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FOREWORD

In the present era, the field of Electronics and Communication plays an important role in every sphere of our life. It has penetrated in to all the fields of human existence. It has not only connected people but also provided viable solutions to various practical problems in the field of Communication through the utilization of Maths and Science. So, the greatest contributions to the society can be done by Electronic advancements in the fields of Communications, Navigation, Medical Diagnosis, Control and Automation. These developments have revolutionised the way people live and the way people think. These emerging developments are exciting, inspiring and challenging for the students aspiring to be Electronics and Communication Engineer.

B. Tech. programme of Electronics and Communication Engineering is aimed at offering the knowledge and skills to design and verify various systems such as digital systems, communication systems, automated systems and networking systems. R19 curriculum includes skill-oriented activities to enable the students to acquire hands-on experience of technology to make them industry ready.

R19 curriculum unique features:

- *Project based learning.*
- *Semester wise projects: Intra-Disciplinary, Inter-Departmental and Societal Centric and Industry related Projects.*
- *One modular course with industry support.*
- *Pool of electives on current technologies.*
- *Credits to online courses like NPTEL, MOOC's.*
- *Laboratory sessions to as many courses as possible.*

In R19 curriculum, utmost care has been taken to accommodate and address the knowledge and skill requirements of industry through practical experimentation. While making the graduates industry ready, this also enables them to be confident and successful in competitive examinations like GATE and Engineering Services.

The Board of Studies of ECE consists of eminent personalities from Industry, Academia and Research organizations, in addition to experienced faculty members of the VFSTR.

External BoS Members:

1. Dr. N. V. S. Narasimha Sarma, *Director IIIT Trichy and Professor, NIT Warangal.*
2. Sri. D. Ramakrishna, *Managing Director, Efftronics Ltd., Vijayawada.*
3. Dr. S. Salivahanan, Principal, *SSN College of Engineering, Chennai.*
4. Dr. M. Mallikarjuna Rao, *Scientist-F, RCI, Hyderabad.*
5. Sri. S. Uma Mahesh, *CEO, INDRION Technologies, Bangalore.*
6. Sri. P. Hari Babu, Scientist, *CDAC, Bangalore.*

I thank all the BoS Members, Academic Council Members and University authorities for encouraging us to design this innovative curriculum for our students. Our special thanks to the following industry partners and our alumni.

1. Sri. D. Ramakrishna, *Managing Director, Efftronics Ltd., Vijayawada.*
2. Sri. M. Srinivasarao, *Sr. Vice-President, IcommTele, Hyderabad.*
3. Dr. K. Subbarangaiah, *Director, Veda IIT, Hyderabad.*
4. Mr. V. V. Pathy, *Head Bussiness Development, Keysight Technologies, Bangalore.*
5. Dr. Subba Rao Pavuluri, *Founder and Managing Director, Ananth Technologies, Hyderabad.*
6. Sri. Visweswaran Jagadeesan, *Sr. Academic Consultant, National Instruments, Bangalore.*

Dr. T. Pitchaiah
HoD, ECE

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be UNIVERSITY)

VISION

To evolve into a Centre of Excellence in Science & Technology through creative and innovative practices in teaching – learning, towards promoting academic achievement and research excellence to produce internationally accepted, competitive and world class professionals who are psychologically strong & emotionally balanced, imbued with social consciousness & ethical values.

MISSION

To provide high quality academic programmes, training activities, research facilities and opportunities supported by continuous industry - institute interaction aimed at promoting employability, entrepreneurship, leadership and research aptitude among students and contribute to the economic and technological development of the region, state and nation.

Department of ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

To emerge as a Centre of Academic Excellence in Electronics and Communication Engineering that imparts quality technical education, research impetus, professional and ethical values to meet global needs of Industry and society.

MISSION

M1: Offering state of the art curriculum with innovative practices in teaching learning to pursue career in electronics and related fields.

M2: Providing advanced laboratory facilities and conducive research environment to make them industry ready and equip to carryout higher education towards research and consultancy.

M3: Transforming into responsible professionals with leadership qualities, managerial ability, team spirit, social consciousness, human values and ethics.

B.Tech. - ELECTRONICS AND COMMUNICATION ENGINEERING

Programme Educational Objectives (PEOs)

Program Educational Objectives (PEOs) are established through a consultation process. PEOs are broad statements that describe the career and professional accomplishments that the graduates should achieve within three to five years after their graduation.

Graduates of the UG-ECE program will be able to

PEO 1: Apply the concepts of electronics, communication and computation to pursue career in core and allied industries to solve industrial and societal problems.

PEO 2: Pursue higher education to progress professionally in contemporary Technologies and multidisciplinary fields with an inclination towards continuous learning.

PEO 3: Exhibit professional skills, ethical values, interpersonal skills, leadership abilities, team spirit and lifelong learning.

Programme Specific Outcomes (PSOs)

The students will be able to –

PSO1 : Analyse and design electronic systems for signal processing, communications and other applications.

PSO2 : Develop Solutions for various problems using Embedded Systems and Internet of Things.

PSO3 : Apply domain specific knowledge to design, analyse, synthesize and validate the VLSI systems.

Programme Outcomes (POs)

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **IIndividual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B.Tech.

ECE

I YEAR

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

I Year I Semester

Course Code	Course Title	L	T	P	C
19HS105	Engineering Mathematics - I (E)	3	-	2	4
19HS113	Engineering Physics (A)	3	-	2	4
19EE101	Basic Electrical and Electronics Engineering	3	-	2	4
19ME101	Engineering Graphics & Design	2	-	2	3
19CS101	Programming for Problem Solving	3	-	2	4
19PC001	Physical Fitness, Sports & Games - I	-	-	3	1
	Total	**14**	**-**	**13**	**20**

I Year II Semester

Course Code	Course Title	L	T	P	C
19HS111	Engineering Mathematics - II (E)	3	-	2	4
19HS118	Engineering Chemistry (C)	2	-	2	3
19EC101	Network Theory	3	1	-	4
19HS122	English Proficiency and Communication Skills	-	-	2	1
19HS123	Technical English Communication	2	-	2	3
19HS124	Constitution of India	1	-	-	1
19EE102	Basic Engineering Products	2	-	2	3
19ME103	Workshop	1	-	2	2
19PC002	Physical Fitness, Sports & Games - II	-	-	3	1
	Total	**14**	**1**	**15**	**22**

L : Lecture Hours/week ; T : Tutorial Hours/week ;
P : Practical Hours/week ; C : Credits of the Course.

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

II Year I Semester

Course Code	Course Title	L	T	P	C
19HS202	Transforms & Complex Variables	3	1	-	4
19EC201	Electronic Devices and Circuits	3	-	2	4
19EC202	Signals and Systems	3	-	2	4
19EC203	Digital System Design	3	-	2	4
19EC204	PCB Lab	-	-	2	1
19HS204	Environmental Studies	1	-	-	1
19PC003	Life Skills - I	-	-	2	-
19PC004	Technical Seminar - I	-	-	2	1
19PC005	Intra-Disciplinary Projects - I	-	-	3	1
19PC006	Physical Fitness, Sports & Games - III	-	-	2	1
	Total	**13**	**1**	**17**	**21**

II Year II Semester

Course Code	Course Title	L	T	P	C
19EC211	Analog Communications	2	-	2	3
19EC212	Analog Circuits	3	-	2	4
19EC213	Microcontrollers	3	-	2	4
19EC214	Probability Theory and Stochastic Processes	3	1	-	4
19EC215	Control Systems	3	-	-	3
19PC007	Life Skills - II	-	-	2	1
19PC008	Technical Seminar - II	-	-	2	1
19PC009	Intra-Disciplinary Projects - II	-	-	2	1
	Open Elective - I	3	-	-	3
	Total	**17**	**1**	**12**	**24**

B.Tech.

ECE

III YEAR

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

III Year I Semester

Course Code	Course Title	L	T	P	C
19EC301	Digital Communications	3	-	2	4
19EC302	Electromagnetic Waves and Transmission Lines	3	1	-	4
19EC303	Sensors and Instrumentation	2	-	2	3
19EC304	Data Communications and Computer Networks	3	-	2	4
19HS301	Human Values, Professional Ethics & Gender Equity	2	-	-	2
19HS205	Soft Skills Laboratory	-	-	2	1
19PC010	Employability Skills - I	-	-	2	-
19PC011	Inter-Departmental Projects - I	-	-	4	2
	Department Elective - I	3	-	-	3
	Open Elective - II	3	-	-	3
	Total	**19**	**1**	**14**	**26**

III Year II Semester

Course Code	Course Title	L	T	P	C
19EC311	Data Structures and Algorithms	3	-	2	4
19EC312	Antennas and Wave Propagation	3	-	-	3
19EC313	Digital Signal Processing	3	-	2	4
19EC314	Internet of Things	3	-	2	4
19HS206	Professional Communication Laboratory	-	-	2	1
19PC012	Modular Course	-	-	-	1
19PC013	Employability Skills - II	-	-	2	1
19PC014	Inter-Departmental Projects - II	-	-	4	2
	Department Elective - II	3	-	-	3
	Open Elective - III	3	-	-	3
	Total	**18**	**0**	**14**	**26**

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

IV Year I Semester

Course Code	Course Title	L	T	P	C
19MS303	Principles of Management and Organizational Behavior	3	-	-	3
19EC401	VSLI Design	3	-	2	4
19PC015	Societal - Centric and Industry Related Projects	-	-	2	3
	Department Elective - III	3	-	-	3
	Department Elective - IV	3	-	-	3
	Department Elective - V	3	-	-	3
	Total	**15**	**-**	**4**	**19**

IV Year II Semester

Course Code	Course Title	L	T	P	C
19PC016/19PC017	Internship / Project Work	-	-	24	12
	Total	**-**	**-**	**24**	**12**

In addition to L, T, P, C the following information in hours/semester is also provided for each course.

WA/RA : Writing Assignment / Reading Assignment

SSH/HSH : Self Study Hours / Home Study Hours

CS : Case Study and Example

SA : Skills Activity

S : Seminar

BS : Beyond Syllabus

B.Tech.

ECE

ELECTIVES

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

DEPARTMENT ELECTIVE COURSES

Course Code	Course Title	L	T	P	C
19EC331	Digital Design through Verilog	3	-	-	3
19EC332	PYTHON Programming	3	-	-	3
19EC333	Computer Architecture and Organization	3	-	-	3
19EC334	Optical Communication	3	-	-	3
19EC335	Information Theory and Coding	3	-	-	3
19EC336	Digital TV and Broadcasting	3	-	-	3
19EC337	Embedded Systems	3	-	-	3
19EC338	Cellular and Mobile Communications	3	-	-	3
19EC431	Mobile OS and Application Development	3	-	-	3
19EC432	RF and MW Engineering	3	-	-	3
19EC433	Wireless Sensor Networks	3	-	-	3
19EC434	Machine Learning	3	-	-	3
19EC435	Satellite Communications	3	-	-	3
19EC436	Radar Systems	3	-	-	3
19EC437	Digital Image and Video Processing	3	-	-	3
19EC438	Software Defined Radio	3	-	-	3

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	C
19AE521	Basic Automobile Engineering	3	-	-	3
19AE531	On Road and Off-road Vehicles	3	-	-	3
19AE532	Safety systems in Automobiles	3	-	-	3
19AE541	Vehicle Maintenance and pollution Norms	3	-	-	3
19BI521	Community Informatics	3	-	-	3
19BI531	Health Informatics	3	-	-	3
19BI532	Software Tools for Sustainable Biodiversity	3	-	-	3
19BM521	Basic Clinical Sciences	3	-	-	3
19BM522	Assist Devices and Implant Technology	3	-	-	3
19BM531	Clinical Instrumenatation	3	-	-	3
19BM532	Biomaterial and Artificial Organs	3	-	-	3
19BM533	Biomedical Equipments	3	-	-	3
19BM541	Medical Imaging Techniques	3	-	-	3
19BM542	Medical Physics	3	-	-	3
19BT521	Elements of Biotechnology	3	-	-	3

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	C
19BT531	Community Medicine and Public Health	3	-	-	3
19BT532	Biodiversity Economics, Trade and Commerce	3	-	-	3
19BT533	Bioplastics and Biocomposites engineering	3	-	-	3
19CE521	Environmental Pollution & Control	3	-	-	3
19CE522	Building Technology	3	-	-	3
19CE531	Disaster Management	3	-	-	3
19CE532	Solid Waste Management	3	-	-	3
19CE533	Remote Sensing & Geographical Information System	3	-	-	3
19CE534	Geo - Informatics	3	-	-	3
19CE541	Environmental Impact Assessment	3	-	-	3
19CS531	Python Programming	3	-	-	3
19CS532	R Programming	3	-	-	3
19CS533	Data Structures	3	-	-	3
19CS534	Database Management Systems	3	-	-	3
19CS535	Operating Systems	3	-	-	3

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	C
19CS541	Data Mining Techniques	3	-	-	3
19CS542	Internet of Things	3	-	-	3
19EC521	Embedded Linux	3	-	-	3
19EC531	Embedded Systems and RTOS	3	-	-	3
19EC532	Microcontrollers for Embedded Systems	3	-	-	3
19EC541	Design of IOT Systems (IOT)	3	-	-	3
19EE521	Solar PV Technologies-I	3	-	-	3
19EE531	Solar PV Technologies-II	3	-	-	3
19EE532	Design & Economics of PV plants	3	-	-	3
19EE541	Solar Thermal Conversion Systems	3	-	-	3
19FT521	Introduction of Food Laws and Regulation	3	-	-	3
19FT531	Food Quality and Evaluation	3	-	-	3
19FT532	Subjective and Objective Evaluation in Food Products	3	-	-	3
19FT541	Food Safety and Public Health	3	-	-	3
19HS521	Modern Indian History and Indian Culture	3	-	-	3

R-19 CURRICULUM

(Applicable for students admitted into First Year from academic year 2019-20 onwards)

OPEN ELECTIVE COURSES

Course Code	Course Title	L	T	P	C
19HS531	Polity and Governance in India	2	-	-	2
19HS532	Economic and Social Development in India	2	-	-	2
19HS541	Geography of India	2	-	-	2
19IT521	OOPs through JAVA	3	-	-	3
19IT541	Data Science using Python	3	-	-	3
19MS521	Business Environment and Ethics	3	-	-	3
19MS522	Managerial Economics	3	-	-	3
19MS531	Marketing and HR Management	3	-	-	3
19MS532	Finance for Engineers	3	-	-	3
19MS541	Production and Operations Management	3	-	-	3
19ME521	Biomechanics & Kinesiology	3	-	-	3
19ME522	Basics in Robotics	3	-	-	3
19ME531	Advances in Robotics	3	-	-	3
19ME532	Reliability Engineering	3	-	-	3
19ME533	Field and Service Robots	3	-	-	3
19ME534	Energy Audit & Management	3	-	-	3
19ME535	Supply Chain Management	3	-	-	3
19TT531	Fashion Product Development	3	-	-	3
19TT532	Costing of Fashion and Apparel Production	3	-	-	3
19TT541	Fashion Marketing and Visual Merchandising	3	-	-	3

Note : Students should not choose open electives offered by their branch.

I

YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.

I SEMESTER

19HS105	-	Engineering Mathematics - I (E)
19HS113	-	Engineering Physics (A)
19EE101	-	Basic Electrical and Electronics Engineering
19ME101	-	Engineering Graphics & Design
19CS101	-	Programming for Problem Solving
19PC001	-	Physical Fitness, Sports & Games - I

II SEMESTER

19HS111	-	Engineering Mathematics - II (E)
19HS118	-	Engineering Chemistry (C)
19EC101	-	Network Theory
19HS122	-	English Proficiency and Communication Skills
19HS123	-	Technical English Communication
19HS124	-	Constitution of India
19EE102	-	Basic Engineering Products
19ME103	-	Workshop
19PC002	-	Physical Fitness, Sports & Games - II

COURSE CONTENTS

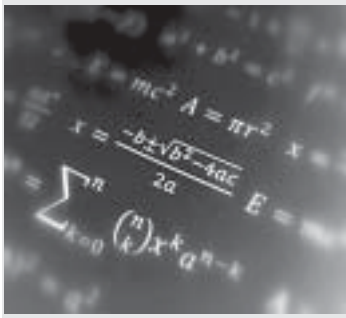
I SEM AND II SEM

19HS105 ENGINEERING MATHEMATICS - I (E)

LINEAR ALGEBRA & VECTOR CALCULUS

Hours Per Week :

L	T	P	C
3	-	2	4



SOURCE:

https://www.google.co.in/search?q=mathematics+pictures&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQ-837lvXiAhVPVH0KHe56CVEQ_AUIECgB#imgrc=kipeCal6REorUM:

COURSE DESCRIPTION AND OBJECTIVES:

To acquaint students with principles of mathematics through matrices, vector calculus, differential equations that serves as an essential tool in several engineering applications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Compute the solutions of differential equations using analytical techniques.
2	Appreciate the use of Cayley-Hamilton theorem.
3	Perform vector differentiation and integration and applications.
4	Determine rank, Eigen values and Eigen vectors of a matrix and solution of a system of linear equations.
5	Use software tools to obtain and verify the solutions

SKILLS:

- ✓ *Find the rank of matrix by different methods.*
- ✓ *Solve the system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Convert the matrix into diagonal form by suitable method.*
- ✓ *Compute gradient, divergence and curl.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*
- ✓ *Solve first order ordinary differential equations by various methods.*

ACTIVITIES:

- *Compute the rank of the matrix*
- *Solve the system of simultaneous equations, Eigen values and Eigen vectors with any software like MATLAB.*
- *Compute the power of matrix and inverse of matrix by Cayley – Hamilton Theorem with any software like MATLAB.*
- *Evaluate surface and volume integrals through vector integral theorems.*
- *Compute exact solutions of first order differential equations by various methods.*

UNIT – I **L–9**

MATRICES : Rank of a matrix, Normal form, Triangular form, Echelon form; Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Seidel method.

UNIT – II **L–9**

EIGEN VALUES AND EIGEN VECTORS : Eigen values, Eigen vectors, Properties (without proofs); Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT – III **L–9**

VECTOR DIFFERENTIATION : Review of Vector Algebra (Not for testing).

Vector function, Differentiation, Scalar and Vector point functions, Gradient, Normal vector, Directional Derivate, Divergence, Curl, Vector identities.

UNIT – IV **L–9**

VECTOR INTEGRATION : Line integral, Surface integral, Volume integral, Vector Integral Theorems : Green's theorem for plane, Gauss divergence theorem, Stokes' theorem (without proofs)

UNIT – V **L–9**

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS : Basic Definitions, Variable separable and homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

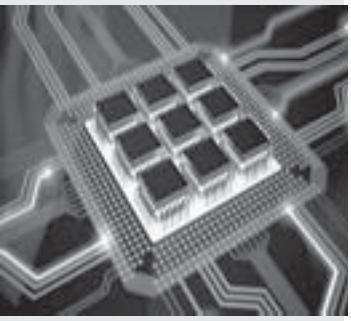
1. Mathematical Preliminaries.
2. Algebra of Matrixes.
3. To find Rank of a Matrix.
4. To find Triangular & Echelon form of a Matrix.
5. Solving system of equations using Cramer's rule.
6. Solving system of equations using Matrix inversion method.
7. Solving system of equations using Gauss-Jordan method, Gauss elimination method.
8. To find Eigenvalues, Eigenvectors of a Matrix.
9. Cayley-Hamilton theorem for a square Matrix.
10. Algebra of Vectors.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2015.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2018.

REFERENCE BOOKS:

1. John Bird, "Higher Engineering Mathematics", Routledge (Taylor & Francis Group), 2018.
2. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
3. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers, 2008.
4. N. P. Bali and K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", Universal Science Press, 2018.
5. T. K.V. Iyengar et al., "Engineering Mathematics, I, II, III", S. Chand & Co., 2018.



