impedance of Lossless Lines – Reflection on a Line Not Terminated By Z0 – Transfer Impedance – Reflection Factor and Reflection Loss – Insertion Loss

Unit II TRANSMISSION LINE AT RADIO FREQUENCIES 9

Standing Waves and Standing Wave Ratio on a Line – One Eighth Wave Line – The Quarter Wave Line and Impedance Matching – The Half Wave Line – The Circle Diagram for the Dissipation Less Line – The Smith Chart – Application of the Smith Chart – Conversion from Impedance to Reflection Coefficient and Vice -Versa – Impedance to Admittance Conversion and Vice-Versa – Input Impedance of a Lossless Line Terminated by Impedance – Single Stub Matching and Double Stub Matching.

Unit III GUIDED WAVES BETWEEN PARALLEL PLANES 9

Waves Between Parallel Planes of Perfect Conductors – Transverse Electric and Transverse Magnetic Waves – Characteristics of TE and TM Waves – Transverse Electromagnetic Waves –Velocities of Propagation – Component Uniform Plane Waves Between Parallel Planes –Attenuation of TE and TM Waves of Parallel Plane Guides – Wave Impedances.

Unit IV RECTANGULAR WAVEGUIDES 9

Transverse Magnetic Waves in Rectangular Waveguides – Transverse Electric Waves in Rectangular Waveguides – Characteristic of TE and TM Waves – Cutoff Wavelength and Phase Velocity – Impossibility of TEM Waves in Waveguides – Dominant Mode in Rectangular Waveguide – Attenuation of TE and TM Modes in Rectangular Waveguides – Wave Impedances – Characteristic Impedance – Excitation of Modes.

Unit V CIRCULAR WAVE GUIDES AND RESONATORS 9

Bessel Functions – Solution of Field Equations in Cylindrical Co-Ordinates – TM and TE Waves in Circular Guides – Wave Impedances and Characteristic Impedance – Dominant Mode in Circular Waveguide – Excitation of Modes – Microwave Cavities – Rectangular Cavity Resonators – Circular Cavity Resonator – Q Factor of a Cavity Resonator for TE101 Mode.

TOTAL: 45 HOURS

Text Book

1) J.D.Ryder, “Networks, Lines and Fields”, Pearson, 2e, 2015.

2) E.C.Jordan and K.G.Balmain, “Electro Magnetic Waves and Radiating System”, Pearson, 2e, 2015.

References

1) David M.Pozar, “Microwave Engineering”, 4th Edition, John Wiley, 2013.

2) Ramo, Whineery and Van Duzer: “Fields and Waves in Communication Electronics” John Wiley, 3e, 2011

3) R.S. Sabeenian, “Transmission Line and Waveguides”, Sonaversity

4) G.S.Raju, Electromagnetic Field Theory and Transmission Lines, 3/e, Pearson Education India, 2012.

U19EC504 DIGITAL COMMUNICATION 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to

1) Analyse the sampling process and different types of digital pulse modulation techniques
2) Describe the baseband pulse transmission and ISI
3) Derive the bit error probability of digital modulation techniques.
4) Compute the code vectors for different error control coding techniques
5) Calculate the performance parameters of spread spectrum modulation methods

Pre-requisite

Basic idea of Signals and Systems, analog modulation and probability theory

CO/PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**2**	**1**	**3**					**2**	**2**	**2**	**3**	**3**
CO2	**3**	**2**	**2**	**1**	**3**					**2**	**2**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**2**	**3**					**2**	**2**	**2**	**3**	**3**
CO4	**3**	**2**	**3**	**2**	**3**					**2**	**2**	**2**	**3**	**3**
CO5	**3**	**2**	**2**	**1**	**3**					**2**	**2**	**2**	**3**	**3**

Unit I PULSE MODULATION 9

Sampling Process – Signal Distortion and Recovery – PAM - PWM – PPM - Pulse Code Modulation – Noise Considerations in PCM Systems – Delta Modulation – Differential Pulse Code Modulation – Adaptive DPCM – Adaptive DM - Digital Multiplexer - Applications of PWM.

Unit II BASEBAND PULSE TRANSMISSION **9**

Matched Filter – Error Rate Due to Noise – Line Coding Formats – Inter -Symbol Interference – Nyquist's Criterion for Distortion Less Base Band Binary Transmission - Correlative Level Coding – Base Band M- ary PAM – Adaptive Equalization – Eye Patterns.

Unit III PASS BAND DATA TRANSMISSION **9**

Introduction – Pass Band Transmission Model – Generation and Detection – Signal Space Diagram – Bit Error Probability – Power Spectra of ASK- FSK- PSK – DPSK – QAM - QPSK and MSK Schemes – Comparison of Digital Modulation Systems using a Single Carrier – Carrier and Symbol Synchronization – Applications of QAM.

Unit IV ERROR CONTROL CODING **9**

Linear Block Codes – Cyclic Codes – Generator Polynomial – Encoder for Cyclic Codes – Convolutional Codes – Time Domain and Transform Domain Approach – Maximum Likelihood Decoding of Convolutional Codes – Viterbi Algorithm..

Unit V SPREAD SPECTRUM MODULATION **9**

Pseudo- Noise Sequences – Properties of Maximum Length Sequence – Direct Sequence Spread Spectrum with Coherent BPSK– Processing Gain –Probability of Error – Jamming Margin – Frequency – Hop Spread Spectrum.

TOTAL: 45 HOURS

Text Book

1) Simon Haykin, "Digital Communications", Wiley India Pvt.Ltd, 2015.

2) John G. Proakis, "Digital Communication" 5th Edition, McGraw Hill, 2014

References

1) B. P. Lathi, Zhi Ding, 'Modern Digital and Analog Communication Systems", Oxford University Press, 2017

2) Taub and Schilling, "Principles of Digital Communication", 4 th edition, Tata McGraw-Hill, 2013

3) Sanjay Sharma," Digital Communication," 6th edition, S.K.Kataria & son's publication, 2014.

4) Sklar Bernard, "Digital Communications — Fundamentals and Applications", Pearson Education-LPE, 2nd Ed., 2009

U19EC505 VLSI DESIGN 3 0 0 3

Course Outcomes

After successful completion of this course, the students should be able to

1) Design HDL code for combinational circuits and sequential circuits
2) Analyze MOS and CMOS transistor characteristics
3) Illustrate the fabrication processes of CMOS & logic families
4) Architectural choices and performance tradeoffs involved in designing
5) Learn the different FPGA architectures and testability of VLSI circuits

Pre-requisite

Digital Electronics

CO/PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	3	2	3	3	1	1	2	1	3	3
CO2	1	2	2	2	2	1	2	3	1	1	2	1	2	3
CO3	2	2	3	3	2	1	2	2	1	2	1	1	3	3
CO4	2	2	2	3	2	3	2	3	1	2	2	1	3	3
CO5	1	2	3	3	2	3	3	2	1	2	1	2	2	2

Unit I VERILOG HDL 9

Overview of Digital Design with Verilog HDL, Hierarchical Modeling Concepts, Basic Concepts, Modules and Ports, Gate-Level Modeling, Dataflow Modeling, Behavioral Modeling, Tasks and Functions, Logic Synthesis with Verilog.

Unit II MOS TRANSISTOR THEORY 9

Introduction – MOS Transistors – CMOS Logic – Inverter – NAND gate – CMOS Logic Gates – Compound - MOS Transistor Theory – MOS Structure - nMOS and pMOS Transistor Operation –Long Channel V-I Characteristics – C-V Characteristics – Non-ideal I-V Effects – DC Transfer Characteristics CMOS Inverter.

Unit III CMOS TECHNOLOGY AND LOGIC FAMILY 9

Introduction – CMOS Technologies – nMOS Fabrication – n-well Process – SOI – Twin Well Process - Layout Design Rules – CMOS Process Enhancement - Stick Diagram – Inverter – CMOS NAND – CMOS NOR. Static CMOS – Pseudo logic– Dynamic Circuits – Pass-Transistor Circuits – CMOS with Transmission Gates – Source of Power Dissipation

Unit IV DESIGNING ARITHMETIC BUILDING BLOCKS 9

Data path circuits, architectures for ripple carry adders (RCA), high speed adders, carry look ahead adder (CLA), Accumulators, Multipliers, Barrel shifters, Speed and Area tradeoff.

Unit V TESTING OF VLSI CIRCUITS 9

Introduction – Testers – Text Fixtures and Test Programs – Logic Verification Principles - Silicon Debug Principles – Manufacturing Test – Design for Testability – Boundary Scan.

TOTAL: 45 HOURS

Text Book

1) Neil H. E Weste and David Money Harris, “CMOS VLSI Design a circuits and systems perspective”, 4th Edition, Pearson, 2015.

2) Ciletti, "Advanced Digital Design with the Verilog HDL, 2nd Edition ", Pearson Education, Second Edition, 2011.

References

1) Jan M. Rabaey, Anantha Chandrakasan ,Borivoje Nikolic, “Digital Integrated Circuits a design perspective”, Pearson Education, 2nd edition, 2016.

2) Charles H. Roth, Jr., Lizy Kurian John,”Digital System Design using VHDL”, Cengage, 3rd edition, 2018

3) Pucknell D.A and Eshraghian K., “Basic VLSI Design”, Third Edition, PHI, 2003

NOC21-CS61 COMPUTER ARCHITECTURE AND ORGANIZATION 3 0 0 3

Week 1: Evolution of Computer Systems

Week 2: Instruction Set Architecture

Week 3: Quantitative Principles of Computer Design

Week 4: Control Unit Design

Week 5: Memory System Design

Week 6: Design of Cache Memory Systems

Week 7: Design of Arithmetic Unit

Week 8: Design of Arithmetic Unit (contd.)

Week 9: Input-Output System Design

Week 10: Input-Output System Design (contd.)

Week 11: Instruction Set Pipelining

Week 12: Parallel Processing Architectures

Books and references

1. D.A. Patterson and J.L. Hennessy, "Computer Architecture: A Quantitative Approach, 5/E", Morgan Koffman, 2011.

2. D.A. Patterson and J.L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface, 5/E", Elsevier India, 2016.

3. W. Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson, 2015.

4. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization, 5/E", McGraw Hill, 2011.

5. J.P. Hayes, "Computer Architecture and Organization, 3/E", McGraw Hill, 1998.

TOTAL: 45 HOURS

NOC21-CS56 PROGRAMMING IN JAVA 3 0 0 3

Week 1 : Overview of Object-Oriented Programming and Java

Week 2 : Java Programming Elements

Week 3 : Input-Output Handling in Java

Week 4 : Encapsulation

Week 5 : Inheritance

Week 6 : Exception Handling

Week 7 : Multithreaded Programming

Week 8 : Java Applets and Servlets

Week 9 : Java Swing and Abstract Windowing Toolkit (AWT)

Week 10 : Networking with Java

Week 11: Java Object Database Connectivity (ODBC)

Week 12: Interface and Packages for Software Development

Books and references

1.Java: The Complete Reference Hebert Schildt, Mc Graw Hill

2. Object-Oriented Programming with C++ and Java Debasis Samanta, Prentice Hall India.

TOTAL: 45 HOURS

U19EC506 MICROPROCESSORS AND MICROCONTROLLER LABORATORY 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Write the assembly language programs to perform various arithmetic and logical operations using microprocessors.
2) Interface various peripheral ICs' and I/O devices with 8086 microprocessor
3) Write the assembly language programs to generate time delay and to establish the data communications using 8051 microcontroller.

Pre-requisite

Basics of Microprocessor and Microcontroller

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	2				2	2	2	3	3
CO2	3	3	3	2	3	2				2	2	2	3	3
CO3	3	2	3	2	3	2				**2**	2	2	3	3

List of Experiments

1) Study of 8085, 8086 and 8051 Trainer Kits
2) 8- bit Addition and Subtraction using 8085µP
3) 16-bit Manipulation (addition and subtraction) 8085µP
4) 8-bit Multiplication and Division 8085µP
5) 16-bit Multiplication and Division 8085µP
6) Code Conversion 8085µP
7) 16 – bit Addition and Subtraction using 8086µP
8) 16 - bit Multiplication and Division using 8086µP
9) String Manipulation using 8086µP
10) Array Manipulation using 8086µP
11) Experiments with 8255 in Mode 0 using 8086µP

12) 8279 Keyboard/Display Interface with the 8086µP

13) Timer Interface 8253 with the 8086µP

14) Stepper Motor Interface 8086µP

15) 8-bit Manipulations using 8051 Microcontroller

16) 16-bit Manipulations using 8051 Microcontroller

17) Array Operations-Sum of N Elements using 8051 Microcontroller

18) Generation of Time Delay using 8051 Microcontroller

19) Data Communications using Parallel and Serial Ports

TOTAL: 30 HOURS

U19EC507 COMMUNICATION SYSTEMS LABORATORY 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Design and construct signal generator and demodulator for AM and FM
2) Construct the sampling process of a signal and its recovery using the sampled version
3) Generate and detect the signals using analog and digital pulse modulation techniques

Pre-requisite

Signals and systems, Digital Signal Processing

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	2				2	2	2	3	3
CO2	3	3	3	2	3	2				2	2	2	3	3
CO3	3	2	3	2	3	2				**2**	2	2	3	3

List of Experiments

1) Amplitude Modulation and Demodulation
2) Frequency Modulation and Demodulation
3) Characteristics of AM Receiver (Selectivity and Sensitivity).
4) Sampling of an Analog Signal and Reconstruction
5) Pulse Modulation Techniques - PAM, PWM, PPM
6) Study of Line Coding Formats and Decoding
7) Time Division Multiplexing using PAM.
8) Pulse Code Modulation
9) Delta Modulation and Demodulation
10) Differential Pulse Code Modulation
11) Digital Modulation -ASK, FSK, PSK, QPSK
12) Analysis of Filters using Network Analyzer

TOTAL : 30 HOURS

U19EC508 VLSI DESIGN LABORATORY 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Design and simulate the combinational logic circuits and sequential logic circuits using Verilog HDL
2) Design CMOS circuit using SPICE
3) Implement in Artix FPGA

Pre-requisite
Digital Electronics

CO/PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	2	1	1	1	3	3	3
CO2	3	2	1	3	3	1	3	2	1	1	1	3	3	2
CO3	3	3	3	3	3	3	3	2	1	1	1	3	3	3

List of Experiments

Design and simulate the combinational logic circuits and sequential logic circuits using Verilog HDL.

1. Adder and Subtractor
2. Multiplexer, Demultiplexer, Encoder and Decoder
3. Comparator
4. Flipflops
5. Synchronous counter and ripple counter
6. Shift register
7. Sequence detector using FSM

Design CMOS circuit using SPICE.

8. CMOS Inverter
9. Logic gates, Boolean Expression

Implement in Artix FPGA.

10. 4 – bit adder
11. 4 – bit multiplier
12. Traffic light controller
13. Bluetooth interface
14. Wi – Fi interface
15. Image Capture

TOTAL: 30 HOURS

B-E-V Sem
2019-Batch

Semester –V	U19GE501 : SOFT SKILLS AND APTITUDE - III	L	T	P	C	Marks
		0	0	2	1	100

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

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches
2. Solve problems of advanced levels than those in SSA-II in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate greater than SSA-II level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests

1.SOFT SKILLS

Demonstrating soft-skill capabilities with reference to the following topics:

a. **Career planning:** Importance; Exploring various career options, Field research, Social media management; Process, benefits and limitations of career planning; Mapping SWOT and GOALS to career planning; Self-evaluation

b. **Resume writing :** Build credentials and resume, Positioning yourself and your career, JD mapping, Video resume, Relevant resume phrases and components; Cover letter; Portfolio management and Social media cover

c. **Group discussion :** Skills needed for GD; Frequently Asked topics and Practice; Types of topics; Various framework and tools to handle GD; Practice and assessment

d. **Teamwork :** Definition and importance of team-building; Stages of team-building; Communication within a team; Various styles of teams and their analysis; Activities demonstrating a team

e. **Leadership skills :** Role of a leader; Difference between a manager and a leader; Various Leadership styles; Compelling qualities of a leader; Famous leaders and their impact to the world; Self-assessment

f. **Interview skills :** Process and types of interview; Appearance and grooming etiquette; Do's and Don'ts (Before – During interview); Brainstorming interview possible questions; Hot seat; Transactional Analysis for effective communication and handling interviewers; mock interviews and assessment parameters discussion

g. **Mock interviews :** Frequently Asked Questions practice and assessment; Discussion and demonstrations on Stress and Technical interviews; Group interview

h. **Mock GDs :** Frequently Asked Topics Practice; Assessment and feedback

2.QUANTITATIVE APTITUDE AND LOGICAL REASONING	**Solving problems with reference to the following topics :** a. **Geometry:** 2D, 3D, Coordinate Geometry, and Height & Distance. b. **Permutation & Combinations :** Principles of counting, Circular Arrangements and Derangements. c. **Probability:** Addition & Multiplication Theorems, Conditional Probability and Bayes Theorem. d. **Statistics :** Mean Median, Mode, Range and Standard Deviation. e. **Interest Calculation :**Simple Interest and Compound Interest f. **Crypto arithmetic:** Addition and Multiplication based problem. g. **Logical Reasoning :**Blood Relations, Directions Test, Series, Odd man out, Analogy, Coding & Decoding, Problems and Input – Output Reasoning. h. Statement & Assumptions, Statements & Arguments, Inference. i. **Company Specific Pattern :**Infosys and TCS company specific problems
3. VERBAL APTITUDE	**Demonstrating English language skills with reference to the following topics:** a. Subject verb agreement b. Selecting the best alternative for the stated parts of given sentences c. Reading comprehension d. Contextual synonyms e. Sentence fillers f. Writing a story for a given picture g. Company specific aptitude questions

Dr.S.Anita

Head/Training

Department of Placement Training
Sona College of Technology,
Salem-636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VI Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1	U19EC601	Antenna and Wave Propagation		3	0	0	3	45
2	U19EC602	Digital Image Processing		3	0	0	3	45
3	U19EC603	Embedded Systems		3	0	0	3	45
4	U19EC904	**Professional Elective**	Machine learning (Lab Integrated)	2	0	2	3*	60
	U19EC909		Satellite Communication	3	0	0	3*	45
	U19EC911		IoT System architecture	3	0	0		
	U19EC913		Computer Networks	3	0	0		
6	U19BM1001	**Open Elective -I**	Hospital Management	3	0	0	3#	45
	U19CE1001		Building Services and Safety Regulations					
	U19CS1001		Big Data Analytics					
	U19CS1002		Cloud Computing					
	U19CS1004		Mobile Application Development					
	U19CS1006		Data Science					
	U19EE1002		Energy Conservation And Management					
	U19EE1003		Innovation, IPR and Entrepreneurship Development					
	U19EE1004		Renewable Energy Systems					
	U19FT1001		Fundamentals of Fashion Design					

	U19FT1002		Garment Manufacturing Technology					
	U19IT1001		Problem solving techniques using JAVA Programming					
	U19MC1003		Smart Automation					
Practical								
7	U19EC604	Digital Image Processing laboratory		0	0	2	1	30
8	U19EC605	Embedded Systems laboratory		0	0	2	1	30
9	U19EC606	Mini Project		0	0	2	1	30
10	U19GE601	Soft Skills and Aptitude - IV		0	0	2	1	30
Total Credits							**22**	

***Any 2 elective to be opted by a student among 4 professional electives**
 # Any 1 elective to be opted by a student among 13 open electives

Approved By

Chairperson, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	Dr.R.Shivakumar	Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electronics and Communication Engineering, Sixth Semester BE ECE Students and Staff, COE

U19EC601 ANTENNA AND WAVE PROPAGATION 3 0 0 3

Course Outcomes

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

1) Analyze the antenna fundamentals and Radiation pattern
2) Evaluate the different parameters of antenna arrays.
3) Design microwave antennas for the given specifications
4) Analyze the different measurement techniques of antenna parameters and special antennas
5) Analyze the atmospheric and terrestrial effects on radio wave propagation.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	2	1	2	1	2	2	3	3
CO2	3	3	3	3	3	1	2	1	2	1	2	2	3	3
CO3	3	3	3	3	3	1	2	1	2	1	2	2	3	3
CO4	3	3	3	3	3	1	2	1	2	1	2	2	3	3
CO5	3	3	3	3	3	1	2	1	2	1	2	2	3	3

Unit I ANTENNA FUNDAMENTALS **9**

Basic antenna parameters - Reciprocity principle - Friis transmission formula - Retarded vector potential - Power radiated and radiation resistance of current element - Radiation from half - wave dipole antennas - folded dipole - Loop antenna

Unit II ANTENNA ARRAYS **9**

Antenna Arrays- Broad-side array - End-Fire array - Collinear array and Parasitic array - Arrays of point sources - Two point sources – Linear array with n point sources (broad side and end fire case) - Pattern multiplication - Binomial array - Chebyshev array - Taylor series.

Unit III MICROWAVE ANTENNAS **9**

Helical antenna - Normal mode and axial mode operation -Yagi Uda Antenna - Log periodic antenna - Spiral antenna - Rhombic antenna - Horn antenna – Antennas with parabolic reflectors – Case study of Micro strip antenna – Implementation of Micro strip antenna in HFSS.

Unit IV **ANTENNA MEASUREMENTS AND SPECIAL ANTENNAS** **9**

Measurement of different Antenna parameters - Radiation pattern – Gain – Phase – Polarization – Impedance – Efficiency - Antennas for special applications- Antenna on cellular handsets - GPR - Embedded antennas - UWB - Plasma antenna.

Unit V **RADIO WAVE PROPAGATION** **9**

Ground wave propagation - Calculation of field strength at a distance - Space wave propagation - Duct propagation – Calculation of field strength at a distance - Sky wave propagation - Structure of the ionosphere - Mechanism of refraction - Refractive index - Critical frequency - Skip distance - Maximum usable frequency - Calculation of field strength at a distance - Fading and Diversity reception.

TOTAL : 45 HOURS

Text Books

1) John D. Kraus and Ronald Marhefka, "*Antenna*s", Tata McGraw-Hill Book Company, Reprint 2017
2) C.A.Ballanis, "*Antenna Theory Analysis and Design*", Wiley inter science, Reprint 2016

References

1) Prasad K.D., “Antennas and Wave Propagation”, Satya Prakashan, Reprint 2018
2) Jordan E.C and Balmain, "Electro Magnetic Waves and Radiating Systems", PHI, Reprint 2015..
3) Collins R.E., “Antennas and Radio Propagation", McGraw-Hill, Reprint 2014.