SOURCE:
https://www.deccanchronicle.com/technology/in-other-news/241017/scientists-invent-new-semiconductor-capable-of-doing-optical-communication.html

19HS113 ENGINEERING PHYSICS (A)

Hours Per Week :

L	T	P	C
3	-	2	4

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed at imparting knowledge on Crystal physics, principles of Quantum Mechanics and Electron theory of metals. This course throws light on semiconductor physics and Optoelectronic devices along with photonics. Further it highlights the principles and concepts of electrical properties in the perspective of Engineering.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Compute the crystal geometry in terms of crystal planes and defects.
2	Apply the principles of quantum mechanics to learn the dynamics of free electrons in metal.
3	Compute carrier concentration in semiconductors and to understand carrier transport mechanism in semiconductors.
4	Evaluate electron dynamics in the presence of electric and magnetic fields.
5	Recognise the importance of photonic devices relevant to engineering domains.

SKILLS:

- ✓ *Analyze crystal structures.*
- ✓ *Compute the crystal geometry in terms of crystal planes and defects.*
- ✓ *Compute carrier concentration in semiconductors and hence conductivity.*
- ✓ *Analyze band structure and classify materials based on band structure and calculate band gap for semiconductors.*
- ✓ *Compute electric and magnetic field in materials based on fundamental principles.*
- ✓ *Calculate photoconductivity, responsivity and sensitivity of various photo conducting materials such as photodiodes and photo resistors.*
- ✓ *Calculate the efficiency and fill factor of solar cell.*

UNIT - I **L-9**

INTRODUCTION TO SOLIDS:

Bonding in Solids (Types); Crystalline and amorphous solids; Lattice points and Space lattice, Basis, Crystal structure, Unit cell, Primitive cell and Lattice parameters; Crystal systems and Bravais lattices; Packing factor for SC, BCC and FCC; Miller indices, Distance of separation between successive (h k l) planes; X-ray diffraction, Bragg's law, Powder crystal method; Classification of defects, Point defects.

UNIT - II **L-10**

QUANTUM MECHANICS:

Introduction to Quantum mechanics-wave and particle duality of radiation, deBroglie's concept of matter waves, electron diffraction; Heisenberg's uncertainty principle; Schrodinger's time independent wave equation, Eigen values and Eigen functions of a particle confined to one dimensional infinite square well (potential well).

FREE ELECTRON THEORY OF METALS:

Classical and Quantum free electron theory of metals, Fermi-Dirac distribution, Density of states. Bloch's theorem (Qualitative), Kronig - Penny Model (Qualitative), Classification of solids based on energy bands.

UNIT - III **L-9**

SEMICONDUCTOR PHYSICS:

Introduction, Classification of Semiconductors, Direct and indirect band gap semiconductors, Intrinsic semiconductors; Variation of Intrinsic carrier concentration with temperature, Fermi level and conductivity; Extrinsic semiconductor, Effect of temperature on carrier concentration in extrinsic semiconductors, Band diagrams of extrinsic semi conductors; Hall effect.

UNIT - IV **L-9**

ELECTROMAGNETICS:

Electrostatics : Vector analysis; Computation of electric field and potential in specific cases, Electric flux density, Divergence, Gauss law, Differential form of Gauss law, Derivation of Coulomb's law from Gauss law, Applications of Gauss law, Electric Displacement vector; Applications of Maxwell's equations.

Magnetostatics: Gauss law of for magnetism, Biot-Savart's law, Ampere's law, Faraday's law of induction in integral form; Lenz's law, Maxwell's equations in integral form.

UNIT - V **L-8**

OPTOELECTRONICS:

Introduction-Classification of optoelectronic devices; PN Junction diode, Photo detectors, PIN and Avalanche photo diodes, Photo voltaic cell, LED, Semiconductor diode laser.

ACTIVITIES :

- *Construction of various crystal models.*
- *Identification of crystal structure from XRD pattern.*
- *Determination of Hall coefficient.*
- *Laser- Measurement of height of the building.*
- *Finding out the grating constant by known wave length of laser.*
- *Frequency of laser by using diffraction grating.*
- *Determination of efficiency of solar cell when two solar cells are connected in parallel and*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS:30**

1. Laser - Determination of wavelength.
2. Optical fibre – Determination of Numerical aperture – Acceptance angle.
3. Determination of planck's constant.
4. Melde's Experiment - determination of the frequency of tuning fork.
5. Determination of wavelength of given light source using diffraction grating method.
6. Determination of resistivity of metal using 2 probe / 4 probe method.
7. Determination of Energy Band gap of p-n junction diode.
8. Hall Effect - Determination of Hall coefficient.
9. Stewart & Gee's Experiment- Study of magnetic field along the axis of a current carrying coil.
10. Verification of Tangent law.
11. Solar cell – Determination of Fill factor & efficiency.
12. LED - Study of V-I characteristics.

TEXT BOOKS:

1. S.O.Pillai, "Solid State Physics", 8th edition, New Age International Publishers, 2018.
2. H. P. Myers, "Introduction to Solid State Physics", Taylor & Francis, 2009.

REFERENCE BOOKS:

1. D. Halliday, R. Resnick and J. Walker, "Fundamentals of Physics", 6th edition, John Wiley and Sons, 2001.
2. Charles Kittel, "Introduction to Solid State Physics", 7th edition, Wiley, 2007.
3. Donald A. Neamen, "Semiconductor Physics and Devices:Basic Principle", 4th edition, Mc Graw-Hill, 2012.
4. David J. Griffiths, "Introduction to Electrodynamics", 3rd edition, Prentice Hall of India, 2012.
5. Neil W. Ashcroft and David Mermin, "Solid State Physics", International Student Edition, Holt, Rinehort & Winston Publishers, 2008.

LABORATORY MANUALS:

1. Dr.Ruby Das, C.S.Robinson, Rajesh Kumar and Prasanth Kumar "A text book of Engineering Physics Practical", 1st edition, Sahu University Science Press, 2010.
2. Jayaraman, "Engineering Physics Laboratory Manual", 1st edition, Pearson Education, 2014.

19EE101 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

SOURCE:

https://engineering interview questions.com/wp-content/uploads/ 2017/07/ ELECTRICAL-Engineering-Multiple-Choice-Questions-and-Answers.png

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both DC & AC machines. It also deals with the basic electronic components like P-N junction diode, Zener diode, Transistor and their characteristics.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Analyse the resistive circuits with independent sources and find its solution.
2	Solve the AC (single and three phase) and DC circuits using different methods.
3	Familiarize the concepts of electromagnetism and it's applications.
4	Explain the types of electrical equipment, machines and its applications.
5	Acquire the knowledge about the characteristics and working principles of semiconductor diodes, transistor.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half and full wave rectifiers using PN junction diode.*

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

UNIT – I **L - 9**

FUNDAMENTALS OF ELECTRIC CIRCUITS: Concept of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws, Application to simple series, Parallel circuits, Mesh and nodal analysis of resistive circuits with DC source (Simple numerical problem).

UNIT – II **L - 9**

FUNDAMENTALS OF AC CIRCUITS: Generation of AC voltage, Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only; Analysis of single-phase ac circuits consisting of R, L, C, RL, RC (series and parallel) (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – III **L - 9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self inductance and mutual inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – IV **L - 9**

DC MACHINES: Constructional details of a DC Machine, DC Generator, Principle of operation, EMF equation (simple numerical problems); DC Motor, Principle of operation, Torque equation (simple numerical problems).

AC MACHINES: Principle of operation of three phase induction motor, Slip ring and squirrel cage motors, Torque equation; Constructional details of synchronous machine.

UNIT – V **L - 9**

SEMICONDUCTOR DEVICES: Classification of semiconductors, P-N junction diode - operation and its characteristics, Half wave rectifier - operation, efficiency; Full wave rectifiers - types, operation, Efficiency; Zener diode and its characteristics, Zener diode as voltage regulator, Bi polar junction transistor - operation, Types (NPN & PNP).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS-30**

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Determination of R.M.S. Values of sinusoidal waveform.
8. Determination of impedance in complex AC circuits.
9. Verification of PN junction diode characteristics under both forward and reverse bias.
10. Verification of Zener diode characteristics under reverse bias.

TEXT BOOKS:

1. V. K. Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand & Co., Publications, New Delhi, 2010.
2. D. P. Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, "Integrated Electronics", Mc Graw Hill, 1979.
2. A. K. Thereja and B.L. Thereja, "Electrical Technology Vol.–II", S. Chand & Co., Publications, 2007.
3. U. Bakshi and A. Bakshi, "Basic Electrical Engineering", 1st edition, Technical Publications, Pune, 2005.

Source:
www.gettyimage.in

19ME101 ENGINEERING GRAPHICS AND DESIGN

Hours Per Week :

L	T	P	C
2	-	2	3

COURSE DESCRIPTION AND OBJECTIVES:

Engineering graphics is the language of engineers and is the most effective way of communicating and sharing technical ideas in the form of pictures/drawings. The objective of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided drawing.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Communicate the technical ideas in the form of drawings.
2	Apply the drawing skills in representing various geometrical features.
3	Develop orthographic projections and isometric views of various objects.
4	Estimate the lateral surface area of regular geometrical solids.
5	Sketch simple objects and their pictorial views using AutoCAD.

SKILLS:

- ✓ *Convert isometric views of objects into orthographic views and vice versa.*
- ✓ *Visualize the shape of the 3D components.*
- ✓ *Create pictorial views by using AutoCAD.*
- ✓ *Understand projections by visualization.*

UNIT - I **L-6 P-6**

ENGINEERING CURVES: Types of lines; Lettering; Dimensioning; Geometric construction - lines, polygons (Angle, ARC, General and Inscribe in circle method), conical curves (General method), ellipse by Oblong method.

UNIT - II **L-6 P-6**

ORTHOGRAPHIC PROJECTIONS OF POINTS & LINES: Principles of projection; Projections of points; Projection of straight lines - inclined to one plane, inclined to both planes.

UNIT - III **L-6 P-6**

PROJECTION OF PLANES: Projection of planes inclined to one reference plane - triangle, square, circle, regular pentagon and hexagon.

PROJECTIONS OF SOLIDS: Projection of solids axis inclined to one reference plane - prism, pyramid, cylinder and cone.

UNIT - IV **L-6 P-6**

DEVELOPMENT OF SURFACES: Development of lateral surfaces of simple solids - prisms, pyramids, cylinder and cone.

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views.

UNIT - V **L-6 P-6**

DRAFTING USING COMPUTER PACKAGE: Introduction to 2D modelling software - AutoCAD; Conversion of Isometric view into Orthographic views of simple castings; Conversion of Orthographic views into Isometric view of simple solids - prisms, pyramids, cylinders and cones.

TEXT BOOKS:

1. N D Bhatt, “Engineering Drawing”, 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal and C.M.Agrawal “Engineering Drawing”, 2nd edition, Tata McGraw-Hill, 2014.

REFERENCE BOOKS:

1. J Hole, “Engineering Drawing”, 2nd edition, Tata McGraw-Hill, 2008.
2. K L Narayana, “Engineering drawing”, 2nd edition, Scitech Publications, 2008.

SOURCE: http:// www.trytoprogram. com/images

19CS101 PROGRAMMING FOR PROBLEM SOLVING

Hours Per Week :

L	T	P	C
3	-	2	4

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed to impart knowledge on basic concepts of C programming language and problem solving through programming. It covers basic structure of C program, data types, operators, decision making statements, loops, functions, static and dynamic data structures. At the end of this course, students will be able to design, implement, test and debug modular C programs.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand how to write simple, but complete, C programs.
2	Identify suitable data type operands and design of expressions having right precedence.
3	Apply decision making and iterative features of C programming language effectively.
4	Design and develop of non-recursive and recursive functions and their usage to build large modular programs.
5	Select problem specific static/dynamic data structures and suitable accessing methods.
6	Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.

SKILLS:

- ✓ *Analyse a given problem to be solved.*
- ✓ *Design algorithm/solution for a given problem.*
- ✓ *Identify suitable data types for operands.*
- ✓ *Apply suitable control statements for decision making.*
- ✓ *Design non-recursive and recursive functions to perform different tasks.*
- ✓ *Select static or dynamic data structures for a given problem and manipulation of data items.*
- ✓ *Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.*

UNIT - I **L - 9**

INTRODUCTION TO C: Structure of a C program; pre-processor statement, inline comments, Variable declaration statement, Executable statement; C Tokens: C Character Set, Identifiers and Keywords, Type Qualifiers and Type Modifiers, Variables and Constants, Punctuations, and Operators.

Data Types: Basic data types; Storage classes; scope of a variable; Formatted I/O; Reading and writing characters;

UNIT - II **L - 9**

OPERATORS AND CONTROL STATEMENTS: Operators **-** assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, sizeof, dot, arrow, parentheses operators; Expressions - operator precedence, associative rules; Control statements - category of statements, selection, iteration, jump, label, expression and block.

UNIT - III **L - 9**

ARRAYS AND FUNCTIONS: Array - declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays, multidimensional arrays; Function - declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions.

UNIT - IV **L - 9**

STRINGS AND POINTERS: Strings - declaration, string library functions, array of strings, command line arguments; Pointers - declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; Dynamic memory allocation functions.

UNIT - V **L - 9**

STRUCTURES AND UNIONS: Structures - defining a structure, declaration of a structure objects, operations on structures; Pointers to a structure; Array of structures; Nested Structures; Unions; Bit – Fields.

ACTIVITIES:

- *Analysis of a given problem.*
- *Design of algorithm/ solution.*
- *System testing.*
- *Implementation (coding and unit testing) of algorithm.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

EXPERIMENT 1:

(a) Write a C program to display a simple message on the standard output device using puts ().

(b) Every character holds an ASCII value (an integer number in the range of 0 to 255) rather than that character itself, which is referred to as ASCII value. Likewise, for a given input whether it is character or digit or special character or lower case or upper case letter, find corresponding ASCII value.

Example: ASCII value of 'A' is 65.

EXPERIMENT 2:

(a) For the given Basic salary, compute DA, HRA and PF using the following criteria and find out the Net Salary of an Employee by deducting PF and IT.

DA = (Basic salary *25)/1000

HRA= (Basic salary * 15)/100

Gross salary = Basic salary + DA + HRA

PF = Gross salary * 10/100

IT= Gross salary * 10/100

Net Salary = Basic Salary + DA + HRA – (PF + IT)

(b) Write a C program to swap the two integers with and without using additional variable.

Example: Before swapping values of a =4, and b = 5 and after swapping a = 5, and b = 4.

EXPERIMENT 3:

(a) Write a C program to check whether a given character is a vowel or consonant.

Hint: Read input from the user, and check whether it is an alphabet or not. If it is an alphabet, then check whether it is a vowel or a consonant. Otherwise display it is not an alphabet.

(b) The marks obtained by a student in '*n*' different subjects are given as an input by the user. Write a program that calculates the average marks of given 'n subjects and display the grade. The student gets a grade as per the following rules:

Average	Grade
90-100	O
80-89	E
70-79	A
60-69	B
50-59	C
<50	F

EXPERIMENT 4:

(a) Write a C Program to print Floyd triangle for the user given number of rows.

Example: If the user entered 4 rows, then the output is as follows:

```
1
2 3
4 5 6
7 8 9 10
```

(b) Write a C Program to print the * for the given number of times in a rows to form a diamond shape.

Example: If the user input is 5, then the output is as follows:

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

EXPERIMENT 5:

(a) Write a C Program to check whether the given number is a palindrome or not.

Hint: To check whether a number is a palindrome or not, reverse the given number and compare the reversed number with the given number, if both are same then the number is palindrome otherwise not.

Example: Given Number = 121, Reversed number = 121.

(b) Write a C Program to calculate sum of the individual digits of the given number.

Hint: To find the sum of the digits of given number, use modulus operator (%) to extract individual digits of a number and keep on adding them.

Example: Given number is 9875. Sum of the digits of given number "9875" is
9+8+7+5 = 29

EXPERIMENT 6:

(a) Write a program to search for a given number in the given set of numbers.

Example: Read set of numbers *L*={2,4,6,1}. Search whether 4 is present in the set or not.

(b) Write a program to perform the following operations on a given list of elements.

i. Insert the given element at the beginning of the list and at the end of the list.

Example: The given list is *L*={1,2,3,8}. Insert '0' at the beginning of the list and at the end of the list. Hence the resultant list is *L*={0,1,2,3,8,0}

ii. Delete an element at the beginning of the list and at the end of the list.

Example: The given list is *L*={1,2,3,8}. Delete an element at the beginning of the list and at the end of the list. Hence the resultant list is *L*={2,3}

EXPERIMENT 7:

Write a C program to perform the following operations on a list.

(a) Find the maximum or the largest element in a given list.

(b) Find the minimum or the smallest element in a given list.

Hint: Choose one dimensional array to store the given list of data items.

EXPERIMENT 8:

Write a C program to perform addition, subtraction, multiplication operations on the two given matrices using functions.

EXPERIMENT 9:

(a) Write a C program to compute the factorial of a given number using recursion.

Hint: Factorial is represented using '!' and it is calculated as n! = n*(n-1)*(n-2)*…*3*2*1.*As a function factorial(n)=n*factorial(n-1). Note: 0!=1.*

(b) Write a C program to swap two numbers using call by value and call by reference.

EXPERIMENT 10:

(a) Write a C program to read string using gets() function and use puts() function to print the contents of the string.

(b) Write a C program to copy a given string into another string without using standard string handling library function **strcpy()**.

Hint: Read one string as an input and then with the help of loop copy the content of given string into the new string. If the storage space allocated to the new string is less than the given string, entire string will not be copied into the new string.

Example: consider storage space allocated to new string is 20 and given string length is 30. In this case, your program can only copy 20 characters from given string into the new string.

EXPERIMENT 11:

(a) Write a C program to reverse a string without using standard string handling library function. Do not use another array to store the reversed string.

Hint: If a user enters a string "hello", then on reversing it will be displayed as "olleh".

(b) Write a C program to find whether the given two strings are same or not.

Hint: User need to enter two strings *s1 and s2* and check whether the two strings are same or not. For example: s1=hello, s2=hello output: YES

EXPERIMENT 12:

Write a C program for the following:

Given a string S, consisting of uppercase and lowercase letters, change the case of each alphabet in the string. That is, all the uppercase letters should be converted to

lowercase and all the lowercase letters should be converted to uppercase.

Input: Vignan University

Output: vIGNANuNIVERSITY

EXPERIMENT 13:

(a) Write a C program to access the integer elements of the array using pointers.

Hint: Declare a pointer variable and assign the base address of the array to it and print the values of an array using pointer variable.

(b) Declare a character array to hold the input string and declare a character pointer variable. Assign the character array base address to the pointer and then display the every element of the character array.

Hint: Increment the pointer in loop.

EXPERIMENT 14:

Write a C program to count the number of vowels and consonants in a string using pointers.

Hint: Use pointers to read the content of the string.

EXPERIMENT 15:

Create a jagged array [array of variable length lists] with no of rows and no of columns in each row as specified by the user

Hint: Use Dynamic memory allocation (malloc() or calloc())

Input:

Enter no of rows: 3

Enter no of columns in Row 1: 3

Enter no of columns in Row 2: 5

Enter no of columns in Row 3: 2

Enter the elements row wise:

8 6 5

8 4 6 9 7

9 2

Output:

8 6 5

8 4 6 9 7

9 2

EXPERIMENT 16:

Write a C program for the following:

Customer billing system is a structure, having customers_name, street_address, city, state, account_number, payment_status(paid/ not_paid), payment_date(current date/ due_date), and amount as members. In this example, payment_date is also structure includes month, day and year as members. So, every customer record can be considered as nested structure. Display the payment_status of each customer.

Hint: Use nested structure concept.

EXPERIMENT 17:

Write a C program for the following: Define a structure named 'Complex' consisting of two floating point members called "real and imaginary". Let c1 and c2 are two Complex variables; compute the sum of two variables.

TEXT BOOKS:

1. Behrouz A. Forouzan and Richard F.Gilberg, "Programming for Problem Solving", 1st edition, Cengage, 2019.
2. Ajay Mittal, "Programming in C - A practical Approach", 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. ReemaThareja, "Introduction to C Programming", 2nd edition, Oxford University Press India, 2015.
2. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata McGraw-Hill, 2017.
3. Byron S Gottfried, "Programming with C", 4th edition, Tata McGraw-Hill, 2018.

19HS111 ENGINEERING MATHEMATICS-II (E)

DIFFERENTIAL EQUATIONS & FOURIER SERIES

Hours Per Week :

L	T	P	C
3	-	2	4

SOURCE:

https://www.google.co.in/search?q=mathematics+pictures&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiQ-837lvXiAhVPVH0KHe56CVEQ_AUIECgB#imgrc=ecmQ1hn9L9veOM:

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with solid foundation in mathematical fundamentals such as numerical methods, ordinary and partial differential equations, Fourier series, Laplace transformations required for different branches of Engineering.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand discuss the Laplace transformation of a function and apply to solve differential equations.
2	Apply various numerical methods to solve differential equations.
3	Compute the solutions of differential equations by using analytical techniques.
4	Illustrate the concept of Fourier series.
5	Use software tools to obtain and verify the solutions.

SKILLS:

- ✓ *Find the complete solution of second and higher order ordinary differential equations with constant coefficients.*
- ✓ *Compute numerical solutions of differential equation by appropriate methods.*
- ✓ *Solve partial differential equation by suitable method.*
- ✓ *Obtain the Fourier series of periodic function.*
- ✓ *Apply Laplace transformations to solve ordinary differential equations.*

ACTIVITIES:

- *Compute exact solutions to second order differential equations by various methods.*
- *Apply iterative methods to solve differential equations and compare with results obtained using any software like MATLAB.*
- *Differentiate methods to solve partial differential equations.*

UNIT – I **L-9**

HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form : e^{ax} ,sin ax, cos ax and x^n.

UNIT – II **L-9**

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS & APPLICATIONS OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS:

Numerical Methods : Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

Applications : Newton's law of cooling, Law of natural growth and decay, Orthogonal trajectories.

UNIT – III **L-9**

FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS : Introduction, Partial differential equations, Order and degree, Formation of partial differential equations; Lagrange's linear equations, Method of multipliers, Non-linear equations in p and q, Charpit's method.

UNIT – IV **L-9**

FOURIER SERIES : Periodic Functions, Fourier series, Dirichlet's conditions, Fourier series for discontinuous functions, Fourier series for function defined in two or more sub-ranges, Fourier series for even and odd functions, Half-range series, Change of interval and functions having arbitrary period.

UNIT – V **L-9**

LAPLACE TRANSFORMATIONS : Introduction, Laplace transformation, Properties, Change of scale property, Shifting theorems, Laplace transformation of derivative, Laplace transformation of integral, Multiplication by t, Initial and final value theorems, Convolution theorem.

Inverse Laplace transformation, Multiplication by s, Division by s, Shifting properties, Inverse Laplace transformation of derivatives.

Applications : Solutions of ordinary differential equations.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS:30**

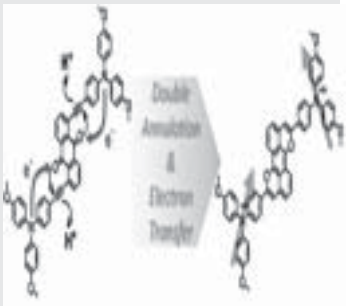
1. Limits and continuity of functions of one variable.
2. Differentiation of functions of one variable and two variables.
3. Integration of functions of one variable and two variables.
4. Ordinary differential equations.
5. Euler's method for first order ODE.
6. Runge-Kutta method for first order ODE.
7. Gradient of Scalar functions.
8. Directional derivative of a Scalar functions.
9. Divergence of Vector function.
10. Curl of vector function.
11. Fitting of curve for given data.
12. Plotting of graph for functions of one variable.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand & Co., 3rd edition, 2015.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2018.

REFERENCE BOOKS:

1. John Bird, "Higher Engineering Mathematics", Routledge (Taylor & Francis Group), 2018.
2. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
3. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers, 2008.
4. N. P. Bali and K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", Universal Science Press, 2018.
5. T. K.V. Iyengar et al., "Engineering Mathematics, I, II, III", S. Chand & Co., 2018.



SOURCE :

Koya Prabhakara Rao. et al., J. Am. Chem. Soc.***2010***, *132, 35, 12472-12479*

19HS118 ENGINEERING CHEMISTRY (C)

Hours Per Week :

L	T	P	C
2	-	2	3

COURSE DESCRIPTION AND OBJECTIVES:

The course aims to cover the importance of chemistry and its applications in engineering disciplines among the students by imparting knowledge on the basic concepts of bonding, water technology, electrochemistry and construction of a battery etc. Besides, it also generates awareness on some contemporary advanced topics such as nanomaterials and their characterization using advanced instrumental techniques.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply the molecular orbital theory to various types of chemical compounds.
2	Analyze the quality of the water and design a suitable water purification mechanism.
3	Apply the principle of electrochemistry for designing various batteries and fuel cells.
4	Apply the electromagnetic radiation to the spectroscopic methods for the analysis of engineering materials.
5	Evaluate the concept of “Nano materials” to the applications of electronic engineering.

SKILLS:

- ✓ *Analyze the total hardness of water sample.*
- ✓ *Construct and working of reference electrodes.*
- ✓ *Characterize chemical compound by using UV and IR spectroscopic techniques.*
- ✓ *Synthesize nanomaterials like carbon nanotubes, fullerenes.*

UNIT – I **L-6**

CHEMICAL BONDING AND WATER TECHNOLOGY:

Chemical Bonding - Crystal field splitting of octahedral and tetrahedral complexes; Molecular orbital theory of diatomic molecules (O_2 and CO), Molecular orbital energy diagram of octahedral complex, Ex: Hexamine Cobalt (II) complex.

Water Technology - Hardness of water, Determination of hardness by EDTA method and numerical problems; Softening of water by ion-exchange process.

UNIT - II **L-6**

ELECTRO CHEMISTRY: Redox reactions, Electrode potential, EMF of an electrochemical cell, Electrochemical series; Nernst equation; Reference electrodes - standard hydrogen electrode, calomel electrode, pHmetric and potentiometric titrations.

UNIT – III **L-6**

BATTERIES: Primary cell and secondary cells, Construction, Working and applications of lead-acid storage cell, Nickel-cadmium batteries, Lithium ion battery; Fuel cells – construction, working and applications of methanol-oxygen and hydrogen-oxygen fuel cell.

UNIT - IV **L-6**

INSTRUMENTAL TECHNIQUES:

Electronic Spectroscopy - Beer-Lambert's law and its derivation, Applications of Beer-Lambert's law, Instrumentation of UV-visible spectrophotometer.

IR Spectroscopy - Types of vibrations, Instrumentation of IR spectrophotometer and the applications.

UNIT – V **L-6**

NANO MATERIALS: Introduction, Classification, Properties, Synthesis - top down and bottom up; Synthesis, Properties & potential applications of carbon nanotubes, Fullerenes and graphene.

ACTIVITIES:

- *Construction of batteries.*
- *Synthesis of nano particles.*
- *Preparation of conducting polymer-polyaniline.*
- *Analysis of water and its purification.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Determination of total alkalinity of water.
2. Determination of total hardness of water.
3. Determination of Fe (II) by dichrometry method.
4. Determination of available Chlorine in bleaching powder.
5. Determination of strength of weak acid by pH-metry.
8. Determination of concentration of strong acid by conductometry.
9. Determination of Mn^{7+} by colorimetry.
10. Simultaneous determination of Cr (VI) & Mn (VII) by UV-Visible spectrophotometry
11. Synthesis of iron oxide nanoparticles.
12. Removal of hardness of water by ion-exchange method.
13. Chemistry of blue printing.

TEXT BOOKS:

1. Shashi Chawala, "A Text book of Engineering Chemistry, Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.
2. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
3. K.S. Maheswaramma and Mridula Chugh, "Engineering Chemistry", 1st edition, Pearson publications, 2015.

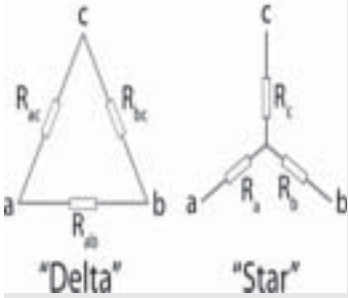
REFERENCE BOOKS:

1. H. W. Wilard and Demerit, "Instrumental Methods of Analysis", 7th edition, CBS Publications, 1986.
2. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
3. T. Pradeep, "Nano:The Essentials; understanding of Nano Science and Technology" Tata McGraw-Hill, 2012.
4. Shikha Agarwal, "Engineering Chemistry: Fundamentals and Applications", 2nd edition, Cambridge Publications, 2019.

LABORATORY MANUAL:

1. Dr.Sunita Rattan "Experiments in Applied Chemistry", S.K. Kataria & Sons Publications, 2008.

19EC101 NETWORK THEORY



SOURCE :

https://upload.wikimedia.org/wikipedia/commons/thumb/1/18/Delta-Star_Transformation.svg/400px-Delta-Star_Transformation.svg.png

Hours Per Week :

L	T	P	C
3	1	-	4

COURSE DESCRIPTION AND OBJECTIVES:

The aim of this course is to make the student understand transient responses of RC, RL and RLC circuits, steady state response of circuits to sinusoidal excitation in time domain, application of phasors to circuit analysis and graph theory to analyze circuits, which will help in analyzing the circuits.

COURSE OUTCOMES:

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

COs	Course Outcomes
1	Apply Kirchhoff's voltage & current laws and theorems to linear circuits.
2	Analyze the transient response of networks for different inputs.
3	Investigate steady state analysis and filters.
4	Synthesize the response of R, L, C series and parallel combination circuits to sinusoidal excitation and compute the two port network parameters.

SKILLS:

- ✓ *Find currents flowing through and voltage across any branch.*
- ✓ *Analyze the transient and steady state response of electric/electronic circuits for various inputs.*
- ✓ *Design filters for given specifications.*

ACTIVITIES:

- *Measure the Resistance of any resistive Electrical Appliance like water heater, incandescent bulb.*
- *Design of smallsize house wiring system.*
- *Design circuits with suitable load to get maximum power from source.*
- *Determination of RLC values for given resonant frequency connected series/parallel combination.*
- *Design resonant circuit for oscillator and filter applications.*
- *Design of Power bank for mobile charger circuit.*
- *Determination of Voltage and current characteristics of given Black box.*
- *Verify duality for a given Network.*

UNIT - I **L-9**

INTRODUCTION TO CIRCUIT ELEMENTS: Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and current division, V-I characteristics of passive elements and their series / parallel combination, Energy stored in Inductors and capacitors, Kirchhoff's voltage law and Kirchhoff's current law, Mesh and nodal analysis, Star and delta conversions.

UNIT - II **L-9**

SINUSOIDAL STEADY STATE ANALYSIS AND RESONANCE: Instantaneous, Peak, Average, RMS values, Crest factor and form factor of periodic waveforms, Notation and concept of phasors, Response of R, L, C series and parallel combination circuits to sinusoidal excitation, Calculation of active and reactive powers, Resonance - Series and parallel resonance circuits, Concept of bandwidth and Q factor; Filters - Introduction to Low pass, High pass, Band pass and band reject filters.

UNIT - III **L-9**

NETWORK TRANSIENT ANALYSIS: Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, Initial conditions, Time domain and laplace transform methods of solutions.

UNIT - IV **L-9**

NETWORK THEOREMS: Superposition, Thevenin's, Norton's, Reciprocity, Compensation, Maximum power transfer and Millman theorems, Application of theorems to DC and AC circuits, Duality and dual networks.

UNIT - V **L-9**

TWO PORT NETWORK PARAMETERS: Introduction to Two port networks, Open circuit impedance and short circuit admittance (Y), Transmission and inverse transmission, Hybrid and inverse hybrid parameters, Relation between parameter sets, Interconnection of two port networks, Graph theory - Definitions, Graph, Tree, Basic tie-set and basic cut set matrices for planar networks; Network synthesis - Driving point and transfer functions, Poles and Zeros of immittance function, Their properties, Sinusoidal response from pole-zero locations.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 7th edition,Tata McGraw-Hill, 2007.
2. A Sudhakar and Shyammohan S Palli, "Circuits & Networks: Analysis and Synthesis", 5th edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Syed A. Nasar, "Electric Circuits", Tata McGraw-Hill, Schaum's Series, 1988.
2. Franklin F.Kuo, "Network Analysis and Synthesis", 2nd Edition, John Wiley and Sons, 2003.
3. Mahmood Nahvi and Joseph Edminister, "Electric Circuits", 4th edition, Schaum's Outline series, Tata McGraw-Hill, 2004.
4. Chakrabati A, "Circuits Theory (Analysis and synthesis)", Dhanpath Rai & Sons, New Delhi, 1999.
5. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi, 2015.

19HS122 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
-	-	2	1

Source:
www.google.com/

COURSE DESCRIPTION AND OBJECTIVES:

The course will provide students an exposure on a wide range of language used in everyday situations. They will read, analyze, and interpret material from a variety of general topics and practice reading, writing, listening and speaking skills in English, to use it confidently in their professional and social contexts.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Read and grasp the content and significance of news, articles and reports on a wide range of general topics connected with their interests.
2	Apply suitable strategies to achieve comprehension, like listening for main points; checking comprehension by using contextual clues etc.
3	Follow lectures or talks on topics within their own field, and well structured presentations outside their field.
4	Apply their knowledge of functional English to communicate effectively in real life situations and demonstrate good presentation skills in classroom situations.

SKILLS:

- ✓ *Read strategies for global meaning and for specific details.*
- ✓ *Write a purpose.*
- ✓ *Listen drawing inferences.*
- ✓ *Speak fluently with appropriate stress and intonation.*

UNIT - I **P-6**

Functions: Introducing self / others (SWOT Analysis), Expressing needs/feelings/opinions

Skill Focus:

- Reading – Understanding factual information.
- Writing – Understanding word order and sentence formation.
- Listening – Decoding for meaning following elements of stress, intonation and accent.
- Speaking – Articulating individual sounds/syllables clearly, speaking fluently with intelligibility.
- Vocabulary – Discerning use of right word suiting the context, Preliminary English Test (PET) word list.
- Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions.

Practice : Units 1 – 6 in the Text Book, *Objective PET*

UNIT - II **P-6**

Functions: Describing people and things.

Skill Focus:

- Reading – Drawing inferences from sentences and short messages(True/False statements).
- Writing – Rewording, Sentence transformation, Convincing.
- Listening –Understanding short messages and conversations.
- Speaking – Role-plays, Short conversations.
- Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives.

Practice: Units 7 – 12 in the Text Book, *Objective PET.*

UNIT - III **P-6**

Functions: Describing places and processes, Spatial and temporal aspects, Giving directions/ instructions.

Skill Focus:

- Reading – Reading between the lines, Drawing inferences, True/False.
- Writing –Developing hints, Writing short messages/paragraphs.
- Listening – Searching for factual information, Gap filling.
- Speaking – Snap Talks, JAM, Elocution.
- Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list.

Practice: Units 13 – 18 in the Text Book, *Objective PET.*

UNIT - IV **P-6**

Functions: Narrating, Predicting, Negotiating, Planning.

Skill Focus:

- Reading – Reading for comprehension, evaluation and appreciation.
- Writing – Letters, E-mails, 7 C's.
- Listening – Following long conversations / Interviews.
- Speaking – Participating in Group Discussions, Debates, Mini-presentations.
- Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense).

Practice: Units 19 – 24 in the Text Book, *Objective PET.*

UNIT - V **P-6**

Functions: Requesting, Denying, Suggesting, Persuading.

Skill Focus:

- Reading – Understanding factual information.
- Writing – Short stories, Explanatory paragraphs.
- Listening – Inferring information from long speeches/conversations.
- Speaking – Making announcements, Presentations.
- Vocabulary / Grammar - Punctuation, Cloze tests.

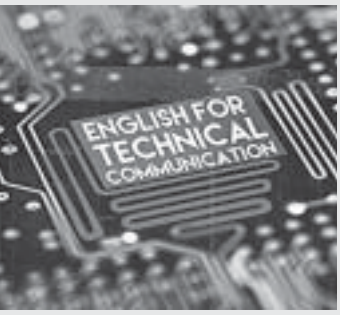
Practice: Units 25 – 30 in the Text Book, *Objective PET.*

TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOK:

1. Annette Capel and Rosemary Nixon, "Introduction to PET", Oxford University Press, 2009.



Source:
www.google.com

19HS123 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
2	-	2	3

COURSE DESCRIPTION AND OBJECTIVES:

The course will introduce students to the specific use of English for Technical Communication. In this course students will read, analyze, and interpret material from general and technical fields, and will practice reading, writing, listening and speaking skills on a variety of contemporary topics

COURSE OUTCOMES :

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Understand and interpret a wide range of materials on technology.
2	Apply a variety of strategies to achieve comprehension, including listening for main points; checking comprehension using contextual clues etc.
3	Apply functional/academic language and grammar to express clearly while speaking and make short presentations on general/technical topics.
4	Apply functional/academic language and grammar to write clearly on topics related to technology and writing in the workplace.

SKILLS:

- ✓ *Oral communication skills to make presentations.*
- ✓ *Paraphrasing and summarizing skills.*
- ✓ *Etiquette in interpersonal communication.*
- ✓ *Language competence to work in international environments.*

UNIT - I **L-6**

Reading: Reading for comprehension (general/technical articles); Reading subskills: predicting, skimming, scanning, reading for inference; Reading and note making (**Reading Texts:** 1) Is a Global Agreement the Only Way to Tackle Climate Change? 2) How to Regain Green Cover 3) Solution to Plastic Pollution).

Writing: Precis writing; Paraphrasing; Functional grammar [articles, prepositions of time, place, direction and movement, verb;tense, subject;verb agreement]; Glossary of 25 words from the texts studied.

Listening: Anupam Mishra; TED Talk on Water Harvesting (LC); Answering comprehension based Qs; Listening to improve pronunciation.

Speaking: Functional English(LC); Introducing oneself; Speaking of likes & dislikes/hobbies; Speaking of daily/weekly routine; Speaking of past and present habits/ activities/events; Speaking of future plans.

UNIT - II **L-6**

Reading: Reading for global understanding; Reading for specific information; Guessing meanings from context; Inter-textual (extrapolative) reading;
Reading Texts: 1) The Hubble Telescope 2) Genesis of ISRO 3) A Home in the Sky.
Writing: Writing formal and informal letters; Functional grammar; Modals[Receptive practice of modals like can, could, will, would, shall, should, may, might, must, ought to, used to; Receptive practice of modals for habit, advice, ability, permission, obligation and possibility]; Framing questions: Open ended & Close ended.

Listening: Listening to a debate on "Colonising the Moon" (LC); Listening subskills; Listening for global understanding; Listening for specific information; Note Making.

Speaking: (LC) Making mini presentations on general topics; Sharing information about ISRO / NASA/ Elon Musk.

UNIT - III **L-6**

Reading: Reading for specific information; Reading with a focus to learn new words; Reading critically for the narrative tone; 50 most commonly used collocations; **(Reading Texts:** 1) Ten Reasons Why Travel is a Waste of Time 2) Southern Splendour 3) Tourism in India: Role in Conflict and Peace).

Writing: Paragraph writing [writing a topic sentence, supporting sentences, effective introductions & conclusions, cohesive devices]; Stages of writing: planning /organising /writing /editing /rewriting; Functional grammar [relative pronouns, comparative adjectives, adverbs of time, frequency, place & manner, speaking of the future/ simple future using *will* and *am/is/are* + *going to*].

Listening: (LC) Listening to a Song; Listening for global meaning; Listening for getting at the nuances and the mood of the singer.

Speaking: (LC) Telephonic Skills; Participating in an interactive video or telephone talk.

UNIT - IV **L-6**

Reading: Reading for factual information; Reading for extrapolation; Reading for understanding author's stance; **(Reading Texts:** 1) In Search of Our Energy Solution 2) Wind Energy 3) How pertinent is the nuclear option).

Writing: Current modes of communication; Writing an E-mail; Fax texting; SMS texting for Mobile.

Speaking: Group Discussion (LC) – Language functions; initiating a discussion; expressing one's opinion; leading a discussion; agreeing/ disagreeing to someone's view; cutting into a speech; **(G.D Topics:** Dumping of nuclear wastes, Exploring eco-friendly energy options, Lifting subsidies on petrol, diesel, LPG, etc).