U19EC602 **DIGITAL IMAGE PROCESSING** **3 0 0 3**

Course Outcomes

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

1) Describe the fundamentals of monochrome and color image processing and analyze the basic relations between pixels, connectivity and distance measures
2) Apply DFT DCT, DST, Walsh, Hadamard, Haar, wavelet and SVD transform for images
3) Apply image enhancement techniques in spatial and frequency domain
4) Analyze image restoration using constrained and unconstrained filters and image segmentation approaches
5) Appraise the need for image compression using lossy and lossless techniques and Morphological operations

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1	1	1	1	2	2	2	3	3
CO2	3	3	2	2	3	1	1	1	1	2	2	2	3	3
CO3	3	3	2	2	3	1	1	1	1	2	2	2	3	3
CO4	3	3	2	2	3	1	1	1	1	2	2	2	3	3
CO5	3	3	2	2	3	1	1	1	1	2	2	2	3	3

Unit I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS **9**

Fundamental Steps in Digital Image Processing – Elements of Visual Perception – Some Basic Relationship Between Pixels – Connectivity – Distance Measure – Brightness – Contrast – Hue- Saturation – Mach Band Effect – Image Sampling – Quantization – Dither – Colour Image Fundamentals RGB – HSI Models – Conversion from RGB to HSI.

Unit II IMAGE TRANSFORMS **9**

2D Transforms : DFT – DCT – DST – Walsh – Hadamard – Haar Transform –SVD- Discrete Wavelet Transform – Multi Resolution Analysis

Unit III IMAGE ENHANCEMENT **9**

Spatial Domain Approach – Point Processing – Image Negative – Contrast Stretching – Gray Level Slicing – Histogram Equalization – Image Addition – Subtraction – Averaging – Smoothing Filters – Spatial LPF – Median Filter – Sharpening Filters – Spatial HPF – High Boost Filter – Derivative Filters Frequency Domain Filters – Homomorphic Filter.

Unit IV IMAGE RESTORATION AND SEGMENTATION **9**

Degradation Model – Noise Models – Types of Restoration – Inverse Filtering – Least Mean Square (wiener–parametric wiener) Filter – Image Segmentation – Point – Line and Edge Detection – Region Based Segmentation – Region Splitting and Merging – Thresholding. Standard Binary Morphological Operations-Dilation and Erosion based Operations.

Unit V IMAGE COMPRESSION **9**

Image Compression – Lossless Compression – Huffman Coding – Minimum Variance Huffman Coding – Arithmetic Coding – LZW Coding – Lossy Compression – Transform Coding – Compression Standards – JPEG Image Compression Standards – MPEG Video Compression Standards-Block Diagram Approach

TOTAL : 45 HOURS

Text Book

1) Jayaraman S., Esakkirajan and Verrakumar, "Digital Image Processing", TMH New Delhi, 2nd edition ,2020.
2) Rafael C- Gonzalez- Richard E-Woods, "Digital Image Processing", Pearson Education, Eleventh Impression, 2013

References

1) Annadurai S., R. Shanmugalakshmi, "Fundamentals of Digital Image Processing", Pearson Education India,2007
2) Anil K- Jain, "Fundamentals of Digital Image Processing", Pearson/Prentice Hall of India, 2002
3) Sridhar.S, "Digital Image Processing", Oxford University Press, First Edition, 2011
4) Sabeenian R.S., "Digital Image Processing", Sonaversity publication, Second Edition reprint, 2014.
5) Kenneth R. Castleman, "Digital Image Processing", Pearson, 2009.Samuel Y- Liao, *"Microwave Devices and Circuits"*, Pearson/Prentice Hall of India, 3rd Edition 2011.

U19EC603 **EMBEDDED SYSTEMS** **3 0 0 3**

Course Outcomes

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

1) Understand the hardware and software architecture of embedded system
2) Analyze the factors on developing the embedded software..
3) Develop the embedded hardware using ARM processor..
4) Design the embedded software using real time operating system tools
5) Develop the embedded applications using suitable hardware and software.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	2	3	2	1	2	2	3	3	2
CO2	3	2	3	3	3	3	3	2	2	2	2	3	3	2
CO3	2	3	3	3	3	2	3	2	1	2	3	3	3	2
CO4	2	2	3	3	3	2	3	2	2	2	3	3	3	2
CO5	2	2	3	3	3	2	3	2	1	2	3	3	3	2

Unit I ARCHITECTURE OF EMBEDDED SYSTEMS **9**

Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded System – Recent Trends in Embedded System – Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software –Process of Generation of Executable Image – Development-Testing..

Unit II DESIGN AND ANALYSIS OF EMBEDDED SYSTEMS **9**

Embedded System Design Process – Formalism for System Design – Memory System Mechanism – CPU Performance – CPU Power Consumption – CPU Buses – Memory Devices – I/O Devices – Program Design – Model of Programs – Analysis and Optimization of Execution Time – Power – Energy – Program Size – Program Validation and Testing.

Unit III ARM PROCESSOR **9**

The ARM architecture basics – Architectural inheritance – The ARM programmer model-3 stage and 5 stage pipelining – ARM organization –Addressing modes – ARM instruction set (Data processing, Data transfer, Branching) – Thumb Instructions set.

Unit IV REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphores – Mutex – Mailboxes – Message – Queues – Event Registers – Pipes – Signals – Timers – Memory Management – Priority Inversion Problem.

Unit V DEVELOPMENT OF EMBEDDED APLPLICATIONS 9

Case Study of an Automatic Chocolate Vending Machine using MUCOS RTOS – Case Study on developing digital camera– Case Study on developing adaptive crucial system.

TOTAL : 45 HOURS

Text Book

1) Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 4th Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2016.
2) Raj Kamal "Embedded Systems Architecture Programming and Design" 3rd Edition TMH, 2014.
3) Steve Furber, "ARM System on Chip Architecture", Pearson Publications, 2nd Edition, 2015

References

1) Shibu K V, "Introduction to Embedded Systems", 2nd Edition, McGraw Hill, 2016.
2) Xiaocong Fan, Real-Time Embedded Systems: Design Prinicple and engineering practices, SCI-Tech Connect, Elsevier, 2016
3) Dr. K. V. K. K. Prasad, "Embedded/Real-Time Systems: Concepts, Design & Programming", Dream Tech Publishers, 2003

U19EC904 **MACHINE LEARNING** **2 0 2 3**

(Lab Integrated)

Course Outcomes

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

1) Realize the significance of machine learning techniques
2) Implement basic machine learning algorithms in Python and Pandas.
3) Design a Machine learning Model with Unconstrained minimization optimization techniques and its parameters..
4) Inscribe a python program for supervised learning and its applications
5) Solve basic classification problems using ANN and unsupervised classification

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	1	2		1			2	1	2	3	2
CO2	2	2	2	3	3	2	1	2	1	1	2		2	2
CO3	2	3	2	1	2		1	2		2	1	2		2
CO4	1	2	3	3		2		1	2	1		1	3	2
CO5	2	2	3	2	3	1	1	1	1	2		3	3	2

Unit I INTRODUCTION TO MACHINE LEARNING AND COST FUNCTION **12**

Basics of Vectors and Matrices -Machine learning – Application of Machine learning- Types of Machine learning – Representation of Model- Gradient Descent Algorithm- Cost function Notation for measuring the accuracy of a hypothesis function –Minimize and Maximize the cost function for Single & Two variable function.

Unit II DATA **PRE-PROCESSING USING PANDAS & PYHTON** **12**

Introduction about Python – Basic Syntax- Python identifiers- Basic Operations of Python – Python Decision Making- Looping – Functions – NumPy -Matplotlib – Introduction to Pandas and Scikit Learn & programming -Data cleaning – Data Integration – Data Reduction -Standard Deviation-Variance-Covariance-Eigen Values & Vectors-PCA

Unit III MACHINE LEARNING PARAMETERS AND OPTIMIZATION 12

Confusion Matrix - Sensitivity – Specificity – Precision – Accuracy-False Negative Rate-False Positive Rate & F1 Score-Optimization-Linear vs Nonlinear Programming Problems-Unconstrained minimization: Steepest Descent Method, Newton's Method.

Unit IV SUPERVISED LEARNING ALGORITHMS 12

Introduction to supervised learning and regression - Statistical Relation between Two Variables and Scatter Plots – steps to establish a Linear Regression using Python– Evaluation of Model Estimators -Introduction and scenarios of Logistic Regression – Building Logistic Regression Model using Python - Maximal Likelihood Estimation using python- Steps to construct a Decision Trees.

Unit V BASICS OF ANN, SVM & UNSUPERVISED LEARNING ALGORITHMS 12

Introduction to ANN – Biological Neuron – Basic of ANN Architectures – Activation Functions – McCulloch Pitts Model – K-NN – Linear SVM with examples (Vectors) using python – Non-Linear SVM with examples (Vectors) using SVM - Introduction to clustering – Types of Clustering – K- Means Algorithm theory and programs.

TOTAL : 60 HOURS

Text Book

1) Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.
2) Anuradha Srinivasaraghavan, Vincy Joseph , Machine Learning, Wiley-2019

References

1) Alpaydin Ethem, "Introduction to Machine Learning", MIT Press, Second Edition, 2010.
2) Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning: with Applications in R", Springer; First Edition 2013.
3) Dr. Soman K. P., Loganathan, R., and Ajay, V., Machine Learning with SVM and other Kernel methods. PHI Learning Pvt. Ltd., 2009
4) Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014
5) Stephen Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall/CRC Press, Second Edition, 2014

U19EC909 **SATELLITE COMMUNICATION** **3 0 0 3**

Course Outcomes

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

1) Describe the satellite orbits.
2) Analyze the space segment and budget equations.
3) Analyze the earth segment and various test equipment
4) Compare the various multiple access techniques.
5) Summarize the latest trends in Satellite applications.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	2		2			2		2	3	3
CO2	3	2	3	3	2		2			2	2	2	3	3
CO3	3	2	3	3	2		2			2	2	2	3	3
CO4	3	2	3	3	2		2			2	2	2	3	3
CO5	3	2	3	3	2		2			2	2	2	3	3

Unit I SATELLITE ORBITS **9**

Kepler's Three Laws of Planetary Motion – Definition of Terms for Earth – Orbiting Satellites – Orbital Elements – Orbital Parameters – Orbital Perturbations – Station Keeping – Frequency Allocation – Non Geo-Stationary Orbits – Geostationary Orbits – Sun Transit Outages – Limits of Visibility – Look Angle Determination – Sub Satellite Point – Elevation Angle Calculation – Azimuth Angle Calculation – Launch Vehicles and Propulsion

Unit II SPACE SEGMENT AND SATELLITE LINK DESIGN **9**

Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem – Link Design – Satellite Up Link – Down Link – Link Power Budget– Noise Temperature – Rain and Ice Effects – Polarization.

Unit III EARTH SEGMENT **9**

Transmitters – Receivers – Antennas – Terrestrial Interface– Television Receive Only (TVRO) – Master Antenna TV (MATV) – Community Antenna TV(CATV) – Test Equipment – Measurements on G/T – C/No – Equivalent Isotropic Radiated Power (EIRP) – Antenna Gain.

Unit IV SATELLITE ACCESS **9**

Modulation and Multiplexing – Voice-Data –Video–Analog–Digital Transmission System – Multiple Access, Frequency Division Multiplexing Access (FDMA) Systems – Time Division Multiplexing Access (TDMA) Systems –Satellite Switched TDMA – Code Division Multiplexing Access (CDMA)

Unit V SATELLITE APPLICATIONS **9**

Mangalyaan – Chandraayan Mobile satellite services – GSM – GPS –LEO – MEO – GEO – Satellite Navigational System – Direct Broadcast satellites (DBS) – Direct to home Broadcast (DTH) – Digital audio broadcast (DAB) – World space services, Business TV(BTV) – GRAMSAT – DVB.