Listening: Listening to an Interview (LC) related to the text ; Listening critically for understanding the attitude/tone of the speaker.

UNIT – V **L-6**

Reading: Reading for factual understanding; Reading for specific information; Reading for inferring words/phrases from context; Reading for summarizing the main ideas/points in a diagrammatical form; Reading for extrapolation; **Reading Texts**: 1) The Evolution of Media 2) The Top Ten Developments in Journalism in the 2000s 3) Criminal Cases and the Media.

Writing: Drafting a report/proposal (LC); Using graphic tools [tables, pie & bar charts; Writing an abstract; Leveraging ICT for communication; Preparing a Ppt (LC).

Speaking: Making short presentations [individual/team] with the aid of Ppt (LC); Physical appearance, body language & voice modulation; Making impromptu presentations

Listening: Listening to a radio program (LC); Watching a movie scene (LC); Subskills: Listening to understand one's viewpoint; Listening to understand speaker's intention; Listening for local understanding.

LABORATORY EXPERIMENTS

LIST OF LAB ACTIVITIES **TOTAL HOURS: 30**

1. Note making while reading a technical/general article.
2. Paraphrasing.
3. Paragraph writing.
4. Note taking while listening to a technical/general talk.
5. Precis writing / Summarising.
6. Preparing an outline for developing a report.
7. Writing a Short Report.
8. Making a Ppt and Mini presentations with the aid of a Ppt.
9. Using Language Functions suiting the context.
10. Team presentations/Group Discussion.
11. Using Collocations.
12. Speaking face to face / on the telephone with appropriate stress and intonation.

TEXT BOOK:

1. Elango, K et.al., "Mindscapes: English for Technologists and Engineers", Orient Blackswan, 2014.

REFERENCE BOOKS:

1. M. Balasubrmanyam, "Business Communication" Vani Educational Books, 1985.
2. T. Balasubramanian, "A Text book of Phonetics for Indian Students", Orient Longman, 1989.
3. N. Krishnaswamy and Sriraman, T., "Current English for Colleges", Macmillan India Ltd. 1995.
4. Mohan Krishna and Meera Banerjee, "Developing Communication Skills", Macmillan India Ltd.,1990.
5. V.R.Narayanaswamy, "Strengthen your Writing", Orient Longman, 1979.
7. B. Jean Naterop and Rod Revell., "Telephoning in English", Cambridge University Press, 1997.

19HS124 CONSTITUTION OF INDIA

SOURCE:
www.livemint.com

Hours Per Week :

L	T	P	C
1	-	-	1

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with a basic understanding of Indian Polity and Constitution and make them understand the functioning of government at the centre and state besides local self government, in order to equip the them with knowledge on fundamental rights and duties of a citizen in democracy.

COURSE OUTCOMES:

Upon completion of the course, the students will be able to achieve the following outcomes.

COs	Course Outcomes
1	Analyze the major articles and provisions of Indian constitution.
2	Understand the constitution and its role in safeguarding individual rights.
3	Understand the functioning of organs of the State in a democracy.
4	Understand the relationship between rights and duties of citizens.

SKILLS

- ✓ *Understanding of the basics of Indian constitution.*
- ✓ *Awareness of the fundamental rights, duties and DPSP.*
- ✓ *Knowledge of the functioning of various institutions in democracy.*

UNIT - I **L - 7**

Meaning of the constitution law and constitutionalism; Historical perspective of the Constitution of India; Salient features and characteristics of the Constitution of India.

Scheme of the fundamental rights; Scheme of the fundamental right to equality; Scheme of the fundamental right to certain freedom under article 19; Scope of the right to life and personal liberty under article 21; The scheme of the fundamental duties and its legal status; The directive principles of state policy; Its importance and implementation.

UNIT - II **L - 8**

Federal structure and distribution of legislative and financial powers between the union and the states; Parliamentary form of Government in India; The constitution powers and status of the President of India; emergency provisions: National emergency, President rule, Financial emergency.

Amendment of the constitutional powers and procedure; The historical perspectives of the constitutional amendments in India; Local self-government; Constitutional scheme in India.

TEXT BOOK:

1. P.M.Bhakshi, "Constitution of India", 15th edition, Universal Law Publishing, 2018.

REFERENCE BOOK:

1. Subhash Kashyap, "Our Constitution", 2nd edition, National Book Trust, India, 2011.

19EE102 BASIC ENGINEERING PRODUCTS

SOURCE:
http://sazehpardazi.ir/wp-content/uploads/2017/01/Mokran-tank.jpg

Hours Per Week :

L	T	P	C
2	-	2	3

COURSE DESCRIPTION AND OBJECTIVES:

This course enable the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintenance of engineering products.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Describe the working principle of IC engine, refrigeration and air conditioning systems.
2	Gain awareness on choosing appropriate construction materials.
3	Install, operate, maintain and troubleshoot basic electrical engineering appliances.
4	Analyze the different lighting sources and it's features.
5	Know the basic electronics engineering appliances.

SKILLS:

- ✓ *Trouble shoot issues relating to air conditioning and refrigeration systems.*
- ✓ *Testing the quality of different construction materials.*
- ✓ *Identify UPS requirements for a given load.*
- ✓ *Design a composition of heating element for a particular application.*
- ✓ *Provide an earthing for domestic outlet.*
- ✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - I **L - 6**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of centrifugal and reciprocating pumps - types, parts and applications; Working principle of screw jack and its components, Working principle of IC engines - 2 stroke and 4 stroke.

UNIT - II **L - 6**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks, Timber - Definition, Qualities of good timber, Decay of timber and advantages of timber in construction.

CEMENTS: Types and composition of cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - III **L - 6**

POWER GENERATION: Overview of Power System Structure, Conventional and Non-conventional power generation sources.

PROTECTION SCHEMES: Earthing procedure, Switch Fuse Unit (SFU), MCB. Methods of Electrical Wiring Systems.

ENERGY STORAGE SYSTEMS: Types of Batteries, Important characteristics for batteries; Elementary calculations for energy consumption.

UNINTERRUPTIBLE POWER SUPPLY (UPS) : Components in UPS, Functionality, Calculation of ratings for UPS components to a specific load.

UNIT - IV **L - 6**

LIGHT: Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and applications.

HEAT: Resistance and Induction Heating, Comparison and Applications.

MOTOR: Motors used in Domestic applications, Mixer grinder, Ceiling fan, Hair dryer, Washing machine, Air coolers, Vacuum cleaner and Electric vehicle.

UNIT - V **L - 6**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of Television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators.
2. 2 Stroke and 4 Stroke Engines.
3. Reciprocating Pumps.
4. Power Screw Jack.
5. Size and Water absorption capacity of Bricks.
6. Initial and final setting time of Cement.
7. Toughness value of coarse aggregates.
8. Bulking of Sand.
9. Earthing Schemes.
10. Electric Wiring.
11. UPS system.
12. Immersion Heater and Iron Box.
13. Induction Heater.
14. Ceiling Fan and Mixer.
15 Washing Machine.
16. Incandescent and Fluorescent lamps.
17. Television and Remote Control.
18. Microwave oven.
19. Telephone and Mobile Phone.
20. PA System.

TEXT BOOKS:

1. M.S. Shetty, “Concrete Technology”, 1st edition, S. Chand & Co., 2005.
2. S.C. Rangwala, “Engineering Materials”, 36th edition, Charotar Publishing House, 2009.
3. Govindasamy and A. Ramesh, “Electrical Engineering - Electrical Machines and Appliances Theory, 1st edition, Tamilnadu Text Book Corporation, 2010.

REFERENCE BOOKS:

1. Janakaraj and A. Sumathi, “Electrical Engineering - Electrical Machines and Appliances Theory”, 1st edition, Tamilnadu Text Book Corporation, 2011.
2. Marshall Brain, “How Stuff Works”, 1st edition, John Wiley & Sons, 2001.
3. Pravin Kumar, “Basic Mechanical Engineering”, 1st edition, Pearson Publishers, 2013.

Source:
http://woodtech.weebly.com

19ME103 WORKSHOP

Hours Per Week :

L	T	P	C
1	-	2	2

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with different workshop trades and tools and also introduction of CNC machines. The objective of this course is to provide hands on experience in carpentry, fitting, tinsmith, black smithy, house wiring and welding.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Identify various tools connected to the carpentry, fitting, tinsmith, black smithy, house wiring and welding.
2	Fabricate different models using workshop trades.
3	Develop methodology as per specifications of the product.
4	Understand various advance machine tools and its components.

SKILLS:

- ✓ *Understand the concepts of making various wooden joints for house hold purpose.*
- ✓ *Design and develop various sheet metal products.*
- ✓ *Fabricate various agriculture tools by using forging technique.*
- ✓ *Create products by using different trades for Industrial applications.*

UNIT- I **L-3**

ENGINEERING MATERIALS: Introduction; Classification; Ferrous & non ferrous metals and alloys; Physical, electrical, optical & mechanical properties.

UNIT- II **L-3**

CARPENTRY: Introduction; Classification of wood; Marking tools; Measuring tools; Holding tools; Cutting tools & supporting tools; Classification of joints; Safety precautions.

UNIT- III **L-3**

FITTING: Introduction; Vices; Try square; Files; Hacksaw.

TINSMITHY: Introduction; Metals used in sheet metal work; Classification of tools.

UNIT- IV **L-3**

FORGING: Introduction; Tools and equipment used in forging; Smith's forge or hearth.

HOUSE WIRING: Concepts of basic electricity; Single phase and three phase circuits; Knowledge of different electrical wirings - residential, offices, hospitals, godowns.

UNIT- V **L-3**

WELDING: Concepts of welding; Arc welding; Gas welding; Soldering and Brazing.

CNC: Introduction; Components of CNC; Types of CNC systems.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Fabrication of Mortise and Tenon joint using carpentry tools.
2. Fabrication of T-lap joint using carpentry tools.
3. Fabrication of V-fit using fitting tools.
4. Fabrication of U-fit using fitting tools.
5. Fabrication of truncated cylinder using tinsmithy tools.
6. Fabrication of square tray using tinsmithy tools.
7. Forging of S shape using blacksmithy technique.
8. Forging of square to round cross section using blacksmithy technique.
9. Peformance of 1 lamp controlled by one way switch using house wiring.
10. Performance of 2 lamp controlled by one way switch using house wiring.
11. Demonstration of CNC and welding operations.

TEXT BOOKS:

1. S.K Hazra Choudhury, “Elements of Work Shop Technology”, 11th edition, Media Promoters, 1997.
2. Venkatachalapathy, V.S, “First year Engineering Workshop Practice”, Ramalinga Publications, 2014.

REFERENCE BOOKS:

1. T.V.Gopal, T.Kumar and G. Murali, “A first Course on Workshop Practice: Theory, Practice and Work Book”, Suma Publication, 2005.
2. K.V.N.Pakirappa, “Workshop Technology”, 5th edition, Radiant Publishing House, 2011.

II

YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.

I SEMESTER

19HS202	-	Transforms & Complex Variables
19EC201	-	Electronic Devices and Circuits
19EC202	-	Signals and Systems
19EC203	-	Digital System Design
19EC204	-	PCB Laboratory
19HS204	-	Environmental Studies
19PC003	-	Life Skills - I
19PC004	-	Technical Seminar - I
19PC005	-	Intra-Disciplinary Projects- I
19PC006	-	Physical fitness, Sports & Games - III

II SEMESTER

19EC211	-	Analog Communications
19EC212	-	Analog Circuits
19EC213	-	Microcontrollers
19EC214	-	Probability Theory and Stochastic Processes
19EC215	-	Control Systems
19PC007	-	Life Skills - II
19PC008	-	Technical Seminar - II
19PC009	-	Intra-Disciplinary Projects - II
	-	Open Elective - I

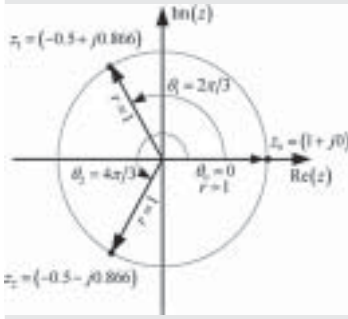
COURSE CONTENTS

I SEM AND II SEM

19HS202 TRANSFORMS & COMPLEX VARIABLES

Hours Per Week :

L	T	P	C
3	1	-	4



SOURCE:
https://www.google.com/search?client

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with foundation in elementary topics of transformations and complex variables such as Z- and Fourier transformations, analytical functions, complex integration, theory of residues required for various engineering applications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply the concept of complex integration.
2	Apply properties of transformations for various problems.
3	Analyse functions for their continuity, differentiation and analyticity.
4	Construct harmonic conjugate of a given analytic function.
5	Use residue to evaluate real integrals.

SKILLS:

- ✓ *Check the analyticity of a function.*
- ✓ *Decide the nature of singularity.*
- ✓ *Apply Cauchy's theorems.*
- ✓ *Expand a function into Taylor series.*
- ✓ *Evaluate real integrals using singularities.*
- ✓ *Find the Laplace transformation of a given function.*

UNIT - I **L-9, T-3**

Z-TRANSFORMATIONS, DIFFERENCE EQUATIONS : Introduction, Definition, Standard Z-transformations, Linear property, Damping rule, Shifting rules, Multiplication and division by n, Initial and final value theorems, Inverse Z-transformations, Convolution theorem, Solving difference equations using z-transformations.

UNIT - II **L-9, T-3**

FOURIER TRANSFORMATIONS: Fourier integral theorem, Fourier sine and cosine integrals, Fourier's complex integral, Fourier transforms, Fourier sine and cosine transforms, Properties, Convolution Theorem, Parseval's identity.

UNIT - III **L-9, T-3**

ANALYTICAL FUNCTIONS: Complex numbers, Properties including roots of a complex number (Not for testing). Functions of complex variables, Limit and Continuity, Differentiability, Analytic functions, Cauchy-Riemann equations (without proof), Cauchy-Riemann equations in polar form (without proof), Orthogonal curve, Harmonic functions, Conjugate harmonic functions, Construction of conjugate harmonic function, Milne-Thomson method.

UNIT - IV **L-9, T-3**

ELEMENTARY FUNCTIONS: Complex trigonometric functions, Hyperbolic functions, Relation between trigonometric and hyperbolic functions, Separation of real and imaginary parts of trigonometric and hyperbolic functions, Logarithmic function, Inverse functions.
COMPLEX INTEGRATION: Line integral, properties of contour integrals; Cauchy's Integral theorem, Cauchy's Integral formula and its generalization; Evaluation of integrals.

UNIT - V **L-9, T-3**

RESIDUES: Convergence of series of complex terms, Power series, Region and radius of convergence, Taylor's series, Maclaurin's series and Laurent's series; Singularity, Classification of Singularities, Pole at infinity. Zeros of analytic function, Residue of a pole, Residue at infinity, Residue theorem, Method of finding residues, Residue integrals.

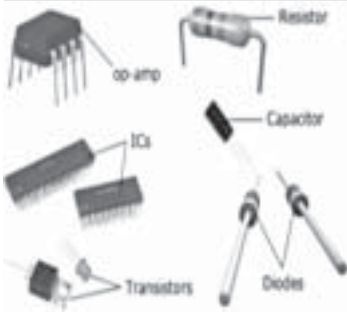
TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand & Co., 3rd edition, New Delhi, 2015.
2. B.S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2015.

REFERENCE BOOKS:

1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill Publishing Co, 3rd edition, 2008.
2. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd Edition, Narosa Publishing House, 2007.

19EC201 ELECTRONIC DEVICES AND CIRCUITS



SOURCE:
https://www.elprocus.com/wp-content/uploads/2016/06/2016-06-10_11-36-59.jpg

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE: Engineering Physics (A).

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed at offering fundamental concepts of semiconductor devices and circuits. It starts with the concepts of the Junction Diode, Transistor, FET and other basic devices that are designed with semiconductor materials. As a first-level course in electronics, the objectives of this course is to form the basis for the understanding of advanced electronic courses that are offered in subsequent semesters.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand and apply the usage of semiconductor devices concepts in circuit making.
2	Analyze characteristics of BJT and FET devices.
3	Investigate the position of operating point under various biasing conditions.
4	Understand the various types of feedback amplifiers and oscillators.
5	Experiment and demonstrate the application of analog electronic circuits using Electronic components.

SKILLS:

- ✓ *Identify a Semiconductor Diode for a specific application and power handling capacity.*
- ✓ *Identify the transistor type for a given application (switch/amplifier).*
- ✓ *Recognize the required specifications of the transistor.*
- ✓ *Identify the amplification factor of the given transistor.*
- ✓ *Test the working condition of the transistor.*

UNIT - I **L-9**

P-N JUNCTION DIODE: Formation of PN junction, Energy band diagram of open circuited PN junction, operation of forward and reverse biased PN junction diode, Volt-Ampere characteristics, Temperature dependence on V–I characteristic, Diode resistances and capacitances, Diode current equation; Special diodes - breakdown mechanisms, zener diode, zener diode as voltage regulator, tunnel diode, varactor diode.

UNIT - II **L-9**

APPLICATIONS OF DIODES: Rectifiers - Analysis of half wave, Full wave and bridge rectifiers; Filters - inductor filter, capacitor filter, L- section filter and π - section filter, analysis in terms of ripple factor; Clipping and clamping circuits - elementary diode clippers and clamping circuits.

UNIT - III **L-10**

TRANSISTOR: Bipolar Junction Transistor (BJT) - construction and working of BJT, BJT characteristics; Junction Field Effect Transistor (JFET) - construction and working of JFET, JFET characteristics; MOSFET - construction and working of MOSFET, MOSFET characteristics, MOS capacitor, CMOS; Comparison of BJT, JFET and MOSFET.

UNIT - IV **L-9**

TRANSISTOR BIASING: Introduction to amplifier, Need for biasing-DC load line, AC load line and Operating point; Thermal runaway, Thermal stability - stabilization against variations in I_{co},V_{BE} and , stability factors; Types of stabilization, Stabilization techniques, Compensation techniques, Small Signal model of CE amplifier.

UNIT - V **L-8**

FEEDBACK AMPLIFIERS: Feedback amplifiers - concept and types of feedback, effects of negative feedback; Classification of feedback amplifiers - voltage series, current series, voltage shunt, current shunt, block diagrams and expressions for gain, input and output resistances.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

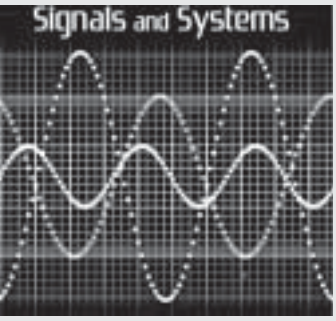
1. P-N Junction diode characteristics.
2. Zener diode characteristics and Zener diode as Voltage regulator.
3. Determination of the ripple factor and efficiency of Half wave Rectifier with and without filter.
4. Determination of the ripple factor and efficiency of Centre tapped Full wave Rectifier with and without filter.
5. Determination of the ripple factor and efficiency of Bridge Rectifier with and without filter.
6. Construction of various diode clipping circuits.
7. Transistor CB characteristics (Input and Output).
8. Transistor CE characteristics (Input and Output).
9. Transistor CC characteristics (Input and Output).
10. FET characteristics.
11. Determination of the voltage gain of CE amplifier.

TEXT BOOKS:

1. J. Millman and C.C.Halkias, “Electronic Devices and Circuits”, 4th edition, Tata Mc-Graw Hill, 2015.
2. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits”, Pearson/Prentice Hall, 4th edition, 2015.

REFERENCE BOOKS:

1. J. Millman and Christos C. Halkias, “Integrated Electronics”, 2nd Edition, Tata Mc-Graw Hill, 2017.
2. Salivahanan and N Suresh Kumar,” Electronic Devices and Circuits”, 4th edition, Tata Mc-Graw Hill, 2016.
3. K. Thomson, “Electronic Switching Circuits”, 2nd edition, Oxford University Press, 2012.
4. K. Satya Prasad, “Electronic Devices and Circuits”, 2nd edition, VGS Book Links, 2014.