TOTAL : 45 HOURS

Text Book

1) M. Morris Mano and Michael D. Ciletti – '*Digital Design with an Introduction to the Verilog HDL*', 6th Edition, Pearson Education, 2018

References

1) Venkataramani B. and Bhaskar M., "*Digital Signal Processors – Architecture, Programming and Applications"*, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2017..
2) Emmanuel C. I. Feachor, Barrie W. Jervis, "*Digital signal processing – A Practical Approach"*, 2nd Edition, Pearson Education, Asia 2007.
3) Bayoumi&Magdy A., "*VLSI Design Methodologies for Digital Signal Processing Architectures"*, BS Publications, 2012.
4) Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1st Edition, 2012.

U19EC911 **IOT SYSTEM ARCHITECTURE** **3 0 0 3**

Course Outcomes

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

1) Analyze the connectivity, communication protocols, and data management for developing the IOT based system
2) Develop the web and internet connectivity access for IOT s
3) Identify the suitable data acquiring, storage management, and cloud deployment
4) Analyze the security and vulnerabilities for designing the IOT based system
5) Develop the smart applications using IOT platform

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	2	2	3	2	1	2	2	3	3	2
CO2	3	2	3	3	3	3	3	2	2	2	2	3	3	2
CO3	2	2	3	3	3	2	2	2	1	2	3	3	3	1
CO4	1	2	3	3	3	1	3	2	2	2	2	3	3	2
CO5	2	2	3	3	3	2	3	2	1	3	3	3	3	2

Unit I IOT DESIGN PRINCIPLES **9**

Internet of Things – IOT conceptual framework – IOT architectural overview– Technology behind IOT–Sources of IOT– M2M communication–IOT/M2M systems, layers and designs standardization-Communication Technologies–Data enrichment, data consolidation and device management at gateway-Data management and consolidation gateway-Device management gateway

Unit II DESIGN PRINCIPLES FOR WEB AND INTERNET CONNECTIVITY **9**

Web communication protocols-constrained application protocol-light weight machine to machine protocol-JSON-TLV-MIME–Message communication protocol- CoAP SMS and – CoAP-API-MQ-MQTT-XMPP–Internet connectivity–Internet based communication-Internet protocols-6LoWPAN-TCP/IP suite–IP addressing in the IOT-static-dynamic-DNS-DHCP–Overview on HTTP, HTTPS ports, FTP, and TELNET.

Unit III IOT DATA PROCESSING **9**

Data acquiring and storage–Organizing data–Transactions, business process, integration and enterprise systems–Analytics–Cloud computing paradigm–Cloud deployment models–IOT cloud using Xively and Nimbits

Unit IV IOT SECURITY AND VULNERABILITY **9**

Privacy-vulnerabilities of IOT-Security requirements-Threat analysis-Use cases and Miss use cases-Security tomography- Layered attacker model-Identity management and access control-security models and protocol.

Unit V IOT APPLICATION DEVELOPMENT **9**

Case study on ATM premises monitoring system-Case study on RFID supply chain monitoring system-Case study on Smart home-case study on Smart agriculture.

TOTAL : 45 HOURS

Text Book

1) Raj Kamal, "Internet of Things – Architecture and Design Principles", Mc Graw H ill Education Pvt.Ltd., 2017
2) Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg,Sebastian Lange,StefanMeissner,"Enablingthingstotalk–Designing IoTsolutions with the IoT Architecture Reference Model",SpringerOpen,2013

References

1) Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi, 2013..
2) Ranjith Kumar, Research Methodology – A step by step Guide for Begineers, 4th edition, Sage publisher, 2014...
3) D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell, 1st Edition, 2016.
4) Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1st Edition, 2012.
5) Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press, 1st Edition, 2017.
6) M.Ashok Kumar and Mohd.Iqbal Ali :"Intellectual Property Rights" Serials Pub

U19EC913 **COMPUTER NETWORKS** **3 0 0 3**

Course Outcomes

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

1) Explain the basic concept in modern data communication and computer networking.
2) Analyze the functions and services of data link layer
3) Categorize the functions and services of network layer
4) Examine the basic functions of transport layer and congestion in networks
5) Analyze the concepts of various network applications and data security

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	3	2		2	2	3	3	2
CO2	2	2	3	3	3	2	3	2		2	2	3	3	2
CO3	2	2	3	3	3	2	3	2		2	2	3	3	2
CO4	3	3	3	3	3	2	3	2		2	3	3	3	2
CO5	3	3	3	3	3	2	3	2		2	3	3	3	2

Unit I DATA COMMUNICATIONS **9**

Components – Direction of Data Flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI Model – Transmission Media – Coaxial Cable – Fiber Optics – Modems – TCP/IP Model

Unit II DATA LINK LAYER **9**

Error – Detection and Correction – Parity – LRC – CRC – Hamming Code – Flow Control and Error Control - Stop and Wait – Go Back N ARQ – Selective Repeat ARQ- Sliding Window Techniques – HDLC.LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 – IEEE 802.11–FDDI - SONET – Bridges..

Unit III NETWORK LAYER **9**

Internet Works - Packet Switching and Datagram Approach – IPv4 - IPv6– Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

Unit IV TRANSPORT LAYER **9**

Duties of Transport Layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of Services (QOS) – Integrated Services.

Unit V APPLICATION LAYER **9**

Principles of Network Application – Domain Name Space (DNS) – SMTP – FTP – HTTP - E-Mail - The WEB – Principles of Cryptography – Message Integrity – End Point Authentication – Security Email – Network Layer Security- Modes - Security Protocol – IKE - VPN -Transport Layer Security - SSL Architecture-Application Layer Security – E-mail Security - PGP-S/MIME.

TOTAL : 45 HOURS

Text Book

1) Behrouz A. Foruzan, "*Data communication and Networking*", Tata McGraw-Hill, fifth edition, 2017.
2) James F. Kurouse & W.Rouse, "*Computer Networking: A Topdown Approach Featuring*", Pearson Education, sixth edition, 2017.

References

1) Andrew S. Tannenbaum, "*Computer Networks*", PHI, Fifth edition, 2011..
2) William Stallings, "*Data and Computer Communication*", Tenth Edition, Pearson Education, 2017.
3) Larry L.Peterson & Peter S. Davie, "*Computer Networks*", Harcourt Asia Pvt. Ltd., fifth Edition,2011..

U19EC604 DIGITAL IMAGE PROCESSING LABORATORY 0 0 2 1

Course Outcomes

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

1) Write a MATLAB code to demonstrate and perform various operations related to image processing.
2) Generate a LABVIEW code to demonstrate and perform various operations related to image processing.
3) Write a MATLAB code or Generate a LABVIEW code to extract features from Images

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	2	2	1	1	1	2	3	3	3
CO2	3	3	3	3	2	2	2	1	1	1	3	3	3	3
CO3	3	3	3	3	2	2	2	1	1	1	3	3	3	3

List of Experiments

Using MATLAB

1) Demonstrating False Contour Effect and Checker board effect
2) Extraction and display of each bit plane of an image for a given 8 bit gray scale image
3) Computing Fourier Transform and reconstruction of original image from Fourier Transform
   a) Without Zero-padding
   b) With Zero-padding
4) Frequency Domain Image Enhancement
   a) Low Pass Filter
   b) High Pass Filter
   c) Band Pass Filter
5) Spatial Domain Image Enhancement
   a) Average Filter
   b) Median Filter
   c) Edge Enhancement
6) Demonstrating JPEG Compression using DCT
7) Creating a degradation model for a given image and applying Wiener Filter
8) Edge Detection Algorithms

Using Lab VIEW

1) Displaying the Image Properties and Pixel Distance
2) Re-Sample a given image
3) Extraction of planes from a given image - RGB and HSI
4) Scalar processing of an image (Addition, Subtraction, Multiplication and division of a scalar quantity on an image)
5) Image Arithmetic (Addition, Subtraction, Multiplication and division of two image)
6) Computing the DWT of an image and displaying the LL, LH, HL and HL images
7) Computing Discrete Fourier Transform of a given image
8) Extracting 1st Order statistical features of an image (Mean and Standard Deviation alone)
9) Computing the Image Histogram and Histogram equalization for the given image.

TOTAL : 30 HOURS

U19EC605 EMBEDDED SYSTEMS LABORATORY 0 0 2 1

Course Outcomes

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

1) Design an embedded system to get input from and to display using microcontrollers. (8951 Microcontroller, Arduino UNO board and TI MSP430 microcontroller)
2) Design a system by interfacing analog and digital sensors with microcontrollers using various communication protocols. (8951 Microcontroller, Arduino UNO board and TI MSP430 microcontroller)
3) Design a system by interfacing with latest microcontrollers like Intel Galileo Gen 2 board and Raspberry Pi 3 for IOT applications.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2	2	2	2	2	1	2	3	3	2
CO2	3	3	3	3	3	2	2	2	2	2	3	3	3	3
CO3	3	3	3	3	3	3	3	3	2	2	3	3	3	3

List of Experiments

The interfacing, programming and simulation of the following 6 to 13 experiments are done with 8951 Microcontroller, Arduino UNO board and TI MSP430 microcontroller, Raspberry Pi 3 board using Keil software, Arduino IDE ,Code Composer Studio IDE and Raspberry PI Python IDE respectively.

1) Study of 8951 Microcontroller using Keil software.
2) Study of Arduino UNO board and its programming Arduino IDE.
3) Study of Intel Galileo Gen 2 board and its programming.
4) Study of TI MSP430 microcontroller using Code Composer Studio IDE
5) Study of Raspberry Pi 3 board, Programming & Simulation in Python Simulators/Tools
6) LED Control using toggle switches and pushbuttons
7) Interfacing matrix keypad and 16 X 2 LCD / 8 X 8 LED Dot Matrix.
8) Interfacing Relay and Buzzer.
9) PWM Based Speed Control of Servo Motor by Potentiometer.
10) Interfacing sensors with microcontrollers based on serial/parallel communication.(UART)
11) Interfacing sensors with microcontrollers based on I2C and SPI protocol.
12) Study of interrupts using IR obstacle sensor and developing a visitor counter.
13) Interfacing Gas Sensor and PIR Sensor with microcontrollers.
14) Real time case study involving design of IOT data logger, WiFi applications by interfacing with microcontrollers.

TOTAL: 30 HOURS

U19EC606 **MINI PROJECT** **0 0 2 1**

Course Outcomes

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

1) Identify the thrust areas in Electronics and Communication Engineering and related domains.
2) Formulate the methodology in interdisciplinary mode.
3) Draft the methodology and develop the product/algorithm related to ECE domain**.**

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	2	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3	2	3	3

- Every project may hold one faculty member appointed by the HOD as a supervisor who is expert in the domain chosen by the team.
- The project problem formulated should be innovative and unique in ECE domain.
- Final solution identified by the student may be converted in to prototype.
- The hours allotted for this course shall be utilized by the students to receive directions from the supervisor to refer the existing literatures and perform the experiments in the lab to come up with the low cost solutions.
- Periodic reviews shall be held by the expert committee identified by the Head of the Department and assessment may be done.
- Monitoring committee may be appointed to regularly monitor the progress work of the student team.
- Final report and relevant documents to be submitted and final assessment will be done by the internal and external examiners appointed by the COE.