SOURCE:
http://engineering interviewquestions.com/ wp-content/uploads/ 2016/07/SIGNALS-and-SYSTEMS-LAB-VIVA-Questions-Answers.jpg

19EC202 SIGNALS AND SYSTEMS

Hours Per Week :

L	T	P	C
3	-	2	4

COURSE DESCRIPTION AND OBJECTIVES:

This course is about the fundamentals of continuous times signals and systems. The course objective is to cover the spectral analysis of periodic and aperiodic signals using Fourier series and Fourier transform. To analyze continuous time linear time invariant systems through Laplace transform and Fourier transform. To use simulation tools for transform analysis, convolution and to generate signals for understanding the behavior of signals and systems.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the characteristics and properties of continuous time signals and systems.
2	Apply the concepts of convolution and correlation for continuous time signal.
3	Analyze the continuous time signals and systems in frequency domain using Fourier series, Fourier transform and Laplace transform.
4	Understand the effects of sampling of a continuous time signal.
5	Apply the techniques necessary for analysis of different CT signals and systems using modern engineering tools.

SKILLS:

- ✓ *Design and test a stable system.*
- ✓ *Choose the various transforms and their applications in the analysis of signals and systems.*
- ✓ *Apply transformation to real-world problems involving bio-signals such as EEG, ECG and EMG.*
- ✓ *Analyze the abnormalities present in the physiological systems.*
- ✓ *Choose the desired sampling frequency for a given application.*

UNIT - I **L-9**

FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS: Introduction to signals and systems, Basic signals, Classification, Operations; Vectors vs Signals, Orthogonal functions, Representation of signals using orthogonal functions, Mean square error, Representation of Fourier series, Continuous time periodic signals, Properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series, Exponential Fourier series, Complex Fourier spectrum.

UNIT - II **L-9**

TRANSFORMS:

FOURIER TRANSFORM (FT): Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, Properties of Fourier transforms, Fourier transforms involving impulse function and Signum function, Introduction to Hilbert Transform.

LAPLACE TRANSFORM (LT): Review of laplace transforms, Inverse laplace transform, Concept of region of convergence (ROC) for laplace transforms, Constraints on ROC for various classes of signals, Properties of LT's, Relation between LT and FT of a signal.

UNIT - III **L-9**

LTI SYSTEMS & ANALYSIS: Classification of Systems, Linear time invariant (LTI) system - impulse response, step response, response of a LTI system to arbitrary inputs, transfer function of LTI system; Filter characteristics of linear systems, Distortion less transmission, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT - IV **L-9**

CONVOLUTION AND CORRELATION OF SIGNALS: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Cross correlation and auto correlation of functions, Properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and power spectral density, Relation between convolution and correlation.

UNIT - V **L-9**

SAMPLING: Sampling theorem, Graphical and analytical proof for band limited signals, Impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling - aliasing, introduction to band pass sampling.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Generation and plotting of trigonometric and exponential functions.
2. Standard signal generation (Impulse, Step, Ramp & Sinc).
3. Operations on signals (Folding, Shifting and Scaling).
4. Periodic and Non-periodic signal generation.
5. Analysis of periodic signals.
6. Analysis of Non-periodic signals.
7. Analysis of transfer function.
8. System analysis by using poles and zeros.
9. Sampling theorem verification.
10. System response.
11. Convolution of continuous time signals.
12. Correlation of continuous time signals.
13. Generation of random signals.

TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd edition, Prentice Hall of India, 1997.
2. B.P.Lathi, "Linear Systems and Signals", 2nd edition, Oxford University Press, 2009.

REFERENCE BOOKS :

1. B.P. Lathi, "Signals Systems & Communications", John Wiley, 2005.
2. Simon Haykin and Van Veen, "An Introduction to Signals & Systems", 2nd edition, Wiley, 2002.
3. John A.Stuller, "An Introduction to Signals & Systems", Thomson, 2008.
4. Kwei P.Hsu, "Signals & Systems", 3rd edition, McGraw-Hill, Schaum's Outlines, 2014.

19EC203 DIGITAL SYSTEM DESIGN

SOURCE:
https://i0.wp.com/blog.oureducation.in/wp-content/uploads/2013/01/Digital-Electronics-Projects.jpg?ssl=1

Hours Per Week :

L	T	P	C
3	-	2	4

COURSE DESCRIPTION AND OBJECTIVES:

Digital Electronics deals with fundamentals of number systems and boolean expressions that are used to realize combinational and sequential circuits. Its objective is to minimize the logical expressions using Boolean postulates, to design various combinational and sequential circuits and to provide with sufficient number of applications to demonstrate the techniques and mathematics used.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply the knowledge of digital logic concepts to optimize digital circuits.
2	Analyze Combinational and sequential digital circuits for given problem statement by applying the digital techniques.
3	Compare the characteristics of logic families.
4	Synthesize given application/problem statement using HDL.
5	Experiment using digital ICs to demonstrate a given application / problem statement.

SKILLS:

- ✓ Perform conversions between numbers of different radices.
- ✓ *Identify the different gates and their properties.*
- ✓ *Minimize Boolean expressions.*
- ✓ *Design combinational and sequential circuits for a given application.*
- ✓ *Develop VHDL Code for a given application.*

UNIT - I **L-9**

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Review of number systems - conversions, arithmetic operations, binary codes, parity code, hamming code; Fundamental concepts of boolean algebra-basic theorems and properties; Canonical and standard forms - SOP and POS forms; logic gates, algebraic simplification and realization with basic gates and universal gates, karnaugh maps.

UNIT - II **L-9**

COMBINATIONAL LOGIC DESIGN: Design using conventional logic gates, Decoder, Encoder, Multiplexer, De-multiplexer, Parity generator, code converters, Basic PLDs - PAL, PLA, PROM.

UNIT - III **L-9**

SEQUENTIAL LOGIC DESIGN: Classification of sequential circuits, Latches, Flip-Flops - SR, JK, D, T, triggering and excitation tables; Design of sequential circuits - shift registers, counters, FSM, sequence detectors.

UNIT - IV **L-9**

DIGITAL LOGIC FAMILIES: Introduction to logic families, TTL logic family, Totem pole, Open collector and tri-state output operations; MOS transistor switches - NMOS, PMOS; CMOS inverter and logic gates, ECL logic families, Comparison of TTL, CMOS and ECL logic families.

UNIT - V **L-9**

INTRODUCTION TO HDL: Hardware description language - VHDL design flow, program structure, types and constants, functions and procedures, libraries and packages; VHDL design elements - structural design elements, data flow design elements, behavioral design elements.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Design and Implementation of

1. Basic Logic Gates.
2. Adders: Half Adder, Full Adder, Ripple Carry Adder.
3. Subtractors: Half Subtractors, Full Subtractors.
4. Encoder.
5. Decoder.
6. Multiplexer.
7. De-Multiplexer.
8. Parity Circuits.
9. Code Converters.
10. Flip Flops: SR, JK, D, T.
11. Registers.
12. Counters.
13. Sequence Detectors.

* Above said Experiments can be verified with the Hardware ICs and /or Simulated with VHDL coding.

TEXT BOOKS:

1. Morris Mano and M.D. Ciletti, “Digital Design”, 4th edition, Pearson Education, 2007.
2. John. F. Walkerly, “Digital Design Principles and Practices”, 3rd edition, PHI/Pearson Education, 2015.

REFERENCE BOOKS:

1. Floyd. T. L, “Digital Fundamentals”, 9th edition, Pearson Education, 2009.
2. A. Anand kumar, “Fundamentals of Digital circuits”, 3rd edition, Prentice Hall of India, 2014.

SOURCE:
https://i.pinimg.com/originals/cd/11/20/cd112080e56fe6645cf81c147248df48.jpg

19EC204 PRINTED CIRCUIT BOARD (PCB) LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

COURSE DESCRIPTION AND OBJECTIVES:

Printed Circuit Board (PCB) designing is an integral part of each electronic systems and this laboratory is designed to make students capable to design their own projects PCB.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand PCB designing concepts and materials used for making PCB.
2	Understand the Development Tools.
3	Design and develop PCB for various Electronic Circuits.

SKILLS:

- ✓ *Identify suitable materials for PCB fabrication.*
- ✓ *Identify PCB type required for specific application.*
- ✓ *Choose appropriate tool for PCB design.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Understanding PCB Design Flow.
2. Understanding PCB Materials.
3. Working with CAD Tools.(2 Sessions).
4. Developing schematic diagram for a given circuit.

Single layer PCB Design

5. Power supplies circuits.
6. Amplifier circuits.
7. Op- Amp based inverting and Non- inverting amplifiers.
8. Op-Amp based Waveform generators.
9. Digital ICs based Circuits.
10. Double layer PCB Design for FM receiver Circuit.
11. Understanding the Multilayer PCB Design.

SOURCE:
https://stock.adobe.com/uk/ images/ sustainable-development-logo-with-green-watercolor-paint-background-vector-illustration/ 142787368

19HS204 ENVIRONMENTAL STUDIES

Hours Per Week :

L	T	P	C
1	-	-	1

COURSE DESCRIPTION AND OBJECTIVES:

This is a multidisciplinary course which deals with different aspects using a holistic approach. The major objective of the course is to plan appropriate strategies for addressing environmental issues. The course also brings awareness of nature and judicious use of natural resources for long term sustenance of life on this planet. The course also enables the students to understand their responsibility required to react effectively to natural, man-made and technological disasters.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Understand the importance of environment and natural resources.
2	Gain the concept on protection of biodiversity and maintain healthy environment.
3	Analyze the sources of pollutants and their effects on atmosphere.
4	Identify the evidence of global warming, ozone depletion and acid rain.
5	Develop a basic understanding of prevention, mitigation, preparedness, response and recovery.

SKILLS:

- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - I **L-3**

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Environmental Studies: Multidisciplinary nature of environmental studies - definition, scope and its importance; Concept of sustainability and sustainable development; Natural resources: Deforestation-causes and impacts; Water resources-use and over exploitation of surface and ground water, Conflicts over water; Heating of earth and circulation of air; Air mass formation and precipitation; Energy resources-renewable and non-renewable energy sources; Land resources-soil erosion and desertification.

UNIT - II **L-3**

ECOSYSTEMS AND BIODIVERSITY

Ecosystem: Structure and functions of an ecosystem; Energy flow - food chains, food webs and ecological succession; Forest, Grassland, Desert and Aquatic ecosystems (ponds, rivers, lakes, streams, ocean, estuary).

Biodiversity: Genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity; India as a mega diversity; Endangered and endemic species of India;Hotspots of biodiversity; Threats to biodiversity; Conservation of biodiversity.

UNIT - III **L-3**

ENVIRONMENTAL POLLUTION

Pollution: Air, Water, Soil, Chemical and Noise pollution; Nuclear hazards and human health risks; Solid waste Management, Control measures of urban and industrial wastes; Pollution case studies.

UNIT - IV **L-3**

ENVIRONMENTAL POLICIES AND PRACTICES: Climate change, Global warming, Acid rain, Ozone layer depletion and impacts on human communities and agriculture; Environmental laws - Wildlife protection act, Water (pollution prevention and control) act, Forest conservation act, Air (pollution prevention and control) act, Environmental protection act; Tribal populations and rights; EIA - introduction, definition of EIA; EIS - scope and objectives.

UNIT - V **L-3**

HUMAN COMMUNITIES AND THE ENVIRONMENT:

Human population growth: Impacts on environment, human health and welfare; Resettlement and Rehabilitation of project affected persons: Case Studies; Disaster management - floods, earthquake, landslides and cyclones; Environmental communication and public awareness, case studies (C.N.G Vehicles in Delhi).

Field work/Environmental Visit: Visit to a local area to document environmental assets–river/ forest / grassland / hill /mountain; Visit to a local polluted site; Study of local environment - common plants, insects, birds; Study of simple ecosystems – pond, river, hill slopes; Visit to industries/ water treatment plants/effluent treatment plants.

TEXTBOOKS:

1. A. Kaushik and C. P. Kaushik, “Perspectives in Environmental Studies”, 5th edition, New Age International Publishers, 2016.
2. Y. Anjaneyulu, “Introduction to Environmental Science”, B. S. Publications, 2015.
3. B. Joseph, “Environmental Studies”, 2nd edition, Mc Graw Hill Education, 2015.
4. S. Subash Chandra, “Environmental Science”, New Central Book Agency, 2011.

REFERENCE BOOKS:

1. Mahua Basu and S.Xavier, “Fundamentals of Environmental Studies”, Cambridge University Press, 2016.
2. K. Mukkanti, “A Textbook of Environmental Studies”, S. Chand & Company Ltd., 2009.
3. M. Anji Reddy, “A Textbook of Environmental Science and Technology”, B. S. Publications, 2008.
4. K. Joseph and R. Nagendram, “Essentials of Environmental Studies”, Pearson Education Pvt. Ltd., 2007.
5. M. Chandrasekhar, “A Textbook of Environmental Studies”, Hi-tech Publications, 2006.
6. C. S. Rao, “Environmental Pollution Control Engineering”, New Age International Publishers, 2001.

19PC005 INTRA-DISCIPLINARY PROJECTS-I

Hours Per Week :

L	T	P	C
0	0	2	1

COURSE DESCRIPTION AND OBJECTIVES:

These projects arise from a combination of courses. The major objective of these projects is to enable students understand the relationship between the courses.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Map different courses to gain the knowledge of intra-disciplinary engineering.
2	Function effectively as an individual and as a member or leader in diverse teams.
3	Comprehend and write effective reports and make effective presentations.

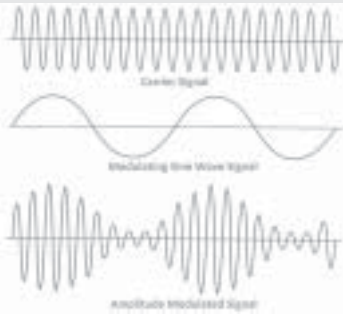
LIST OF INTRA - DISCIPLINARY PROJECTS

- Audio pre-amplifier.
  (Combination of courses: Electronic Devices and Circuits, Signals and Systems).
- Water level indicator using priority encoder.
  (Combination of courses: Electronic Devices and Circuits, Digital System Design)
- Metal detector circuit.
  (Combination of courses: Electronic Devices and Circuits).
- Simple Two Way Intercom Circuit.
  (Combination of courses: Electronic Devices and Circuits, Digital System Design).
- Single transistor audio mixing circuits.
  (Combination of courses: Electronic Devices and Circuits, Signals and Systems).
- Soft start circuits for power supply.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Design laptop or mobile adapter.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Design wideband amplifier using FET.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).

- Design of piano using 555 timer IC.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Bi-Directional Visitors Counter.
  (Combination of courses: Electronic Devices and Circuits, Digital System Design).
- Mobile detector circuit.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Battery charger using SCR.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Line follower robot using IR sensor.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Electricity Generation from Speed Breakers.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Thermistor Temperature Sensing Alarm.
  (Combination of courses: Electronic Devices and Circuits, Digital System Design).
- Battery Level Indicator.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Rain Alarm Project.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Electronic Mosquito Repellent Circuit.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).
- Mobile incoming call indicator.
  (Combination of courses: Electronic Devices and Circuits, Printed Circuit Board Lab).

NOTE: The afore - mentioned list is not exhaustive and the objective is to provide an idea of some of the projects that can be executed by students arising from a combination of courses. Students are given full flexibility to choose any projects of their choice under the supervision of faculty Mentors.

19EC211 ANALOG COMMUNICATIONS



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https://www.elttam.com.au/assets/blog/2017-06-13-brief-sdr-and-rf-analysis/AM-4e4155cd0e92d2806e7b55b1af065587f688eaa1ae1b6be6e45af75e476125e9.jpg

Hours Per Week :

L	T	P	C
2	-	2	3

PREREQUISITE COURSE: Signals and Systems.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the fundamentals of analog communications - amplitude modulation and demodulation, frequency modulation and demodulation, phase modulation and demodulation. The objective of this course is to enable the students to understand the basic mathematical concepts of communications in both time domain and frequency domain.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand and compare different amplitude modulation techniques.
2	Analyze performance of different types of angle modulation techniques for a given set of parameters.
3	Analyze and design the transmitter and receiver systems required for different modulation types.
4	CalculateSNR in different modulation techniques.
5	Simulate and conduct experiments using hardware on different types of Analog communication subsystems.

SKILLS:

- ✓ *Identify the need for modulation and choice of modulation.*
- ✓ *Select the frequency bands of AM/FM/T.V/Mobile/Satellite.*
- ✓ *Identify the Tx/Rx type required for a given application.*
- ✓ *Select base band signal, carrier and modulated signals in a given application.*
- ✓ *Identify inherent or interference noise and classify.*

UNIT - I **L-7**

AMPLITUDE MODULATION: Introduction to communication system, Need for modulation, Frequency division multiplexing, Amplitude modulation - time domain and frequency domain description, single tone modulation, power relations in AM waves, square-law modulator, envelope detector.

UNIT - II **L-7**

DSB-SC MODULATION: Time domain and Frequency domain description, Ring modulator, Coherent detection of DSB-SC waves.
SSB MODULATION: Frequency domain description, Phase discrimination method, Coherent detection.
VSB MODULATION: Frequency domain description, Generation and Detection of VSB waves, Comparison of AM techniques.

UNIT - III **L-7**

ANGLE MODULATION: Basic concepts, Phase modulation, Frequency modulation - single tone modulation, spectrum analysis of sinusoidal FM wave, narrowband FM and wideband FM, transmission bandwidth of FM, direct method for FM generation, detection of FM waves using phase locked loop.

UNIT - IV **L-4**

TRANSMITTERS: AM Transmitters, Variable reactance type FM Transmitter.
RECEIVERS: Receiver characteristics, Tuned radio frequency receiver, Super-heterodyne receiver.

UNIT - V **L-5**

NOISE: Noise in DSB-SC and SSB system using coherent detection, Noise in amplitude modulation systems, Noise in frequency modulation systems, Pre-emphasis & De-emphasis.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Amplitude Modulation and Demodulation.*
2. DSB-SC Modulation and Demodulation.*
3. SSB-SC Modulation and Demodulation.*
4. Frequency Modulation and Demodulation*.
5. Pre-Emphasis and De-Emphasis.
6. Phase Locked Loop.
7. Design of Mixer.
8. AGC Characteristics.
9. Frequency Division Multiplexing.

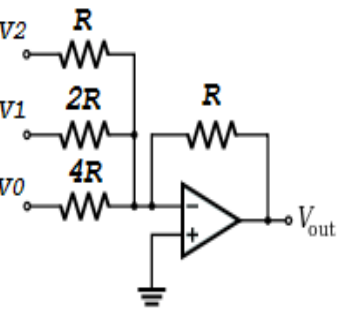
* *To be performed both in hardware and software (Simulink).*

TEXT BOOKS:

1. Simon Haykins, "Communication Systems", 2nd edition, Wiley, 2009.
2. G.K.Mithal, "Radio Engineering Principles of Communication systems", 12th edition, Khanna Publishers, 2013.

REFERENCE BOOKS:

1. H Taub, D.L.Schlling and Goutam Saha, "Principles of Communication Systems", 3rd edition, TMH, 2008.
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", 4th edition, Oxford University Press, 2011.
3 Wayne Tomasi, "Electronics Communication Systems", 5th edition, Pearson, 2004.
4. George Kennedy and Bernard Davis, "Electronic Communication System", 4th edition, TMH, 2009.



SOURCE: *http://electronics-course.com/image/d2a-summing-amplifier.png*

19EC212 ANALOG CIRCUITS

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE: Electronic Devices and Circuits.

COURSE DESCRIPTION AND OBJECTIVES:

To gain knowledge on analysis and design of basic electronic circuits and also to introduce various linear and non-linear applications of operational amplifiers.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Analyze and design single, multistage, Tuned and Power Amplifiers.
2	Apply the concepts of op-amps to design oscillators and timers.
3	Design and Elucidate linear and non-linear applications of op-amp and other ICs.
4	Understand and analyze ADC's and DAC's.
5	Experiment to demonstrate Various Amplifiers, Timers, Converters and applications of OP-AMPs.