TOTAL : 30 HOURS

Semester –VI	U19GE601-SOFT SKILLS AND APTITUDE – IV (Common to All except Civil)	L	T	P	C	Marks
		0	0	2	1	100

Course Outcomes

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

1. Demonstrate capabilities in job-oriented company selection processes using the hands-on approach
2. Solve problems of any given level of complexity in all areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests
3. Demonstrate advanced-level verbal aptitude skills in English and score 70-75% marks in company-specific internal tests

1. Soft Skills	**Demonstrating Soft -Skills capabilities with reference to the following topics:** a. Mock group discussions b. Mock interviews c. Mock stress interviews
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a. Functions and Polynomials b. Clocks and Calendars c. Data Sufficiency: Introductions, 3 Options Data Sufficiency, 4 Options Data Sufficiency and 5 Options Data Sufficiency. d. Logical reasoning: Cubes, Non Verbal reasoning and Symbol based Reasoning. e. Decision making table and Flowchart Campus recruitment papers: Solving of previous year questions paper of all major recruiters f. Miscellaneous: Cognitive gaming Puzzles-(Picture, Word and Number based), IQ Puzzles, Calculation Techniques and Time Management Strategies. g. Trigonometry.- Concepts
3. Verbal Aptitude	**Demonstrating English language skills with reference to the following topics:** a. Writing captions for given pictures b. Reading comprehension c. Critical reasoning d. Theme detection e. Jumbled sentences f. Writing a story on given pictures g. Company specific verbal questions

Dr.S.Anita

Head/Training

Department of Placement Training

ECE

U19EC1006 MOBILE TECHNOLOGY AND ITS APPLICATIONS 3 0 0 3

Course Outcomes

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

1) Analyze the 1G and 2G Technologies.
2) Explain the 2.5G evolutions
3) Analyze the principles of 3G and UMTS
4) Analyze the evolutions of 4G.
5) Summarize the various wireless security applications and solve the mobile phone faults.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
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CO2	3	3	3	3	3	3		1		1	1	3		
CO3	3	3	3	3	3	3		1		1	1	3		
CO4	3	3	3	3	3	3		1		1	1	3		
CO5	3	3	3	3	3	3		1		1	1	3		

Unit I 1G and 2G **9**

First Generation (1G): 1G Systems – General 1G System Architecture – Generic MTSO Configuration – Generic Cell Site Configuration – Call Setup Scenarios – Handoff – Frequency Reuse – Spectrum Allocation – Channel Band Plan
Second generation (2G): Enhancements over 1G Systems – Integration with Existing 1G Systems – GSM - iDEN – CDPD

Unit II 2.5G Generation **9**

Enhancements over 2G – Technology Platforms – General Packet Radio Service (GPRS) – Enhanced Data Rates for Global Evolution (EDGE) – High-Speed Circuit Switched Data (HSCSD) – CDMA2000 (1XRTT) – WAP-Migration Path from 2G to 2.5G to 3G..

Unit III 3G Generation **9**

Introduction – Universal Mobile Telecommunications Service (UMTS), UMTS Basics, The UTRAN Architecture, Handover, UMTS Services – The UMTS Air Interface – Overview of the 3GPP Network Architecture – Overview CDMA2000 – Commonality Between WCDMA/CDMA2000/CDM

Unit IV 4G and Beyond **9**

Introduction to LTE - Network architectures – EPC – E-UTRAN architecture – Mobility management – Resource management – Services – Channel – logical and transport channel mapping – downlink/uplink data transfer – MAC control element – PDU packet formats – scheduling services – random access procedure – Objectives of 5G- Architecture – Features and benefits.

Unit V Wireless Security and Mobile Phone service **9**

Introduction – Fingerprint – Classification of major security attacks against RFID systems – GSM Security – Barcode scanner technology features and applications – QR code – BAR code – OTP – AirDrop.

Mobile phone Service: Parts in the mobile phones -Mobile phones assembling and disassembling –motherboard - Mobile Operating Systems - Fault finding - Advanced troubleshooting techniques.

TOTAL : 45 HOURS

Text Book

1) Clint Smith,P.E, Dannel Collins, "3G Wireless Networks" 2nd edition, Tata McGraw-Hill, 2008.
2) Vijay K.Garg, "Wireless Network Evolution- 2G & 3G" Pearson, 2013.

References

1) T.S Rapp port, "Wireless Communications" Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint, 2013.
2) JochenH.Schiller, "Mobile Communications", 2/e, Pearson, 2014
3) SassanAhmadi, "LTE-Advanced – A practical systems approach to understanding the 3GPP LTE Releases 10 and 11 radio access technologies", Elsevier, 2014

U19EC1003 SENSORS AND SMART STRUCTURES TECHNOLOGIES 3 0 0 3

Course Outcomes

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

1) Insight into the basic concept regarding smart materials and their use in structures.
2) Analyze the use of measuring techniques in smart materials and structures
3) Identify the suitable sensors for smart materials.
4) Apply the techniques of actuators in smart structures.
5) Relate the data acquisition techniques, signal processing and control for smart structures.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	2	3	2	2	2	2	3	3	2
CO2	3	2	3	3	3	2	3	2	3	2	3	3	3	2
CO3	3	2	3	3	3	2	3	2	3	3	3	3	3	2
CO4	3	2	3	3	3	2	3	2	3	2	3	3	3	2
CO5	3	3	3	3	3	3	3	2	3	2	3	3	3	2

Unit I INTRODUCTION TO SMART MATERIALS AND STRUCTURES 9

Introduction to Smart Materials and Structures – Instrumented Structures Functions and Response –Sensing Systems – Smart Bridge – Self Diagnosis – Signal Processing Consideration – Actuation Systems and Effectors

Unit II MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical Strain Gauges, Types – Resistance – Capacitance – Inductance – Wheatstone Bridges – Pressure Transducers – Load Cells – Temperature Compensation – Strain Rosettes.

Unit III SENSORS **9**

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain Measurement – Inductively Read Transducers – The LVDT – Fiber Optic Techniques. Chemical and Bio-Chemical Sensing in Structural Assessment – Absorptive Chemical Sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed Measurement –Fire Sensor –Emergency Fire Alarm – Humidity Sensor – Accelerometers – Motion Sensors and Pressure Sensors.

Unit IV ACTUATORS **9**

Actuator Techniques – Actuator and Actuator Materials – Piezoelectric and Electrostrictive Material – Magnetostrictive Material – Shape Memory Alloys – Electro Rheological Fluids– Electro Magnetic Actuation – Role of Actuators and Actuator Materials..

Unit V SIGNAL PROCESSING AND CONTROL SYSTEMS **9**

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

TOTAL : 45 HOURS

Text Book

1) A.K. Sawhney, "A Course in Electical and Electronic and Measurements and Instrumentation",Dhanpat rai and co pvt limited, 2015
2) Brain Culshaw , "Smart Structure and Materials", Artech House, Borton. London, 1996.

References

1) L. S. Srinath , "Experimental Stress Analysis", Tata McGraw,1998.
2) J. W. Dally & W. F. Riley, "Experimental Stress Analysis", Tata McGraw, 1998.
3) Srinivasan, A.V and Michael McFarland. D, "Smart Structures -Analysis and Design", Cambridge University Press, 2001

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VII under Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title		Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory								
1.	U19EC701	Wireless Communication		3	0	0	3	45
2.	U19EC702	Microwave and Optical Communication		4	0	0	4	60
3.	U19GE701	Professional Ethics and Human Values		3	0	0	3	45
4.	U19EC920	Professional Elective	Low power ASIC Design	3	0	0	3*	45
	U19EC922		Deep Learning					
5.	U19EC928	Professional Elective	IoT and Sensors	3	0	0	3*	45
	U19EC931		Wireless Adhoc Network					
6.	U19GE702	Professional Elective	Professional Readiness for Innovation, Employability and Entrepreneurship	0	0	6	3	90
7.	U19CE1004	Open Elective	Disaster Management	3	0	0	3	45
	U19CS1001		Big Data Analytics					
	U19CS1002		Cloud Computing					
	U19CS1003		Internet of Things					
	U19CS1004		Mobile Application Development					

Approved By

Chairperson, Electronics and Communication Engineering BoS	**Member Secretary, Academic Council**	**Chairperson, Academic Council & Principal**
Dr.R.S.Sabeenian	**Dr.R.Shivakumar**	**Dr.S.R.R.Senthil Kumar**

Copy to:-

HOD/Electronics and Communication Engineering, Seventh Semester BE ECE Students and Staff, COE

	U19CS1006		Data Science					
	U19EE1001		Electric Mobility					
	U19EE1002		Energy Conservation and Management					
	U19EE1003		Innovation, IPR and Entrepreneurship Development					
	U19EE1004		Renewable Energy Systems					
	U19FT1001		Fundamentals of Fashion Design					
	U19FT1002		Garment Manufacturing Technology					
	U19MC1003		Smart Automation					
Practical								
8.	U19EC703	Microwave and Optical Laboratory		0	0	2	1	30
						Total Credits	**23**	

Approved By

Chairperson, Electronics and Communication Engineering BoS
Dr.R.S.Sabeenian

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/Electronics and Communication Engineering, Seventh Semester BE ECE Students and Staff, COE

U19EC701 **WIRELESS COMMUNICATION** **3 0 0 3**

Course Outcomes

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

1) Explain the wireless communication systems and cellular concepts.
2) Analyze the various mobile radio propagation mechanisms and diversity Techniques.
3) Analyze the Path loss models and design the Base Station parameters using various antenna configurations.
4) Analyze and examine the multiple access techniques in wireless communication
5) Explain the various wireless technologies.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	2	2				2	3	3	3	3
CO2	2	3	3	3	3	2				2	3	3	3	3
CO3	2	3	3	3	3	2				2	3	3	3	3
CO4	2	3	3	3	3	2				2	3	3	3	3
CO5	2	3	3	3	3	2				2	3	3	3	3

Unit I WIRELESS COMMUNICATION SYSTEM **9**

Evolution of Mobile Radio Communication – Generation of mobile communication – Paging system – Cordless telephones systems – Cellular telephone Systems - Vehicular communication systems – Cellular telephone Systems – Cellular concept: Frequency reuse – Channel Assignment strategies – Hand off strategies – Interference and System capacity – Improving coverage and capacity in cellular systems – The Wireless Spectrum – Methods for Spectrum Allocation – Spectrum Allocations for Existing Systems.

Unit II MOBILE RADIO PROPAGATION AND DIVERSITY TECHNIQUES **9**

Mobile Radio Propagation – Reflection – Reflection from Dielectrics – Brewster Angle – Reflection from Perfect Conductors – Ground Reflection (Two-Ray) model – Diffraction – Fresnel Zone Geometry – Knife-Edge Diffraction Model – Multiple Knife- Edge Diffraction – Scattering – Diversity Techniques.

Unit III PATH LOSS MODELS AND BASICS OF ANTENNA **9**

Path Loss Prediction over Hilly Terrain – Practical Link Budget Design using Path Loss Models – Log-Distance Path Loss Model – Log - Normal Shadowing – Determination of Percentage of Coverage Area – Design Parameters at Base Station – Antenna Location – Spacing – Heights and Configurations.

Unit IV MULTIPLE ACCESS TECHNIQUES **9**

Introduction to Multiple Access Techniques – Frequency Division Multiple Access (FDMA) – Time Division Multiple Access (TDMA) – Code Division Multiple Access (CDMA) – Spread Spectrum Multiple Access – Power Control –WCDMA – CDMA Network Design – OFDM and MC-CDMA.

.

Unit V WIRELESS TECHNOLOGIES **9**

Global System for Mobile (GSM) – GSM Services and Features – GSM System Architecture – GSM Radio Subsystems and Channel Types – Wireless personal area networks – Bluetooth – UWB and ZigBee – wireless metropolitan area networks – WiMAX – Introduction 4G(LTE) and 5G.