SKILLS:

- ✓ *Design an amplifier for Public address system.*
- ✓ *Construct an oscillator for audio and Radio frequency applications.*
- ✓ *Design Multivibrators for a given application.*
- ✓ *Design Modulators like PWM, PPM, FSK.*
- ✓ *Implement Data converters.*

UNIT - I **L-9**

SINGLE-STAGE AND MULTI-STAGE AMPLIFIERS: Single-stage BJT and FET amplifiers (CE/CS, CB/CG, CC/CD), Voltage gain, Input resistance, Output resistance, h-parameter, Hybrid Pi model, T-model, Multistage Amplifiers - cascade, cascode, CE-CC amplifiers, high input impedance transistor circuits; Frequency response of BJT amplifiers and FET amplifiers.

UNIT - II **L-9**

OSCILLATORS & POWER AMPLIFIERS: Oscillators, Barkhausen's criterion, Classification of oscillators - working of hartley, colpitts, RC phase shift, wein bridge and crystal oscillators, expression for frequency of oscillations using BJT; Classification of power amplifiers, Operation and efficiency of class-A, Class-B, Class-C and Class-D power amplifiers.

UNIT - III **L-9**

INTRODUCTION TO OPERATIONAL AMPLIFIER AND ITS APPLICATIONS: Differential DC amplifier, Common mode analysis, Differential mode analysis, 741 operational amplifier, Ideal and practical characteristics, Inverting and non-inverting configurations, Summing amplifier, Difference amplifier, Integrator and lossy integrator, Differentiator and practical differentiator, Logarithmic Amplifiers, Instrumentation amplifier, Comparators, Multivibrators.

UNIT - IV **L-9**

OP-AMP BASED OSCILLATORS & TIMERS: Op-amp Based Oscillators - Barkhausen's criterion for oscillations, Op-amp RC phase shift oscillators, Op-amp Wein bridge oscillators, Op-amp Schmitt Trigger, VCO and PLL with applications, Timers - IC555 timer, functional diagram of 555 timer, timer as a stable and monostable multivibrator.

UNIT - V **L-9**

ACTIVE FILTERS & DATA CONVERTERS: Application of Op-amp as active filter - low pass, high pass, band pass and band reject filters, design of practical filters; Op-amp based DACs and ADCs **-** characteristics of A/D and D/A converters, weighted resistor DAC, R-2R ladder DAC, flash ADC, successive approximation ADC and dual slope ADC.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Frequency response of a CS FET amplifier.
2. Verify the effect of cascading on gain and bandwidth of a multistage amplifier.
3. Design of an RC phase shift oscillator using BJT.
4. Design of a colpitts oscillator using BJT.
5. Find the conversion efficiency of a class B complementary symmetry power amplifier.
6. Find the conversion efficiency of a class AB complementary symmetry power amplifier.
7. Design an instrumentation amplifier using 741 Op-Amp IC.
8. Design an integrator and a differentiator using using 741 Op-Amp IC.
9. Verify the functionality of PLL using IC 565.
10. Design an astable multivibrator to generate a clock pulse with 60% duty cycle.
11. Design a low pass filter and a high pass filter with certain cutoff frequency using 741 Op-Amp IC.
12. Verify the function of an R-2R ladder DAC circuit.

TEXT BOOKS:

1. J. Millman and C.C. Halkias, “Integrated Electronics”, 2nd edition, Tata McGraw-Hill, 2009.
2. D. Roy Choudhury, “Linear Integrated Circuits”, 4th edition, New Age International (p) Ltd, 2014.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th edition, Pearson/Prentice Hall, 2006.
2. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, 5th edition, Oxford University Press,2006.
3. M.H. Rashid, “Micro Electronic Circuits: Analysis and Design”, 1st edition, Thomson PWS Publications, 1999.
4. Tahira Parveen, “Operational Trans-conductance Amplifier and Analog Integrated Circuits”, I.K International Publishing House Pvt.Ltd., 2010.
5. Sergio Franco, “Design with Operational Amplifiers & Analog Integrated Circuits”, McGraw Hill,1988.
6. G.B.Clayton, “Operational Amplifiers”, 5th edition, Butterworth, 1971.

19EC213 MICROCONTROLLERS

SOURCE: *https://positrontech.in/eshop/wp-content/uploads/2018/01/AVR-Microcontroller-Board.png*

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE: Digital System Design.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces about microprocessor and microcontroller to the student. The course objective is to study the architecture, hardware components and software aspects of ARM LPC 2148 and Cortex M3.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the evolution and architectures of ARM and ARM Cortex-M3 processors.
2	Program on LPC 2148 for the specific application.
3	Understand the peripherals used with microcontroller systems.
4	Compare the specifications and suitability of I2C, SPI, RTC, WATCHDOG TIMER, PWM generation blocks.
5	Develop applications and experiment to interface various peripherals to ARM Processors.

SKILLS:

- ✓ *Identify suitable microprocessor / microcontroller and hardware components for a specific application.*
- ✓ *Develop Embedded-C or Assembly language programs using LPC 2148.*
- ✓ *Design microcontroller based systems using LPC 2148 / Cortex-M3.*
- ✓ *Develop the environment for interfacing peripherals with ARM processors.*

UNIT - I **L-9**

ARM ARCHITECTURE & PROGRAMMING MODEL: ARM design philosophy, Registers, Program status register, Instruction pipeline, Interrupt and vector table, ARM processor families, Instruction set: Data processing instructions, Addressing modes, Branch, Load-Store instructions, PSR instructions, and Conditional instructions.

UNIT - II **L-9**

LPC 2148 CONTROLLER ARCHITECTURE : Features, Architecture, Functional pin description, On-chip Flash memory, On chip SRAM, Memory Mapping, LPC 2148 programming - programming of LPC 2148 GPIO ports, generation of PWM signals, simple programs.

UNIT - III **L-9**

LPC 2148 COMPONENTS: PLL, General purpose I/O (GPIO), ADC and DAC, Timers and counters, Watchdog timer, Real-time clock, Interrupt controller.

UNIT - IV **L-9**

LPC 2148 PERIPHERALS: UART, USB, Features of I2C - bus serial I/O controller; SPI - serial I/O controller, pulse width modulator.

UNIT - V **L-9**

ARM CORTEX-M3: Features, Architecture, Operation modes, NVIC, Instruction set development-thumb-2 technology and instruction set architecture; Cortex-M3 applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Simulation using LPC 2148:

1. Blinking of LED's.
2. Reading switches and glowing LED's.
3. Generation of PWM signals.

Interfacing with LPC 2148:

1. 7 Segment LED.
2. LCD Module.
3. 4x4 Hex keypad.
4. DC motor control.
5. Real time clock.
6. Temperature sensor.
7. Bluetooth module.
8. Wi-Fi Module.
9. Micro SD Card.

TEXT BOOKS:

1. Andrew N Sloss, Dominic Symes and Chris Wright, “ARM system developer’s guide”, Elsevier - Morgan Kaufmann Publishers, 2008.
2. Joseph Yiu, “The definitive guide to the ARM CORTEX-M3”, 2nd edition, Elsevier - Newnes, 2010.

REFERENCE BOOKS:

1. Steve Furber, “ARM System on Chip Architecture”, 2nd edition, Pearson education, 2000.
2. Martin Trevor, “The Insider’s Guide to the ARM7 based microcontrollers”, Hitex Ltd., 2006.
3. William Hohe and Christopher Hinds, “ARM Assembly Language”, 2nd edition, CRC Press, 2015.
4. David Seal, “ARM Architecture Reference Manual”, Addison-Wesley, 2001.

SOURCE: *https://www.bocagrandehappenings.org/wp-content/uploads/2018/11/roll-the-dice-300x228.jpg*

19EC214 PROBABILITY THEORY AND STOCHASTIC PROCESSES

Hours Per Week :

L	T	P	C
3	1	-	4

PREREQUISITE COURSE: Signals and Systems.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of the course is to enable the students to learn probability theory and random variables, gain knowledge of multiple random variables, conditional expectation, independence of random variables, analysis of random process and applications in the communication systems.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the basics of probability, sample space, events, statistics and apply them to real life problems
2	Distinguish probability density and distribution functions for single and multiple random variables.
3	Check whether a given random process is ergodic and/or wide sense stationary.
4	Analyze the response of linear systems to random inputs.

SKILLS:

- ✓ *Formulate, analyze and validate models applicable to practical problems.*
- ✓ *Use the probability, moment generating functions and characteristic functions.*
- ✓ *Know the multivariate normal law and how to operate jointly with Gaussian random variables.*
- ✓ *Identify the different modes of convergence of sequences of random variables as well as the precise meaning of the laws of large numbers and the central limit theorem.*
- ✓ *Identify probability models based on the theoretical results presented in the course.*

UNIT - I **L-8, T-3**

PROBABILITY THEORY AND PROBABILITY STATISTICS: Introduction to probability, Set theory, Axioms of probability, Sample space, Joint probability, Conditional probability, Total probability and Bayes' theorem, Bernoulli trails and independent events.

UNIT - II **L-10, T-3**

RANDOM VARIABLES: Definition of a random variable, Conditions for a function to be a random variable, Classifications of random variables, Density and distribution functions, Properties of random variables, Binomial, Poisson, Uniform, Gaussian, Exponential and Rayleigh distributions, Conditional distribution, Methods of defining conditioning event, Conditional density and distribution functions, Properties, Operations on random variables - introduction, expected value of a random variable, function of a random variable, moments about the origin, central moments, variance, chebychev's inequality, characteristic function, markov's and chernoff bound, moment generating function, monotonic transformations for a continuous and discrete random variables.

UNIT - III **L-9, T-3**

MULTIPLE RANDOM VARIABLES: Vector random variables, Joint distribution function and its properties, Marginal distribution functions, Conditional distribution and density, Statistical independence, Sum of two random variables, Central limit theorem, Multi-dimensional Gaussian random variables.

UNIT - IV **L-9, T-3**

RANDOM PROCESSES: Temporal characteristics, Random process concept, Classification of processes, Distribution and density functions, Concept of stationary and statistical independence, Wide sense stationary, Time averages and ergodicity, Autocorrelation and cross correlation, Covariance, Gaussian random processes, Poisson random process.

UNIT - V **L-9, T-3**

LINEAR SYSTEMS WITH RANDOM INPUTS: Random signal response of linear systems, System response - convolution, mean and mean square value, Autocorrelation function; Cross-correlation functions of input and output, Spectral characteristics of system response, Power density spectrum of response, Cross-power density spectrums of input and output.

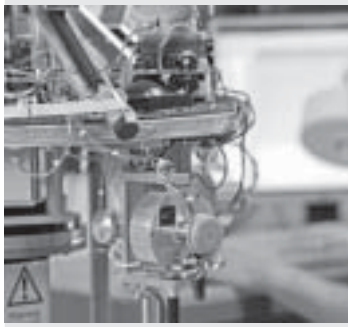
TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th edition, TMH, 2001.
2. Athanasios Papoulis and Unni Krishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th edition, TMH, 2002.

REFERENCE BOOKS:

1. H.Taub, Donald.L.Schilling, GoutamSaha, "Principles of Communication systems", 3rd edition, TMH, 2007.
2. Mallikarjuna Reddy, "Probability Theory and Stochastic Processes", 4th edition, University Press, 2013.
4. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing", 3rd edition, Prentice Hall Publications, 2002.
5. H. Kobayashi, B. L. Mark, and W. Turin, "Probability, Random Processes, and Statistical Analysis", 1st edition, Cambridge University Press, 2012.
6. R. Gallager, "Stochastic Processes: Theory for Applications", 1st edition, Cambridge University Press, 2013.

19EC215 CONTROL SYSTEMS



SOURCE:
https://www.surrey.ac.uk/ssc/images/78139_control_systems_large.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSES: Engineering Mathematics - I (E);
Engineering Mathematics - II (E).

COURSE DESCRIPTION AND OBJECTIVES:

To get acquaintance with the mathematical modelling of the physical systems.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply mathematical modeling to the physical systems/electrical systems.
2	Analyze the response of the open and closed loop systems intime domain.
3	Design lag, lead and lead-lag compensators and PID controllers.
4	Investigate the stability of a given control system by using RH, Root locus, Bode plot and Nyquist plot.

SKILLS:

- ✓ *Model any physical system.*
- ✓ *Determine overall transfer function of a system using block diagram reduction tech nique and SFG method.*
- ✓ *Analyze first and second order systems in time domain.*
- ✓ *Determine design specifications like rise time, settling time, steady state error.*
- ✓ *Analysis of stability using R-H Criterion.*
- ✓ *Determine open loop gain variation in a stable system using root locus method.*
- ✓ *Stability analysis of any system in the frequency domain.*
- ✓ *Design of lag, lead compensators using R, L and C for any linear time invariant system.*

UNIT - I **L-9**

INTRODUCTION TO CONTROL SYSTEMS: Introduction, Concept of control systems, Open loop versus closed loop control systems, Different examples of control systems, Classification of control systems, Transfer function and block diagram representation of systems considering electrical systems as examples, Block diagram algebra, Signal flow graph representation, Reduction using Mason's gain formula.

UNIT - II **L-9**

TIME RESPONSE ANALYSIS AND STABILITY: Time response analysis, Standard test signals, Time response of first order systems, Characteristic equation of feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants.

UNIT - III **L-9**

STABILITY ANALYSIS - 1: Stability - the concept of stability, routh stability criterion; Root locus technique - the root locus concept, construction of root loci.

UNIT - IV **L-9**

STABILITY ANALYSIS - 2: Frequency response analysis - introduction, frequency domain specifications, bode diagrams, phase margin and gain margin, stability analysis from bode plots, polar plots, nyquist plots and nyquist stability criterion.

UNIT - V **L-9**

DESIGN AND MODERN CONTROL SYSTEMS: Preliminary design considerations, Realization of basic compensators - lead, lag and lead-lag; State space analysis of continuous systems - concepts of state, state variables and state model, solving the time invariant state equations, state transition matrix, controllability and observability.

TEXT BOOKS:

1. J. Nagrath and M. Gopal, "Control Systems Engineering", 2nd edition, New Age International (P) Limited, 2009.
2. Katsuhiko Ogata, "Modern Control Engineering", 5th edition, Prentice Hall of India Private Ltd, New Delhi, 2011.

REFERENCE BOOKS:

1. M. Gopal, "Control Systems: Principles and Design", 3rd edition, McGraw Hill, 2008.
2. Benjamin C Kuo and Farid Golnaraghi, "Automatic Control systems", 9th edition, Prentice Hall of India Private Ltd, New Delhi, 2009.
3. Richerd C. Dorf and Robert H. Bishop, "Modern Control Systems", 12th edition, Prentice, Hall, 2010.
4. S.Salivahanan, R.Rengaraj and G.R. Venkata Krishnan, "Control Systems Engineering", 1st edition, Pearson, 2015.

19PC009 INTRA-DISCIPLINARY PROJECTS-II

Hours Per Week :

L	T	P	C
0	0	2	1

COURSE DESCRIPTION AND OBJECTIVES:

These projects arise from a combination of courses. The major objective of these projects is to enable students understand the relationship between the courses.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Map different courses to gain the knowledge of intra-disciplinary Engineering.
2	Function effectively as an individual and as a member or leader in diverse teams.
3	Comprehend and write effective reports and make effective presentations.

LIST OF INTRA - DISCIPLINARY PROJECTS

- Simple Tachometer.
  (Combination of courses: Analog Circuits, Digital System Design).
- Automatic plant watering system using AVR(Atmega16) Microcontroller.
  (Combination of courses: Microcontroller, Analog Circuits).
- Solar Inverter Circuit.
  (Combination of courses: Microcontroller, Analog Circuits).
- Wireless Mobile Battery Charger Circuit.
  (Combination of courses: Electronic Devices and Circuits, Digital System Design).
- Electronic Letter Box Project Circuit.
  (Combination of courses: Electronic Devices and Circuits, Digital System Design).
- 8 Channel Quiz Buzzer Circuit using Microcontroller.
  (Combination of courses: Microcontroller, Analog Circuits).
- FM Remote Encoder/Decoder Circuit.
  (Combination of courses: Analog Circuits, Analog Communication).
- RFID Based Door Access Control.
  (Combination of courses: Microcontroller, Analog Circuits).
- GAS LEAKAGE SYSTEM.
  (Combination of courses: Microcontroller, Analog Circuits).

- Simple Time Delay Circuit using 555 Timer.
  (Combination of courses: Microcontroller, Analog Circuits).
- Air Flow Detector.
  (Combination of courses: Microcontroller, Analog Circuits).
- Automatic car head lights turn OFF Circuit.
  (Combination of courses: Microcontroller, Analog Circuits).
- Automatic Door Security Alarm System.
  (Combination of courses: Microcontroller, Analog Circuits).
- Bike Turning Signal Circuit.
  (Combination of courses: Microcontroller, Analog Circuits).
- Frequency Counter.
  (Combination of courses: Analog Circuits, Analog Communication, Microcontroller).
- Two-Channel Wireless Audio Amplifier Using Bluetooth and TA8210AH.
  (Combination of courses: Analog Circuits, Analog Communication).
- Line Follower robot using L293D and IR sensors.
  (Combination of courses: Microcontroller, Analog Circuits).
- Low-Noise 5V DC Converter Using LM2574.
  (Combination of courses: Analog Circuits).
- Numerical Water Level Indicator Using priority encoder.
  (Combination of courses: Analog Circuits, Digital System Design).
- Voltage Regulator as an Audio Amplifier.
  (Combination of courses: Analog Circuits).
- RF-Based 12-Bit Signal Transmitter And Receiver.
  (Combination of courses: Microcontroller, Analog Circuits).
- 5-Watt Audio Amplifier Using TA7222.
  (Combination of courses: Analog Circuits, Analog Communication).
- Understanding Spectrogram of Speech Signal Using MATLAB Program.
  (Combination of courses: Analog Circuits, Analog Communication).
- Temperature based Fan Speed Controller and SMS alerts using GSM mode.
  (Combination of courses: Microcontroller, Analog Circuits).
- SMS based home Automation system.
  (Combination of courses: Microcontroller, Analog Circuits).
- GSM based Vehicle Location Identifier.
  (Combination of courses: Microcontroller, Analog Circuits).
- GSM based wireless Electronic Notice Board.
  (Combination of courses: Microcontroller, Analog Circuits).
- LiFi communication.
  (Combination of courses: Analog Circuits, Analog Communication).
- Air Flow Detector Circuit.
  (Combination of courses: Analog Circuit, Digital System Design).

NOTE: The afore - mentioned list is not exhaustive and the objective is to provide an idea of some of the projects that can be executed by students arising from a combination of courses. Students are given full flexibility to choose any projects of their choice under the supervision of faculty Mentors.

III

YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.

I SEMESTER

19EC301	-	Digital Communications
19EC302	-	Electromagnetic Waves and Transmission Lines
19EC303	-	Sensors and Instrumentation
19EC304	-	Data Communications and Computer Networks
19HS301	-	Human Values, Professional Ethics & Gender Equity
19HS205	-	Soft Skills Laboratory
19PC010	-	Employability Skills - I
19PC011	-	Inter-Departmental Projects- I
	-	Department Elective - I
	-	Open Elective - II

II SEMESTER

19EC311	-	Data Structures and Algorithms
19EC312	-	Antennas and Wave Propagation
19EC313	-	Digital Signal Processing
19EC314	-	Internet of Things
19HS206	-	Professional communication Laboratory
19PC012	-	Modular Course
19PC013	-	Employability Skills - II
19PC014	-	Inter-Departmental Projects - II
	-	Department Elective-II
	-	Open Elective-III

COURSE CONTENTS

I SEM AND II SEM

19EC301 DIGITAL COMMUNICATIONS

SOURCE:
http://www.polytechnichub.comII Year I SemesterSignals and Systems/wp-content/uploads/2017/04/images.jpg

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSES: Signals and Systems; Analog Communication; Probability Theory and Stochastic Processes.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers the fundamental, theoretical and practical concepts of digital communication systems. The objective of the course is to introduce the concepts of digital communication system, waveform coding techniques and digital modulation techniques, basics of information theory, Error-control coding and multiple access techniques.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand themultiple access techniques for communications.
2	Understand and apply the error control coding techniques for efficient communication.
3	Analyze the performance of various digital modulation techniques.
4	Understand and analyze the model of digital communication systems and Information theory.
5	Design, simulate and validate the digital communication systemsfor given applications/ problem statements.