TOTAL : 45 HOURS

Text Books

1) T.S.Rappaport, "*Wireless Communication Principles*", (2/e), Pearson, 2013..

2) Andrea Goldsmith, "*Wireless Communication*", Cambridge University Press, 2012.

References

1) A.F.Molisch, "*Wireless Communications*", Wiley, 2013

2) P .Muthu Chidambara Nathan, "*Wireless Communications*", PHI, 2013.

U19EC702 MICROWAVE AND OPTICAL COMMUNICATION 4 0 0 4

Course Outcomes

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

1) Analyze the multi- port RF networks and parameters used in Microwave Communication systems.
2) Analyze the passive & active Microwave devices, RF transistor amplifiers and measurements.
3) Describe Optical fibers and its characteristics.
4) Illustrate the working of Optical sources and detectors.
5) Explain the Optical transmission systems and components.

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3			2	2	3	3	2
CO2	3	3	3	3	3	3	3			2	2	3	3	2
CO3	3	3	3	3	3	3	3			2	2	3	3	2
CO4	3	3	3	3	3	3	3			2	2	3	3	2
CO5	3	3	3	3	3	3	3			2	2	3	3	2

Unit I TWO PORT RF NETWORKS 12

Introduction to microwave- one port network- two port network– Impedance – Admittance – Hybrid and ABCD parameters –reciprocal and symmetry network- High Frequency Parameters – Formulation of S Parameters – Properties of S Parameters- E plane –H plane – magic tee- Matched Terminations – Directional Coupler – Attenuators – Circulator – Isolator.

Unit II MICROWAVE SEMICONDUCTOR DEVICES AND AMPLIFIERS 12

Gunn Diode Oscillator – Two Cavity Klystron Amplifier – Multicavity Klystron Amplifier - Reflex Klystron Oscillators – Modes and Efficiency Considerations – Magnetrons – TWT-VSWR Meter –Spectrum Analyzer – Network Analyzer – Principles – Measurement of Impedance – Frequency measurement – Power measurement..

Unit III INTRODUCTION TO OPTICAL FIBERS **12**

Evolution of Fiber Optic Systems - Elements of an Optical Fiber Transmission System - Ray Theory –Total Internal Reflection - Acceptance Angle – Numerical Aperture – Fiber- Types and Configurations - Attenuation-Dispersion-Material Dispersion-Waveguide Dispersion-Fiber Losses.

Unit IV OPTICAL SOURCES AND DETECTORS **12**

LED's - Surface Emitters – Edge Emitters - LASER – Diodes - Semiconductor Laser Diodes - Fabry-Perot Lasers - Distributed Feedback (DFB) Lasers- Modulation of LASER Diodes- Temperature Effects - PIN Photo Detector – Avalanche Photodiodes – Fundamental Receiver Operation.

Unit V DIGITAL TRANSMISSION SYSTEMS **12**

Point to Point Link Systems Considerations – Link Power Budget – Rise Time Budget – Optical System Components- Filters-Wavelength Converters -Optical Switches - Erbium Doped Fiber Amplifier (EDFA's) -Wavelength Division Multiplexing (WDM) - SONET/SDH

TOTAL : 60 HOURS

Text Books

1) Annapurna Das and Sisir K Das, *"Microwave Engineering"*, Tata Mc Graw Hill Inc., 2nd edition, 2014..

2) Gerd Keiser, "Optical Fiber Communication", Tata Mc Graw Hill, 5th edition.2017.

References

1) Samuel Y- Liao, *"Microwave Devices and Circuits"*, Pearson/Prentice Hall of India, 3rd Edition 2011..

2) David M. Pozar, *"Microwave Engineering",* Wiley India (P) Ltd, New Delhi, 2008.

3) Thomas H Lee, *"Planar Microwave Engineering: A Practical Guide to Theory, Measurements and Circuits"*, Cambridge University Press, 2004

4) John M. Senior,*"Optical Fiber Communications",* Pearson, 3rd edition, 2009

U19EC920 **LOW POWER ASIC DESIGN** **3 0 0 3**

Course Outcomes

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

1) Evaluate about the sources of power dissipation in CMOS.
2) Design low power Static RAM
3) Illustrate the ASIC.
4) Analyze the Synthesis and Floor planning.
5) Examine the Placement, Routing and SOC.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	3	2		3	2		2	2	3	3	2
CO2	3	2	2	3	3		3	2		2	2	3	3	2
CO3	2	3	2	3	3		3	2		2	2	3	3	2
CO4	2	2	2	3	3		3	2		2	2	3	3	2
CO5	2	2	2	3	3		3	2		2	2	3	3	2

Unit I POWER DISSIPATION IN CMOS **9**

Sources of Power Dissipation – Physics of Power Dissipation in MOSFET Devices - MIS Structure - Long Channel MOSFET - Submicron MOSFET - Gate- Induced Drain Leakage – Power Dissipation in CMOS - Short Circuit Dissipation - Dynamic Dissipation - The Load Capacitance.

Unit II LOW POWER STATIC RAM DESIGN **9**

MOS Static RAM Memory Cell – Banked Organization of SRAM – Reducing Voltage Swings on Bit Lines – Reducing Power in the Write Driver Circuits – Reducing Power in Sense Amplifier Circuits.

Unit III INTRODUCTION TO ASIC **9**

Type of ASIC – Full Custom ASICs – Standard Cell Based ASICs – Gate Array Based ASICs – Channeled Gate Array – Channelless Gate Array – Structured Gate Array – Programmable Logic Devices – Field Programmable Gate Array – Design Flow.

Unit IV FLOORPLANNING **9**

Logic Synthesis – RTL coding for Synthesis – Floorplanning – I/O and Power Planning – Clocking Planning

Unit V PLACEMENT, ROUTING AND SOC **9**

Placement –Placement Algorithms – Iterative Placement Improvement – Routing – Global Routing – Detailed Routing – System-on-Chip Concept – SoC Architecture - Case Studies: Digital camera.

TOTAL : 45 HOURS

Text Book

1) Kaushik Roy and Sharat C. Prasad, *"Low Power CMOS VLSI Circuit Design"*, Wiley India Edition, 2011.
2) Michael John Sebastian Smith, *"Application – Specific Integrated Circuits"*, Pearson Education, 2013.

References

1) Kuo J.B and Lou J.H, "*Low voltage CMOS VLSI Circuits*", Wiley 1999.
2) Wayne Wolf., *"Modern VLSI Design System-On –Chip Design",* Pearson Education, 2005

U19EC922 **DEEP LEARNING** **3 0 0 3**

Course Outcomes

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

1) Explain the basic concepts in Neural Networks.
2) Understand and use feature extraction techniques in Neural Networks
3) Learn the fundamentals of deep learning, and the main research activities in this field.
4) Implement CNN and RNN algorithms and solve real world problems.
5) Analyse detection and recognition tasks using convolution neural networks

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	3	2							3	3	2
CO2	2	2	3	3	3							3	3	2
CO3	2	3	2	3	2							3	3	2
CO4	2	2	3	3	3							3	3	2
CO5	2	2	3	2	3							3	3	2

Unit I INTRODUCTION TO DEEP NETWORKS **9**

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

Unit II LINEAR MODELS **9**

Multilayer Perceptron- Gradient Descent- Forward and Backward Backpropagation- RBF- Fully Connected layers- GLCM - LBP – Particle Swarm Optimization- Cuckoo Search optimization- Grey wolf optimization

Unit III IMPROVING DEEP LEARNING **9**

Introduction to deep learning - Shallow Neural Networks – Radial Basis Function Neural Network -Planar data classification with a hidden layer -Layers in Neural Network- Convolution and its types-Pooling layers and its types- Building your Deep Neural Network: step by step- Deep Neural Network - Hyperparameter tuning, Batch Normalization.

Unit IV DEEP CONVOLUTIONAL MODELS: CASE STUDIES **9**

1D, 2D, 3D Convolutional Neural Network, Basic structure of Convolutional Network – Overfitting-Activation ReLU - Case studies: LeNet, Alex net, VGGNet, GoogLeNet – RNN- Design of New architectures.

Unit V DATA ANALYSIS AND APPLICATION **9**

Data Preparation- Numerical Measure- Confusion Matrix- Visualization-Applications of CNN–YOLO – SSD- Faster RCNN Object Detection, MNIST Image Classification - Face Recognition - Natural Language Processing, Speech Recognition via Spectrogram- 3D-Pose Estimations using Deep learning algorithms for image and signal processing.

TOTAL : 45 HOURS

Text Book

1) Dr. S Lovelyn Rose, Dr. L Ashok Kumar, Dr. D Karthika Renuka, Deep Learning Using Python, Wiley, 2019.
2) Dive Into Deep Learning Tools for Engagement, Joanne Quinn, Joanne McEachen, Michael Fullan, Mag Gardner, Max Drummy · 2019.

References

1) Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006
2) Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3) Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2017

U19EC928 **IoT AND SENSORS** **3 0 0 3**

Course Outcomes

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

1) Demonstrate the fundamentals of Internet of Things.
2) Analyze the various protocols for loT.
3) Understand the functionalities of Arduino and Raspberry Pi development boards.
4) Interface the sensors with development boards.
5) Develop the smart IOT systems.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3	2	3				2	3	3	3
CO2	3	2	3	3	3	2	3				2	3	3	3
CO3	3	2	3	3	3	2	3				2	3	3	3
CO4	3	2	3	3	3	2	3				2	3	3	3
CO5	3	2	3	3	3	2	3				2	3	3	3

Unit I FUNDAMENTALS OF IoT **9**

Evolution of Internet of Things - Enabling Technologies - loT Architectures: oneM2M, loT World Forum (loTWF) and Alternative loT models - Simplified loT Architecture and Core loT Functional Stack - Fog, Edge and Cloud in loT - Functioral blocks of an loT ecosystem - Sensors, Actuators, Smart Objects and Connecting Smart Objects

Unit II lOT PROTOCOLS **9**

loT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11 ah and LoRaWAN - Application Transport Methods: Supervisory Control and Data Acquisition - Application Layer Protocols: CoAP and MQTT

Unit III IOT DEVELOPMENT BOARDS **9**

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - loT system building blocks - Arduino - Board I/O details, IDE programming - Raspberry Pi - Interfaces and Simple programming using Raspberry Pi with Python environment.

Unit IV INTERFACING OF SENSORS WITH DEVELOPMENT BOARD **9**

Introduction and classifications of sensors –Interfacing Arduino with PIR sensor-Potentiometers-Encoders-LM55, DHT11, LDR, ultrasonic sensor-LIDAR- Soil moisture-ESP8266 WiFi module..

Unit V REAL TIME SYSTEM DEVELOPMENT **9**

Case study on Smart Street Lighting System -Smart Irrigation System- Smart home

TOTAL : 45 HOURS

Text Book

1) David Hanes, Gonzalo Salgueiro, Patrick Grossetete. Rob Barton and Jerome Henry, "loT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017..
2) Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010

References

1) Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015
2) Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3) Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
4) Edward Sazonov, Michael R. Newman, “Wearable Sensors: Fundamentals, Implementation and Applications”, 2014, 1st Edition, Academic Press, Cambridge

U19EC931 **WIRELESS ADHOC NETWORK** **3 0 0 3**

Course Outcomes

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

1) Discuss about the Ad hoc wireless networks and MAC protocols
2) Explain the functioning of different routing protocols
3) Analyse the different transport layer protocol
4) Analyse quality of service and its protocols.
5) Discuss the energy management schemes and solutions.

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3		1			1	2	3	3	3
CO2	3	3	2	3	3		1			1	2	3	3	3
CO3	3	3	2	3	3		1			1	2	3	3	3
CO4	3	3	2	3	3		1			1	2	3	3	3
CO5	3	3	2	3	3		1			1	2	3	3	3

Unit I AD HOC WIRELESS NETWORKS AND MAC PROTOCOLS **9**

Introduction to ad-hoc wireless networks - Issues - applications – MAC Protocols - Issues in Designing - goals and classification - Contention based protocols with reservation mechanism, scheduling mechanism, MAC protocols using directional antennas

Unit II ROUTING PROTOCOLS **9**

Design issues – Classification of routing protocols – Table driven routing protocols – Distance vector routing protocols - On demand routing protocols - Dynamic source routing protocols — Hybrid routing protocols -Zone routing protocol –Hierarchical state routing protocols – Fisheye state routing protocols

Unit III TRANSPORT LAYER **9**

Issues in designing – Classification of transport layer, Ad hoc transport protocol, Security in Ad hoc wireless network, Network security requirements – Network security attack – Key management – Secure aware Ad hoc routing protocol - Secure efficient Ad hoc distance vector routing protocol

Unit IV QUALITY OF SERVICE **9**

Introduction – issues and challenges – Classifications of QoS Solutions – MAC layer solutions – Cluster TDMA, IEEE 802.11e, DBASE - Network layer solutions – QoS routing protocols, predictive location based QoS routing protocol, bandwidth routing protocols.

Unit V ENERGY MANAGEMENT **9**

Need for energy management – Classification – Battery management schemes – Device dependent schemes, data link layer solutions, Network solutions – Transmission power management scheme system power management scheme

TOTAL : 45 HOURS

Text Book

1) C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols,
1st edition (paper back), Pearson, 2006

2) Charles E. Perkins, Ad hoc Networking, 1st edition (paper back), Addison Wesley, 2000

References

1) Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley, 2004

2) Ilyas, The handbook of ad-hoc wireless networks, T&F India, 2019.

U19GE702 **PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP** **0 0 6 3**

Objectives

1) To empower students with overall Professional and Technical skills required to solve a real world problem

2) To mentor the students to approach a solution through various stages of Ideation, Research, Design Thinking, workflows, architecture and building a prototype in keeping with the end-user and client needs

3) To provide experiential learning to enhance the Entrepreneurship and employability skills of the students

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
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CO3	3	3	2	3	3	3	3	1	3	3	2	3	3	3

This course is a four months immersive program to keep up with the industry demand and to have critical thinking, team based project experience and timely delivery of modules in a project that solves world problems using emerging technologies

To prepare the students with digital skills for the future, the Experiential Project Based Learning is introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. This is an EEC category course offered as an elective, under the type, “Experiential Project Based Learning”.

Highlights of this course:

1) Students undergo training on emerging technologies
2) Students develop solutions for real-world use cases
3) Students work with mentors to learn and use industry best practices
4) Students access and use Self-Learning courses on various technologies, approaches and methodologies
5) Collaborate in teams with other students working on the same topic
6) Have a dedicated mentor to guide

OUTCOMES:

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

1) Upskill in emerging technologies and apply to real industry-level use cases
2) Understand agile development process
3) Develop career readiness competencies, Team Skills / Leadership qualities
4) Develop Time management, Project management skills and Communication Skills
5) Use Critical Thinking for Innovative Problem Solving
6) Develop entrepreneurship skills to independently work on products

The course will involve 40-50 hours of technical training, and 40-50 hours of project development. The activities involved in the project along with duration are given in Table 1.

TABLE 1: ACTIVITIES

S.No.	Activity Name	Activity Description	Time (weeks)
1)	Choosing a Project	Selecting a project from the list of projects categorized various technologies & business domains	2
2)	Team Formation	Students shall form a team of 4 Members before enrolling to a project. Team members shall distribute the project activities among themselves.	1
3)	Hands on Training	Students will be provided with hands-on training on selected technology in which they are going to develop the project.	2
4)	Project Development	Project shall be developed in agile mode. The status of the project shall be updated to the mentors via appropriate platform	6
5)	Code submission, Project Doc and Demo	Project deliverables must include the working code, project document and demonstration video. All the project deliverables are to be uploaded to cloud based repository such as GitHub.	3
6)	Mentor Review and Approval	Mentor will be reviewing the project deliverables as per the milestone schedule and the feedback will be provided to the team.	1
7)	Evaluation and scoring	Evaluators will be assigned to the team to evaluate the project deliverables, and the scoring will be provided based on the evaluation metrics	1
		TOTAL	**16 WEEKS**
			90 Hours

Essentially, it involves 15 weeks of learning and doing, and one week for evaluation

U19EC703 MICROWAVE AND OPTICAL LABORATORY 0 0 2 1

Course Outcomes

After successful completion of this course, the students should be able to

1) Measure microwave signals and parameters.
2) Analyze the performance behavior of microwave components.
3) Analyze the performance of optical components

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	2	3						1	3	2
CO2	3	2	2	3	3	3						3	3	2
CO3	3	2	2	3	3	3						3	3	2

List of Experiments

1) Study of Microwave Components
2) Reflex Klystron Mode Characteristics
3) Characteristics of Gunn Oscillator
4) Measurement of Impedance
5) Measurement of Frequency, Wavelength, VSWR
6) S parameter measurement of Isolator & circulator
7) Measurement of Directivity and Coupling coefficient of directional coupler
8) Design of microwave integrated circuits based on directional coupler
9) Study of Resonant characteristics of Microwave integrated circuits
10) DC characteristics of LED and LD
11) DC characteristics of PIN PD
12) DC characteristics of APD

TOTAL : 30 HOURS

ECE

U19EC1001 **BIOMEDICAL INSTRUMENTATION AND MEASUREMENTS** **3 0 0 3**

Course Outcomes

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

1) Describe the recording equipment used for Bio medical signal analysis
2) Elaborate the measurement devices on temperature and blood flow
3) State the special features and functions of assist devices
4) Outline the objectives and working principles of the various patients assist equipment's
5) Provide an overview of imaging equipment and computer in medicine

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	1	2	2	3	3	3	2	3	3	2
CO2	2	2	3	3	2	2	2	3	3	3	2	3	3	2
CO3	2	2	3	3	1	2	3	3	3	3	2	3	3	2
CO4	3	2	3	2	2	2	2	3	3	3	3	3	3	2
CO5	2	2	3	2	1	2	3	2	3	3	2	3	3	2

Unit I BASIC ELECTRONICS **9**

Semiconductor Materials, chemical and physical bonds, Intrinsic and extrinsic semiconductors, carrier motion in semiconductors – Drift, Diffusion And Recombination – Generation process, Boltzmann Transport equation, P-N junction diode, Bipolar Junction Transistor (BJT), Field Effect Transistor (FET), Operational Amplifier(OPAMP).

Unit II DIGITAL LOGIC CIRCUITS **9**

Boolean Algebra and basic logic gates, K map, Combinational logic circuit, sequential logic circuit – flip flops,Semiconductor Memories- RAM ,PROM,EPROM,EEPROM, Sequential Memory

Unit III BIOLOGICAL MATERIALS **9**

Analogy between semiconductor and biological materials, water and electrolyte solutions; biological molecules - Proteins, Nucleic acids, Phospholipids; cell membrane; Eucaryotic cell. Motion in solution and chemical reaction: Diffusion, Brownian motion, electrophoresis, enzyme kinetics; Solid electrolyte junctions: electrode-electrolyte interfaces

.

Unit IV BIOMEDICAL SIGNALS **9**

Genesis of bioelectric potential, ECG, EEG, EMG and their monitoring and measurement; overview of analog signal analysis: time – and frequency- domain representation of signal, Fourier series and Fourier transform, linear system, correlation, convolution and filtering; random signal – correlation and spectral representation. Digitization of signal: sampling theorem and A/D Conversion; Quantizing effects; aliasing artifacts in biomedical signals

.

Unit V BIOMEDICAL APPLICATIONS OF DIGITAL FILTERING **9**

Removal power line interference from ECG data, reducing ECG artifact from EMG data. ECG Pre-processing, wave form recognition, morphological studies and rhythm analysis, automated diagnosis based on decision theory, ECG compression.

TOTAL : 45 HOURS

Text Books

1) Massimo Grattarola, Giuseppe Massobrio, "Bioelectronics Handbook, MOSFETs, Biosensors & Neurons",Mc Graw Hill,1998.

References

1) M. Mano, "Digital Logic and Computer Design", PHI,2017.
2) Ronald Pethig Stewart Smith, "Introductory Bioelectronics: For Engineers and Physical Scientists" , John Wiley & Sons, Ltd,2012.
3) E.N. Bruce,"Biomedical Signal Processing and Signal Modeling",John Wiley and Sons,2000.
4) Chandran Karunakaran, Kalpana Bhargava, Robson Benjamin," Biosensors and Bioelectronics",Elsevier,2015

U19EC1002 EMBEDDED AND REAL TIME SYSTEMS 3 0 0 3

Course Outcomes

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

1) Describe the hardware and software architectures of an embedded system.
2) Apply the various design process and parameter analysis of the embedded system.
3) Develop the embedded hardware using ARM processor.
4) Design the embedded software using real time operating system tools.
5) Develop the embedded applications using suitable hardware and software.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	2	2	3	3	2	2	3	2	1	2	2	3
CO2	3	2	3	3	3	3	3	2	2	2	2	3
CO3	2	2	3	3	3	2	2	2	1	2	3	3
CO4	1	2	3	3	3	1	3	2	2	2	2	3
CO5	2	2	3	3	3	2	3	2	1	3	3	3

Unit I ARCHITECTURE OF EMBEDDED SYSTEMS 9

Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded System – Recent Trends in Embedded System – Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software –Process of Generation of Executable Image – Development-Testing.

Unit II DESIGN AND ANALYSIS OF EMBEDDED SYSTEMS 9

Embedded System Design Process – Structural description – Behavioral description – Memory System Mechanism – CPU Performance – CPU Power Consumption – CPU Buses – Memory Devices – Model of Programs – Analysis and Optimization of Execution Time – Power – Energy – Program Size – Program Validation and Testing.

Unit III ARM PROCESSOR ARCHITECTURE 9

Introduction to ARM processor-ARM Architecture Versions – Features of ARM-ARM Architecture – Operating modes-Register set- ARM Instruction Set – Stacks and Subroutines – ARM7TDMI –Features of the LPC 2148 Family-Block Diagram of LPC 2148 – Peripherals – The Timer Unit–GPIO – UART..

Unit IV REAL-TIME OPERATING SYSTEM CONCEPTS 9

Architecture of the Kernel – Task and Task Scheduler – Interrupt Service Routines – Semaphores – Mutex – Mailboxes – Message – Queues – Event Registers – Pipes – Signals – Timers – Memory Management – Priority Inversion Problem..

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Unit V REAL-TIME OPERATING SYSTEM TOOLS AND CASE STUDIES 9

Case Study of an Automatic Chocolate Vending Machine using MUCOS RTOS – Case Study of an Embedded System for Set-top Boxes – Case Study of an Embedded System for a Smart card Reader-Automated Meter Reading System (AMR)..

TOTAL : 45 HOURS

Text Books

1) K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dreamtech press, 2018.
2) Marilyn Wolf, *"Computers as Components - Principles of Embedded Computer System Design",* 3rd Edition, Morgan Kaufmann Publisher, (An Imprint from Elsevier), 2016.