SKILLS:

- ✓ *Design TDM.*
- ✓ *Develop pulse generators for given specification.*
- ✓ *Implement ADC, DAC techniques.*
- ✓ *Mathematical analysis of the digital modulated signals.*
- ✓ *Realize 8-PSK, 16-PSK and 32-PSK.*
- ✓ *Select the suitable error control coding technique.*

UNIT - I **L-9**

ELEMENTS OF DIGITAL COMMUNICATION SYSTEMS: Basic elements of digital communication systems, Advantages of digital communication systems.

BASICS OF INFORMATION THEORY - Information and entropy, Source coding theorem, Huffman coding, Shannon-Fano coding, Channel capacity, Information capacity law, Implications of the Information capacity law.

UNIT - II **L-9**

BASEBAND PULSE TRANSMISSION: Pulse analog modulation, Introduction to pulse amplitude modulation, Pulse width modulation and pulse position modulation; Time division multiplexing, Pulse code modulation, Elements of PCM, Quantization process, Uniform and Non-uniform quantization, Quantization error, SNR, Delta modulation, Draw backs of DM, Adaptive delta modulation, Comparison of PCM and DM systems

UNIT - III **L-9**

MODULATION TECHNIQUES AND OPTIMAL RECEPTION OF DIGITAL SIGNAL: Digital modulation techniques - introduction, ASK, FSK, PSK, DPSK, QPSK and QAM; Optimal reception of digital signal - base band signal receiver, matched filter.

UNIT - IV **L-9**

ERROR CONTROL CODING: Linear block codes - encoding and decoding; Cyclic codes - encoder, syndrome calculator; Convolution codes - introduction, encoding of convolution codes, code tree, trellis diagram, decoding using viterbi algorithm.

UNIT - V **L-9**

MULTIPLE ACCESS TECHNIQUES: Basics of TDMA, FDMA and CDMA, Spread spectrum modulation - use of spread spectrum, direct sequence spread spectrum (DSSS), ranging using DSSS, rrequency hopping spread spectrum; PN sequences - generation and characteristics.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

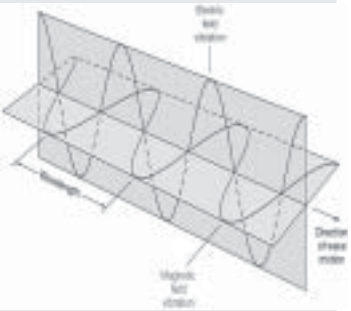
1. Time Division Multiplexing.
2. Pulse Amplitude Modulation.
3. Pulse Position Modulation.
4. Pulse Width Modulation.
5. Pulse Code Modulation.
6. Verification of Sampling Theorem.
7. Delta Modulation.
8. Amplitude Shift Keying.
9. Frequency Shift Keying.
10. Phase Shift Keying.
11. Differential Phase Shift Keying.
12. Companding: u-Law and A-Law.
13. Huffman coding technique.
14. Convolutional encoder.
15. Cyclic code encoder.

TEXTBOOKS:

1. Simon Haykins, “Digital Communications”, 4th edition, John Wiley, 2014.
2. William Stallings, “Wireless Communications and Networks”, 2nd edition, Pearson Education, 2009.

REFERENCE BOOKS:

1. Simon Haykin and Michael Moher, “Introduction to Analog and Digital Communications”, 2nd edition, Wiley, 2007
2. H. Taub, D.L.Schlling and Goutam Saha, “Principles of Communication Systems”, 3rd edition, TMH, 2008.
3. B. P. Lathi, “Modern Digital and Analog Communication Systems”, 4th edition, Oxford University Press, 2008.
4. B. Sklar, “Digital Communications: Fundamentals & Applications”, 2nd edition, Pearson Education, 2001.
5. John. G. Proakis and Masoud Salehi, “Digital Communications”, 5th edition, McGraw-Hill, 2008.



SOURCE: *https://i.stack.imgur.com/OvzDn.jpg*

19EC302 ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Hours Per Week :

L	T	P	C
3	1	-	4

PREREQUISITE COURSE: Engineering Physics (A).

COURSE DESCRIPTION AND OBJECTIVES:

This course offers the fundamental knowledge of electromagnetic applications such as Microwave devices and antennas. It gives the foundation in electromagnetism and its use in modern communication areas such as wired and wireless. The objective of the course is to enable the student familiarize with the propagation, reflection, and transmission of plane waves in bounded and unbounded media and transmission lines.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand and apply the concepts of static Electric & Magnetic fields to study Time-varying electro-magnetic field.
2	Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems of electromagnetic wave propagation.
3	Understand and analyze the phenomena of wave propagation in different media.
4	Understand and analyze the applications of microwave engineering.

SKILLS:

- ✓ *Calculate the emf and hence the inductance offered by coil.*
- ✓ *Use the wave equation to determine the field in various media.*
- ✓ *Consolidate the power conservation in electromagnetic waves.*
- ✓ *Identify the required dimensions of the transmission line for the given specifications.*
- ✓ *Calculate the matching transmission line parameters for the mismatched load.*

UNIT - I **L-9, T-3**

REVIEW OF ELECTRO MAGNETIC THEORY :

ELECTROSTATIC FIELDS: Coulomb's law, Gauss's law, Applications of Gauss's law, Boundary conditions, Capacitance, Parallel plate capacitor, Poisson's and Laplace's equations.

MAGNETOSTATIC FIELDS: Biot-Savart law, Ampere's Circuital law, Magnetic boundary conditions, Self-inductance and mutual inductance.

UNIT - II **L-9, T-3**

MAXWELL'S EQUATIONS AND WAVE PROPAGATION: Faraday's law, Displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, Wave equations for free space and conducting medium, Uniform plane wave equation, Wave propagation - free space, conducting medium, good dielectrics, good conductors; Skin depth, Wave polarization.

UNIT - III **L-9, T-3**

WAVE CHARACTERISTICS: Normal incidence of waves on perfect conductor and dielectric, Oblique incidence of waves on perfect conductor and dielectric, Brewster angle, Surface impedance, Poynting theorem and Poynting vector.

UNIT - IV **L-9, T-3**

TRANSMISSION LINES: Equations of voltage and current on TX line, Propagation constant and characteristic impedance, Reflection coefficient and VSWR, Impedance transformation on loss less and low loss transmission line, Power transfer on TX line, Smith Chart, Admittance Smith chart, Applications of transmission lines - impedance matching.

UNIT - V **L-9, T-3**

TRANSMISSION LINES AT HIGH FREQUENCIES: Parallel plate waveguides, Rectangular wave guides - introduction, application of Maxwell's equations to the rectangular waveguide, TE_{mn} & TM_{mn} modes in rectangular wave guides, impossibility of TEM waves in wave guides, attenuation of TE &TM modes, characteristic impedance of waveguides.

TEXT BOOKS:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", 3rd edition, Oxford Univ. Press, 2001.
2. William H. Hayt and John A. Buck, "Engineering Electromagnetics", 6th edition, TMH, 2001.
3. Umesh Sinha, "Transmission Lines and Networks", 8th edition, Satya Prakasan Publications, 2004.

REFERENCE BOOKS:

1. Edward C Jordan and Keith G Balmain, "Electromagnetic Waves and Radiating Systems", 2nd edition, PHI, 2003.
2. G.S.N.Raju, "Antennas and Wave Propagation", 1st edition, Pearson Publication, Singapore, 2005.
3. R.K Shevgaonkar, "Electromagnetic waves", 1st edition, TMH, 2005.
4. Samuel Y Liao, "Microwave Devices and Circuits", 3rd edition, Pearson Education, 2003.
5. K.D.Prasad and Satya Prakasan, "Antenna and Wave Propagation", 1st edition, Tech India Publications, 2001.

SOURCE:
https://www.burster.com/fileadmin/user_upload/redaktion/Presse/9206_Senso relektronik.jpg

19EC303 SENSORS AND INSTRUMENTATION

Hours Per Week :

L	T	P	C
2	-	2	3

COURSE DESCRIPTION AND OBJECTIVES:

The aim of this course is to implement and operate advanced sensor and instrumentation systems that are necessary for various practical applications, with knowledge on issues like reliability, safety and compatibility.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the physical principles of advanced sensors.
2	Analyze various sensors and its internal structures.
3	Understand the signal conditioning concepts of sensor systems.
4	Interface the sensors with electronic systems.
5	Experiment to investigate the characteristics of various sensing instruments.

SKILLS :

- ✓ *Select the appropriate sensor for measurement of physical parameter.*
- ✓ *Interface sensors to Microcontrollers.*
- ✓ *Test and troubleshoot electronic circuits using various measuring instruments.*

UNIT - I **L-6**

INTRODUCTION TO INSTRUMENTATION: Measurement system, Static and dynamic characteristics, Dynamic response and transfer function, Zeroth, First and second order systems, Errors in measurements - systematic, gross, random; Loading effect, Calibration.

UNIT - II **L-6**

SENSORS-1: Introduction to transducers, Classification, Characteristics, Working principles of thermal sensors - bimetallic strip, thermometer, thermocouple, thermistor, RTD, IR.

UNIT - III **L-6**

SENSORS-2: Working principles of strain gauge, Piezoelectric transducer for force/pressure measurement, Flow measurement using Ultrasonic sensor, Displacement measurement - potentiometer, LVDT; Light sensors using LDR and photodiode, Accelerometer.

UNIT - IV **L-6**

SENSORS-3: Working principles of CO_2, Ultrasonic, Water flow, Hygrometer and PH meter.

UNIT - V **L-6**

DATA ACQUISITION SYSTEM: Analog, Digital data acquisition, Single channel, Multi channel data acquisition, PC based data acquisition, Data loggers.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Measurement of

1. Displacement using LVDT.
2. Distance using LDR.
3. Temperature using R.T.D/Thermocouple.
4. Pressure using strain gauge.
5. Pressure using piezo-electric pick up.
6. Distance using capacitive pick up.
7. Speed of DC motor using magnetic & photo electric pick up.
8. Obstacle detection using Ultrasonic Sensor.
9. Soil moisture.
10. CO_2 concentration in air.
11. Volume of water flow.

TEXTBOOKS:

1. A.K. Sawhney, “A course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai & Sons, 2015.
2. D. Patranabis, “Sensors & Transducers”, 2nd edition, PHI, 2003.

REFERENCE BOOKS:

1. D.V.S. Murthy, “Transducers and Instrumentation”, 2nd edition, PHI, 2008.
2. Uday A. Bakshi and Ajay. V.Bakshi, “Measurements and Instrumentation”, Technical Publications, 2010.
3. A.D. Heltric and W.D. Cooper, “Modern Electronic instrumentation & Measuring instruments”, PHI, 1992.
4. H.K.P. Neubert, “Instrument transducers”, 2nd edition, Oxford University Press, 1999.

19EC304 DATA COMMUNICATIONS AND COMPUTER NETWORKS

SOURCE:
https:// nizamtaher.files. wordpress. com/2013/ 05/ist2_6764102- computer-network.jpg

Hours Per Week :

L	T	P	C
3	-	2	4

COURSE DESCRIPTION AND OBJECTIVES:

Students will be familiar with the components required to build different types of networks and also exposed and learn to the required functionality at each layer and the flow control and congestion control algorithms.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the basic Network types, topologies and different network hardware elements.
2	Understand and analyze various Networking Protocol Reference Models.
3	Understand and analyze the protocols that belong to various layers.
4	Understand and analyze the mechanisms of IP addressing, routing, congestion control, domain naming, world wide web and multimedia.
5	Implementation of variousProtocols that belong to data link layer, network layer, transport layer.

SKILLS:

- ✓ *Implement Local Area Networks with different topologies.*
- ✓ *Simulate various routing protocols.*
- ✓ *Network trouble shooting.*

UNIT - I **L-9**

INTRODUCTION: Use of computer networks, Network hardware, Network software, Reference models and Example networks.

UNIT - II **L-9**

PHYSICAL LAYER: Guided transmission media, Ethernet, Wireless LANs.

DATA LINK LAYER: Design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols, Medium Access Control Sub Layer, The channel allocation problem, Multiple access protocol.

UNIT - III **L-9**

NETWORK LAYER: Design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internet working**,** The network layer in the internet - IPv4, IPv6; ICMP, Mobile IP.

UNIT - IV **L-9**

TRANSPORT LAYER: The transport service, Elements of transport protocols, The internet transport protocols - UDP and TCP.

UNIT - V **L-9**

APPLICATION LAYER: Domain name system, E-mail, World Wide Web, Streaming audio and video.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Implementation of:
   a. Data Link Framing method - Character Count, Bit stuffing and Destuffing.
   b. Error detection method - even and odd parity and CRC Polynomials.
   c. Data Link protocol - Unrestricted simplex protocol.
   d. Data Link protocol - Stop and Wait protocol.
   e. Routing algorithm - Dijkstra's algorithm.
2. Study of Network IP Addressing.
3. Study of TCP/UDP sockets in detail.
4. Design of client server app.

TEXT BOOKS:

1. A. S. Tanenbaum, "Computer Networks", 5th edition, Pearson, 2010.
2. Behrouz A. Forouzan, "Data Communications and Networking", 4th edition, McGraw-Hill, 2003.

REFERENCE BOOKS:

1. William Stallings, "Data and Computer Communications", 7th edition, Pearson, 2004.
2. W.Tomasi, "Introduction to Data Communications and Networking", Pearson education, 2017.
3. G.S.Hura and M.Singhal, "Data and Computer Communications", 1st edition, CRC Press, 2001.
4. S.Keshav, "An Engineering Approach to Computer Networking", 1st edition, Pearson education, 2002.
5. W.A.Shay, "Understanding Data Communications and Networks", 2nd edition, Cengage Learning, 1998.

19HS301 HUMAN VALUES, PROFESSIONAL ETHICS & GENDER EQUITY

SOURCE:
https://www.google.com/search?q=professional+ethics&client

Hours Per Week :

L	T	P	C
2	-	-	2

COURSE DESCRIPTION AND OBJECTIVES:

The course will provide students with an understanding on Engineering Ethics and the nature of moral issues and dilemmas faced by engineers in their professional lives. It will give them an awareness on professional rights and responsibilities of an engineer and acquaint them on the Code of Conduct and Ethics prescribed by professional bodies like IEEE, ASME etc for its members.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Engage in an informed critical reflection on the nature of professionalism and ethical challenges inherent in engineering profession.
2	Apply awareness of professional rights and responsibilities of an engineer to conduct themselves ethically within an organization.
3	Apply understanding of safety norms to highlight ethical issues in risky situation.
4	Understand the role of professional bodies, and the code of ethics and industrial standards prescribed for engineers.

SKILLS:

- ✓ *Safety & Environment consciousness.*
- ✓ *Ethical behaviour and decision-making at workplace.*
- ✓ *Work in large teams.*
- ✓ *Emotional intelligence for workplace.*

UNIT – I **L-6**

Introduction to professional ethics; Morals, values and ethics; Civic virtue; Respect for others, Living peacefully; Caring; Sharing; Honesty; Valuing time; Co-operation; Commitment, Empathy; Self-confidence; Courage, Character; Spirituality; Service learning; Introduction to Engineering Ethics; Profession; Professionalism.

UNIT – II **L-6**

Nature of moral issues; Moral dilemmas (Problem of Vagueness, Conflicting Reasons & Disagreement); Types of inquiry (Normative, Conceptual & Factual); Moral autonomy; Kohlberg's & Carol Gilligan's theory; Impediments to responsible action; Theories of right action (Bentham's Theory of Utilitarianism, Theory of Consequentialism etc.).

UNIT – III **L-6**

Engineering as social experimentation; Engineers' responsibility for safety; Assessment of safety and risk; Testing for safety; Risk benefit analysis; Reducing risk; Government regulator's approach to risk; A balanced outlook on law; Discussion of case studies: Challenger disaster / Chernobyl disaster; Code of ethics; Professional societies; Sample code of ethics like ASME, ASCE, IEEE etc.

UNIT – IV **L-6**

Rights and responsibilities at workplace; Organizational complaint procedures; Whistle blowing; Environment and the workplace; Gender equity; Understanding gender; Organizational policies regarding gender; Gender roles; Looking beyond stereotypical generalizations; Service rules; Conflict of interest; Prevention of sexual harassment; Women rights under labour laws.

UNIT – V **L-6**

Ethics in a Global Context; Multinational Corporations; Intellectual Property Rights; Business ethics; Transparency & fair practices; Discussion of case study - Enron-Dhabol project; Environmental Ethics; Challenge of sustainable development; UN Conventions & protocols on environment; Discussion of case studies: Bhopal gas tragedy, Pacific gas & Electric company Vs. Environmental activist, Erin Brockovich; Computer ethics; Automation & artificial intelligence; Cyber security & Cyber laws; Case study; Wiki leaks; Role in technological development; Weapons development.

TEXT BOOKS:

1. Martin Mike and Schinzinger Roland, "Introduction to Engineering Ethics", 2nd edtion, McGraw-Hill Higher Education, 2010.
2. M. Govindarajan, S.Natarajan and V. S. Senthil Kumar, "Engineering Ethics", Prentice Hall of India, Reprint 2013.
3. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics: Concepts and Cases", 4th edition, Wadsworth Thompson Learning, 2009.

REFERENCE BOOKS:

1. Charles B. Fleddermann, "Engineering Ethics", 4th edition, Pearson Education/Prentice Hall, 2014.
2. Edmund G. Seebauer and Robert L. Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2008.
3. "A Comprehensive Guide to Women's Legal Rights", Prepared by Majlis Legal Centre for IIT-Kanpur, 2018.

19HS205 SOFT SKILLS LABORATORY

Source: https//5.imimg.com

Hours Per Week :

L	T	P	C
-	-	2	1

COURSE DESCRIPTION AND OBJECTIVES:

To impart students employability skills like resume preparation and facing interviews. To enable trainees to develop interpersonal and leadership skills. To train them on work place skills like making presentations, participating in group discussions etc.

COURSE OUTCOMES:

Upon completion of the course, student will able to achieve the following outcomes.

COs	Course Outcomes
1	Introspect on individual strengths and weaknesses, and emerge as a balanced personality with improved self-awareness and self-worth for their future.
2	Prepare a resume and gain the confidence to communicate effectively.
3	Possess the interpersonal skills to conduct himself/herself effectively in everyday professional and social contexts.
4	Adopt professionalism into daily activities.
5	Observe gender sensitive language and workplace etiquette in his professional life.

SKILLS:

- ✓ *Balance social and emotional intelligence quotients though SWOC, JOHARI etc. activities.*
- ✓ *Prepare tailor made resume and face various job interviews with enriched personality traits.*
- ✓ *Plan personal and professional goals.*
- ✓ *Solve personal and professional life hiccups with confidence and maturity.*

ACTIVITIES:

- *Formal and Informal Communication.*
- *SWOT Analysis.*
- *Stephen Covey Time Management Matrix.*
- *Stress Management Technique.*
- *Vocabulary Flashcards.*
- *Group Discussions.*
- *Resume Preparation.*
- *Mock-Interviews.*
- *Reading Comprehension Activities.*
- *Listening Comprehension Activity by Watching American Accent Video.*

UNIT - I **P - 6**

Soft Skills: Need for soft skills, professionalism, employability skills - **Communication**: Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal) -communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers- **Career Planning**: Job vs. career, goal setting, SWOT analysis, planning and prioritization, time management : four quadrant system, self-management, stress-management.

Activities: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid; Writing a Statement of Purpose (SOP) - Stephen Covey's Time Management matrix.

UNIT - II **P - 6**

Vocabulary Building: Word etymology, roots, prefixes & suffixes, synonyms & antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning (50 words)- **Functional English:** Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student) - **Group Discussion:**Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, Key Word Approach (KWA), Social, Political, Economic, Legal and Technical Approach (SPELT), View Point of Affected Part (VAP), language relevance, fluency and coherence.