References

1) Lyla B. Das, "Embedded Systems An Integrated Approach", Pearson Publications, 2019.
2) Shibu K V, *"Introduction to Embedded Systems",* 2nd Edition, McGraw Hill, 2016..
3) Raj Kamal, *"Embedded Systems Architecture Programming and Design"*, 3rd Edition, TMH, 2014
4) Xiaocong Fan, *"Real-Time Embedded Systems: Design Prinicple and engineering practices",* SCI-Tech Connect, Elsevier, 2016..

U19EC1003 SENSORS AND SMART STRUCTURES TECHNOLOGIES 3 0 0 3

Course Outcomes

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

1) Insight into the basic concept regarding smart materials and their use in structures.
2) Analyze the use of measuring techniques in smart materials and structures.
3) Identify the suitable sensors for smart materials.
4) Apply the techniques of actuators in smart structures.
5) Relate the data acquisition techniques, signal processing and control for smart structures.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1	2	1						3	2	1
CO2	2	1	2	1	2	1	2					3	2	1
CO3	2	1	2	1	2	1						3	2	1
CO4	2	1	2	1	2	1	2					3	2	1
CO5	2	1	2	1	2	1						3	2	1

Unit I INTRODUCTION TO SMART MATERIALS AND STRUCTURES 9

Introduction to Smart Materials and Structures – Instrumented Structures Functions and Response –Sensing Systems – Smart Bridge – Self Diagnosis – Signal Processing Consideration for bridges – Actuation Systems and Effectors.

Unit II MEASURING TECHNIQUES 9

Strain Measuring Techniques using Electrical Strain Gauges, Types – Resistance – Capacitance – Inductance – Wheatstone Bridges – Pressure Transducers – Load Cells – Temperature Compensation – Strain Rosettes.

Unit III SENSORS **9**

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain Measurement – Inductively Read Transducers – The LVDT – Fiber Optic Techniques. Chemical and Bio-Chemical Sensing in Structural Assessment – Absorptive Chemical Sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed Measurement –Fire Sensor –Emergency Fire Alarm –Humidity Sensor – Accelerometers – Motion Sensors and Pressure Sensors

Unit IV ACTUATORS **9**

Actuator Techniques – Actuator and Actuator Materials – Piezoelectric and Electrostrictive Material – Magnetostrictive Material – Shape Memory Alloys – Electro Rheological Fluids– Electro Magnetic Actuation – Role of Actuators and Actuator Materials.

Unit V SIGNAL PROCESSING AND CONTROL SYSTEMS **9**

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors : Signal Processing – Control System – Linear and Non-Linear systems.

TOTAL : 45 HOURS

Text Book

1) A.K. Sawhney, “A Course in Electical and Electronic and Measurements and Instrumentation”,Dhanpat rai and co pvt limited, 2015.
2) Brain Culshaw , “Smart Structure and Materials”, Artech House, Borton. London, 1996.

References

1) L. S. Srinath , “Experimental Stress Analysis”, Tata McGraw,1998.
2) J. W. Dally & W. F. Riley, “Experimental Stress Analysis”, Tata McGraw, 1998.
3) Srinivasan, A.V and Michael McFarland. D, "Smart Structures -Analysis and Design”, Cambridge University Press, 2001

Course Outcomes

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

1) Perform multiple operations on CT and DT signals and analyse the characteristics of continuous and discrete time systems.
2) Apply Z transform on DT signals and analyse systems using Z transform.
3) Prove the properties of discrete Fourier transforms and implement DFT using fast Fourier transform.
4) Describe the fundamentals of monochrome and color image processing and analyse the basic relations between pixels, connectivity and distance measures.
5) Apply image enhancement techniques in spatial and frequency domain.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1	1	1
CO2	3	3	2	2	1	1	1	1	1	1	1	1
CO3	3	3	2	2	1	1	1	1	1	1	1	1
CO4	3	3	2	2	1	1	1	1	1	1	1	1
CO5	3	3	2	2	1	1	1	1	1	1	1	1

Unit I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous-Time and Discrete-Time signals – Exponential and Sinusoidal Signals – The Unit Impulse and Unit Step Functions – Operation of Signals (Time Shifting – Time Reversal – Amplitude Scaling – Time Scaling – Signal Addition – Multiplications) – Continuous-Time and Discrete-Time Systems – Basic System Properties (Systems With and Without Memory – Causality – Stability – Time Invariance – Linearity).

Unit II ANALYSIS OF SIGNALS AND SYSTEMS USING Z-TRANSFORM 9

The Z-Transform – The Region of Convergence for the Z-Transform – The Inverse Z-Transform Partial fraction and Long division method– Properties of the Z-Transform – System Function Algebra and Block Diagram Representations – The Unilateral Z-

Transform

Unit III DISCRETE FOURIER TRANSFORM AND FFT **9**

Introduction to DFT – Efficient computation of DFT- Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Fast convolution- overlap save method and overlap add method.

Unit IV DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS **9**

Fundamental Steps in Digital Image Processing, Elements of visual perception, Some basic relationship between pixels, Connectivity, Distance measure, brightness, contrast, hue- saturation- mach band effect, Image sampling- Quantization, Dither, Colour image fundamentals RGB, HSI models.

Unit V IMAGE ENHANCEMENT **9**

Spatial domain approach: point processing, Image negative, Contrast Stretching, Gray level slicing, Histogram Equalization, Image addition, subtraction, averaging, Smoothing Filters- spatial LPF, Median Filter, Sharpening Filters-spatial HPF, High Boost filter, Derivative filters Frequency domain filters, Homomorphic Filter.

TOTAL : 45 HOURS

Text Book

1) Allan V.Oppenheim, Allan S.Willsky and S.Hamid Nawab "*Signals and Systems* "Pearson India; 2nd edition (2015)
2) P.Ramesh Babu, **"***Digital Signal Processing*"-Scitech Publications (India) Pvt Ltd ,7th edition, 2017
3) Jayaraman S., Esakkirajan & Verrakumar "*Digital Image Processing*", TMH ,New Delhi, 2nd Edition ,2020

References

1) M .J. Roberts, "*Signals & Systems Analysis using Transform Methods & MATLAB*", Tata McGraw Hill, 3rd Edition 2017
2) Rafael C. Gonzalez and Richard E. Woods., "*Digital Image Processing*", Pearson,4th edition (2017)

Course Outcomes

After successful completion of this course, the students should be able to

1) Design HDL code for combinational circuits and sequential circuits
2) Analyze MOS transistor theory
3) Illustrate the fabrication processes of CMOS
4) Design combinational circuit design.
5) Architectural choices and performance tradeoffs involved in designing

Pre-requisite

Digital Electronics

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	3	1	3	3	1	1	2	1	3	3
CO2	1	2	2	2	2		2	3		1	2	1	3	3
CO3	2	2	3	3	2		2	2		2	1	1	3	3
CO4	2	2	2	3	2		2	3		2	2	1	3	3
CO5	1	2	3	3	2	1	3	2	1	2	1	2	3	3

Unit I VERILOG HDL **9**

Overview of Digital Design with Verilog HDL – Hierarchical Modeling Concepts – Basic Concepts –Modules and Ports – Gate-Level Modeling – Dataflow Modeling – Behavioral Modeling – Test Benches

Unit II MOS TRANSISTOR THEORY **9**

Introduction – MOS Transistors – CMOS Logic – Inverter – NAND gate – CMOS Logic Gates – Compound - MOS Transistor Theory – MOS Structure - nMOS and pMOS Transistor Operation –Long Channel V-I Characteristics – C-V Characteristics – Non-ideal I-V Effects

Unit III CMOS INVERTER AND ITS TECHNOLOGY **9**

DC Transfer Characteristics CMOS Inverter – CMOS Technologies – nMOS Fabrication – n-well Process – SOI – Twin Well Process - Layout Design Rules – CMOS Process Enhancement - Stick Diagram – Inverter – CMOS NAND – CMOS NOR.

Unit IV COMBINATIONAL CIRCUIT DESIGN **9**

Static CMOS – Pseudo logic– Dynamic Circuits – Pass-Transistor Circuits – CMOS with Transmission Gates – Source of Power Dissipation.

Unit V DESIGNING ARITHMETIC BUILDING BLOCKS AND FPGA **9**

Data path circuits, architectures for ripple carry adders (RCA), high speed adders, carry look ahead adder (CLA), Accumulators, Multipliers, Barrel shifters – Introduction to FPGA - FPGA Architecture – FPGA implementation

TOTAL : 45 HOURS

Text Book

1) Neil H. E Weste and David Money Harris, "CMOS VLSI Design a circuits and systems perspective", 4th Edition, Pearson, 2015..
2) Ciletti, "Advanced Digital Design with the Verilog HDL, 2nd Edition ", Pearson Education, Second Edition, 2011

References

1) Jan M. Rabaey, Anantha Chandrakasan ,Borivoje Nikolic, "Digital Integrated Circuits a design perspective", Pearson Education, 2nd edition, 2016
2) Charles H. Roth, Jr., Lizy Kurian John,"Digital System Design using VHDL", Cengage, 3rd edition, 2018
3) Pucknell D.A and Eshraghian K., "Basic VLSI Design", Third Edition, PHI, 2003.

U19GE701 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 3

COURSE OUTCOMES:

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

- Identify the core values that shape the ethical behavior of an engineer.
- Analyze and practice engineering ethics in their profession.
- Apply codes of ethics in the context of social experimentation.
- Explore various safety issues and ethical responsibilities of an engineer.
- Adopt ethical practices pertaining to global issues.

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	P09	PO10	PO11	PO12
CO1	2	1	1	1	1	2	3	3	3	2	2	3
CO2	2	1	1	1	2	2	3	3	3	3	3	3
CO3	2	1	3	1	2	3	3	3	3	3	3	3
CO4	2	1	3	1	1	3	3	3	3	2	3	3
CO5	2	1	3	1	1	3	3	3	3	3	3	3

UNIT-I HUMAN VALUES 9

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT -II ENGINEERING ETHICS 9

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Profession and Professionalism – Professional Ideals and Virtues –Theories of Right action- Self Interest- Customs and Religion-Uses of Ethical Theories.

UNIT-III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Contrasts with standard experiments- Engineers as Responsible Experimenters – Importance and limitations of Codes of Ethics - Industrial Standards - A Balanced Outlook on Law – Industrial Standards- Case Study: Space shuttle challenger disaster.

UNIT-IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk – Types of risk - Assessment of Safety and Risk – Risk Benefit analysis-Reducing Risk – Case Studies - Chernobyl and Bhopal plant disaster.

Collegiality and Loyalty –Respect for Authority- Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Importance and consequences of whistle blowing - Professional Rights – Employee Rights – Intellectual Property Rights (IPR) and its components– Discrimination.

UNIT-V GLOBAL ISSUES 9

Multinational Corporations – Environmental Ethics – Computer Ethics and Internet- Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Participation in professional societies- –Code of Conduct – Corporate Social Responsibility.

Lecture: 45, Tutorial: 0, TOTAL: 45 Hours

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, Indian Edition, Tenth reprint, 2017.
2. Professional Ethics and Human values- Sonaversity, Edition 2018.

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 2012.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2016.
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.
4. R.Subramanian, "Professional Ethics ",Oxford University Press , Second Edition, 2017.

5/7/2022

Member Secretary-Academic Council
SONA COLLEGE OF TECHNOLOGY
SALEM - 636 005.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for B.E/B.Tech. Semester VIII Regulations 2019
Branch: Electronics and Communication Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Practical							
1	U19EC801	Project Work	0	0	24	12	360
					Total Credits	**12**	

Approved By

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