Activities: Making a flash card (one per day by each student) – vocabulary exercises with hand-outs – Vocabulary quiz - Viewing a recorded video of GD & Mock sessions on different types of GD topics-controversial, knowledge, case study (including topics on current affairs).

UNIT - III **P - 6**

Resume preparation: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter- **Facing Interviews:**

Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language, grooming, other types of interviews such as stress-based interviews, tele- interviews, video interviews, frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

Activities: Appraising some samples of good and bad resumes, preparing the resume, writing an effective covering letter- writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - IV **P - 6**

Reading Comprehension: Reading as a skill, techniques for speed reading, understanding the tone, skimming and scanning, appreciating stylistics, impediments for speed reading, eye fixation, sub-vocalization, critical reading, reading based on purpose, reading for information, reading for inference- **Listening Comprehension:** Listening as a skill, different types of listening, active and passive listening, top-down approach, bottom-up approach, understanding the non verbal cues of communication; intonation and stress.

Activities: Reading comprehension exercises with texts drawn from diverse subject areas. (Hand-outs) -Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - V **P - 6**

Paper Presentation: Selection of a topic, preparing an abstract, gathering information, organizing the information, drafting the paper, citing reference sources – writing striking introductions, discussing the methodology used, developing the argument, presentation style, language, presenting the paper and spontaneously answering audience questions -**Mind your language -** How Language Reflects Personality**: G**ender sensitive language in MNCs - **Seven essential skills** for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing, participating actively.

Activities- Watching & discussing videos on corporate etiquette- Presenting a paper - Quiz on corporate etiquette.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill, 2001.
2. Adrian Furnham, "Personality and Intelligence at work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation" 1st edition, Kogan, 2007.
4. Krishna Mohan & NP Singh, "Speaking English Effectively" 1st edition, Macmillan, 2008.
5. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
6. Rajiv K. Mishra, "Personality Development", Rupa & Co. 2004.

19PC011 INTER-DEPARTMENTAL PROJECTS - I

Hours Per Week :

L	T	P	C
0	0	4	2

COURSE DESCRIPTION AND OBJECTIVES:

These projects are aimed at enabling students understand the relationship between the courses of various programs. Students will get an idea of how interesting technologies or processes, prototype or working model can be developed by culmination of technologies from courses of different programs.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	Map different courses to gain the knowledge of inter-disciplinary engineering.	
2	Function effectively as an individual and as a member or leader in diverse teams.	
3	Comprehend and write effective reports and make effective presentations.	

LIST OF INTER - DEPARTMENTAL PROJECTS - I

- Automatic Sprinkler Control System using Arduino.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- IoT based Patient Health Monitoring Project.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).
- Low Cost data Acquisition system using Arduino and C.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer science Engineering).
- Gas Leakage Detection and Automatic Control System using Arduino.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Petroleum Engineering).
- Piezo based Visitor Sensing Welcome Mat.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).

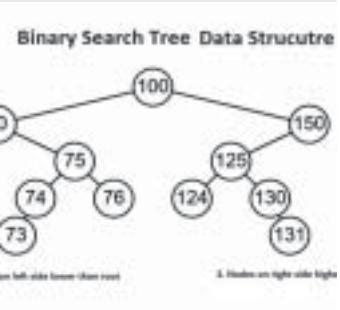
- Cardiac Monitoring System using Arduino.
  (Combination of courses from the Branches of Electronics and communication Engineering and Biomedical Engineering).
- Atmospheric Monitoring Using Arduino Boards and low cost Sensors.
  (Combination of courses from the Branches of Electronics and communication Engineering and Biomedical Engineering).
- Implementation of PO MPPT Method Using Arduino Controller for a Standalone Solar PV System.
  (Combination of courses from the Branches of Electronics and communication Engineering and Electrical and Electronic Engineering).
- Agriculture Robot.
  (Combination of courses from the Branches of Electronics and communication Engineering and Agriculture Engineering).
- Smart Water Quality Monitoring System based on IOT.
  (Combination of courses from the Branches of Electronics and communication Engineering and Civil Engineering).
- Automation based Industrial Plant using SCADA.
  (Combination of courses from the Branches of Electronics and communication Engineering and Electrical and Electronic Engineering).
- Automated Drip Irrigation System using Sensors Network Control.
  (Combination of courses from the Branches of Electronics and communication Engineering and Agriculture Engineering).
- Arduino based Physiotherapy Machine.
  (Combination of courses from the Branches of Electronics and communication Engineering and Biomedical Engineering).
- Accident Prevention System on Turning.
  (Combination of courses from the Branches of Electronics and communication Engineering and Mechanical Engineering).
- Automatic Irrigation System based on Soil Moisture Monitoring using Arduino.
  (Combination of courses from the Branches of Electronics and communication Engineering and Agriculture Engineering).
- Wearable Pulse Oximeter using Arduino and Display on LCD.
  (Combination of courses from the Branches of Electronics and communication Engineering and Biomedical Engineering).
- Leg Rehabilitation and Mobility AID for Paralysis Patients.
  (Combination of courses from the Branches of Electronics and communication Engineering and Biomedical Engineering).
- Line Follower Robot using PID Control.
  (Combination of courses from the Branches of Electronics and communication Engineering and Electrical and Electronic Engineering).
- Real Time Control Framework using Android.
  (Combination of courses from the Branches of Electronics and communication Engineering and Computer Science Engineering).
- Real Time ECG and Saline Level Monitoring System using Arduino.
  (Combination of courses from the Branches of Electronics and communication Engineering and Biomedical Engineering).

- Health Band - A Smart Assistant for the Elderly.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).
- Power Transformer Parameter Fault Detection.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Electrical and Electronic Engineering).
- Diesel Engine Fault Detection using Vibration and Acoustic Emission Signals.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- Design and building a Single-phase Smart Energy Meter using Arduino and RF Communication System.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Electrical and Electronic Engineering).
- Accelerometer based Wireless Gesture Controlled Robot for Medical Assistance using Arduino Lilypad.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).
- Automatic LPG Cylinder Booking and Leakage Detection using Arduino UNO.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- Identification and Control of a Unmanned Ground Vehicle by using Arduino.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- Design Tool of Motor Vehicle Emissions Measurement Devices with based on Arduino Nano with Android Smartphone Viewer.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Automobile Engineering).
- Development and Manufacturing of Arduino based Electrochemical Discharge Machine.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Chemical Engineering).
- Arduino based Cost Effective CNC Plotter Machine.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- Android Mobile based Security Lock for Bike Ignition.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- Remote Controlled, Capacitor Powered Coil Gun.
  *(Combination of courses from the Branches of Electronics and Communication Engineering and Electric*al and Electronic Engineering).
- A Wireless Design of Low-Cost Irrigation System using ZigbeeTechnology.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Agriculture Engineering).
- Design and Development of ARM Processor based Web Server.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- Sun Tracking System for Maximum Energy Utilization.
  (Combination of courses from the Branches of Electronics and Communication

Engineering and Chemical Engineering).

- Personal Live Detection Robot.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- Automatic Railway Gate Control and Track Switching Purpose.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- Develop a Multiple Interface based Fire Fighting Robot.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- GSM based Robotic Arm Control for Pick and Place.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- RF Controlled Robot for Bomb Detection in Sensitive Areas.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Chemical Engineering).
- Smart Line Following Robot with Obstacle Avoidance.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- A Low-Cost Solution for an Integrated Multi-sensor Lane Departure Warning System Description/Idea.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- Sonar Water-Level Meter.
  (Combination of Courses from the Branches of Computer Science Engineering and Electronics Communication Engineering).
- Audio Controlled Running Light.
  (Combination of Courses from the Branches of Computer Science Engineering and Electronics Communication Engineering).
- Infrared Electronic Shooting Game.
  (Combination of Courses from the Branches of Computer Science Engineering and Electronics Communication Engineering).
- Numeric Display Digital Dice.
  (Combination of Courses from the Branches of Computer Science Engineering and Electronics Communication Engineering).

NOTE: The afore - mentioned list is not exhaustive and the objective is to provide an idea of some of the projects that can be executed by students arising from a combination of courses from various branches. Students are given full flexibility to choose any projects of their choice under the supervision of faculty mentors from a combination of different departments.



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19EC311 DATA STRUCTURES AND ALGORITHMS

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE: Programming for Problem Solving.

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed at offering fundamental concepts of data structures and explains how to implement them. It begins with the basic concepts of data, data structures and then introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	Understand the concepts of data structure, data type, array data structure, organization of several ADTs and the manipulation of data stored in various data structures.	
2	Analyse algorithms and determine their time complexity.	
3	Apply different data structures to solve a given problem .	
4	Analyze the efficiency of using different data structures and choose the efficient data structure for solving a given problem.	
5	Develop new algorithms to solve various problems and apply various data structure such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.	

SKILLS:

- ✓ *Analyze the data structure required for various applications.*
- ✓ *Implement array or linked list for a given problem.*
- ✓ *Describe Pros & Cons of each data structure.*
- ✓ *Usage of trees and graphs.*

UNIT - I **L-9**

INTRODUCTION: Abstraction - abstract data types, data Representation, elementary data types, basic concepts of data structures; Mathematical preliminaries, Big-oh notation, Efficiency of algorithms, Notion of time and space complexity, Performance measures for data structures.

UNIT - II **L-9**

ARRAYS: ADT array, Computations on arrays - sorting and searching algorithms; ADT stack, Queue, List - array, linked list, cursor based implementations of linear structures.

UNIT - III **L-9**

TREES: ADT Tree - tree representation, traversal of trees; ADT binary search tree - binary search trees operations; Balanced binary search trees, AVL tree; Applications of search trees, TRIE, 2-3 tree, B-Tree.

UNIT - IV **L-9**

QUEUES: Priority queues and binary heaps, Sorting - merge, quick, radix, selection and heap sort.

UNIT - V **L-9**

GRAPHS: Shortest path, Minimum spanning tree, DFS, BFS, Application of DFS and BFS, Algorithm Design Paradigms - greedy, divide and conquer, dynamic programming, backtracking.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Single Linked List.
2. Stack using array and Linked List.
3. Queue using array and Linked List.
4. Infix to Postfix Expression.
5. Operations on Binary Search Tree.
6. Priority Queue using Binary Heap.
7. Implement Quick, Merge, Heap Sorting techniques.
8. BFS and DFS.
9. Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
10. Implement 0/1 Knapsack problem using Dynamic Programming.
11. Implement N Queen's problem using Back Tracking.

TEXT BOOKS:

1. Ellis Horowitz, Satraj Sahani and Susan Anderson, "Fundamentals of data Structures in C", 2nd edition, Universities Press, 2008.
2. Robert L. Kruse, "Data Structures and Program Design in C", 2nd edition, Pearson, 2002.

REFERENCE BOOKS:

1. Yedidyah Langsam, Moshe J. Augenstein and Aaraon M. Tenenbaum, "Data Structures using C & C++", 2nd edition, Pearson, 2015.
2. Bruno R. Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", 1st edition, Wiley, 1998 .
3. Richard F. Gilberg and Behrouz A. Forozan, "Data Structure – A pseudo code approach with C++", 2nd edition, Cengage Learning, 2007.

SOURCE:
http://www.cmg-change.com/wp-content/uploads/2018/03/Listening-antenae.jpg

19EC312 ANTENNAS AND WAVE PROPAGATION

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSE: Electromagnetic Waves and Transmission Lines.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers fundamental knowledge of wave guides and antenna propagation. The objective of this course is to make the student familiarize with parameters of antenna, different types of antennas and wave propagation.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply the concepts and properties of Electro-Magnetism to obtain parameters of antennas.
2	Understand and apply the different array techniques to improve directivity.
3	Analyze different types of antennas.
4	Understand and analyze the characteristics of radiowaves and their propagation in the atmosphere

SKILLS:

- ✓ *Determine the dipole size for the given frequency range.*
- ✓ *Draw the radiation patterns in various planes for uniform linear array (Broad side/endfire).*
- ✓ *Draw the radiation patterns of helical/ horn / aperture antennas.*
- ✓ *Determine the possible link distance for a given antenna height and vice versa.*

UNIT - I **L-9**

ANTENNA FUNDAMENTALS: Radiation mechanism, dipoles, Current distribution on a thin wire antenna, Radiation patterns, Patterns in principal planes, Beam widths, Antenna temperature, Radiation intensity, Directivity, Gain; Reciprocity, Radiation resistance of dipole antenna, Relation between effective aperture and directivity, Effective height, Field regions, Polarization, FRIIS transmission equation.

UNIT - II **L-9**

ANTENNA ARRAYS: Analysis of uniformly spaced arrays with uniform amplitudes, Principle of multiplication of patterns, Effect of earth on vertical patterns, Patterns in other planes, Binomial array, Basic principle of Dolph - Tschebyscheff array.

UNIT - III **L-9**

CHARACTERISTICS OF TYPICAL ANTENNAS: Folded dipole, Loop antenna, Yagi-Uda array, Helical antenna, Pyramidal Horn antenna, Huygens' principle, Parabolic reflector antennas, Slot antennas.

UNIT - IV **L-9**

BROADCAST ANTENNAS: Micro strip Antennas - basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas; Concept and benefits of smart antennas.

UNIT - V **L-9**

RADIO WAVE PROPAGATION: Ground wave propagation, Earth constants, Space wave propagation - effect of curvature of an ideal earth, atmospheric effects in space wave propagation, radio-horizon; Ionospheric propagation - structure of the Ionosphere, critical frequency, skip distance, maximum usable frequency; Fading, Gyro frequency, Duct propagation.

TEXT BOOKS:

1. Constantain A Balanis, "Antenna Theory: Analysis and Design", 4th edition, Wiley Publishers, 2015.
2. Edward C Jordan and Keith G Balmain, "Electromagnetic Waves and Radiating Systems", 2nd edition, PHI, 2003.

REFERENCE BOOKS:

1. J.D.Kraus and Ronald J Marhefka, "Antennas and Wave propagation", 4th edition, TMH, 2014.
2. K.D.Prasad, "Antenna and Wave Propagation", 3rd edition, Satya Prakasan Publications, 2009.
3. Constantain A Balanis, "Introduction to Smart Antennas", 1st edition, Morgan & Claypool Publishers, 2007.
4. G.S.N.Raju, "Antennas and Wave Propagation", 1st edition, Pearson Publication, 2006.
5. Samuel Y Liao, "Microwave Devices and Circuits", 3rd edition, Pearson Education, 2003.

SOURCE:
https://d3f1iyfxxz8i1e.cloudfront.net/courses/course_image/8dd6e763ac6a.png

19EC313 DIGITAL SIGNAL PROCESSING

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSE: Signals and Systems.

COURSE DESCRIPTION AND OBJECTIVES:

This course covers the analysis and representation of discrete-time signals, systems and aslo the design of digital filters. The course objective is to make the student to understand digital systems and design of digital filters including discrete-time convolution, difference equations, Z-transform, Discrete Time Fourier transform (DTFT), Discrete Fourier transform (DFT), Fast Fourier transform (FFT) and Multirate Signal Processing.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand and analyse the concepts of transform techniques for discrete time signals.
2	Apply various transform techniques for discrete time signals.
3	Design analog and digital filters for a given specifications.
4	Understand fundamentals of multi rate digital signal processing.
5	Verify various transform techniques and filters.

SKILLS:

- ✓ *Simulate the response of the system from impulse or step stimulus.*
- ✓ *Identify the accelerating methods for processing through DFT & FFT.*
- ✓ *Implement FFT and Inverse FFT.*
- ✓ *Identify the type and order of the filter for the given application.*
- ✓ *Design FIR/ IIR filters for removing unwanted frequencies in the signal.*
- ✓ *Remove the echo in the audio system using DSP processor.*
- ✓ *Analyze the stability of the designed filter.*

UNIT - I **L-9**

INTRODUCTION TO DISCRETE TIME SIGNALS & SYSTEMS AND Z-DOMAIN ANALYSIS: Review of signals and systems, Linear shift invariant systems, Stability and causality, Linear constant coefficient difference equations, Impulse response, Step response, Response to arbitrary inputs, Frequency domain representation of discrete time signals and systems, Z-Transform and properties, Analysis of linear time invariant systems using Z-domain.

UNIT - II **L-9**

DFT AND FFT: Discrete fourier representation of periodic sequences (DTFT), Properties, Frequency response, Discrete fourier transform, Properties of DFT, Linear convolution of sequences using DFT, Computation of DFT, Fast fourier transform (FFT), Radix-2 decimation in time and decimation in frequency FFT algorithms, Inverse FFT, Radix-4 FFT.

UNIT - III **L-9**

FIR FILTER DESIGN AND REALIZATION: FIR system function, Characteristics of FIR digital filters, Frequency response, Design of FIR digital filters using window techniques, Frequency sampling technique, Structures of FIR - direct form structure, cascade form structure, linear phase structure, signal flow graphs and transposed structures.

UNIT - IV **L-9**

IIR FILTER DESIGN AND REALIZATION: IIR system function, Analog filter approximations, Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Analog-to-Digital transformations, Structures of IIR - direct form I and II, cascade form, parallel form, signal flow graphs and transposed structures; Comparison of IIR & FIR filters.

UNIT - V **L-9**

MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS: Introduction to multirate digital signal processing, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Polyphase decomposition.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Verification of linear convolution and correlation.
2. Computation of impulse and step response of a given discrete time system.
3. Compuation of DFT of an given sequence.
4. Computaion of FFT of given sequence.
5. Verification of circular convolution.
6. FIR filter design using different window techniques.
7. IIR filter design using analog approximations.
8. Decimation of Polyphase Decomposition.
9. Interpolation by a factor D.
10. Decimation by a factor D.
11. Frequency Response & pole –zero plot of given Transfer function.

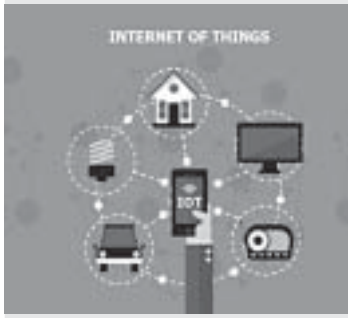
TEXT BOOKS:

1. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing – Principles, Algorithms and Applications”, 4th edition, Pearson Education/Prentice Hall, 2007.
2. Winse Alexender and Cranos Williams “Digital Signal Processing: Principles, Algorithms and System Design”, Elsevier, 2017.

REFERENCE BOOKS:

1. A.V.Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, 3rd edition, Pearson, 2009.
2. Sanjit K. Mitra, “Digital Signal Processing - A Computer Based Approach”, 4th edition, Tata McGraw Hill, 2010.
3. Salivahanan, “Digital Signal Processing”, 3rd edition, McGraw Hill, 2015.
4. Emmanuel C. Ifeachor and Barrie, W. Jervis, “Digital Signal Processing”, 2nd edition, Pearson Education/Prentice Hall, 2002.
5. Andreas Antoniou, “Digital Signal Processing”, 1st edition, Tata McGraw Hill, 2006.

19EC314 INTERNET OF THINGS



SOURCE:
https://www.techjini.com/wp-content/uploads/2017/08/internet-of-things.png

Hours Per Week :

L	T	P	C
3	-	2	4

PREREQUISITE COURSES: Microcontrollers; Sensors and Instrumentation; Data Communications and Computer Networks.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers skills on interconnection and integration of the physical world and the cyber space. The objective of the course is to enable the students to design and develop IoT systems.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the concepts, architecture, algorithms and applications of IoT.
2	Apply the concepts and algorithms of IoT.
3	Analyze the IoT data using appropriate algorithms.
4	Design IoT systems for specific scenarios.
5	Implement IoT applications using open source platforms.

SKILLS:

- ✓ *Use various sensors and actuators for IoT applications.*
- ✓ *Interface programming on I/O devices.*
- ✓ *Develop applications for the Internet of things.*

UNIT - I **L-9**

INTRODUCTION AND CONCEPTS: Introduction to internet of things, Physical design of IoT, Logical design of IoT, IoT enabling technologies, IoT levels.

UNIT - II **L-9**

INTERNET PRINCIPLES: Internet communications: An overview, IP addresses, MAC addresses, TCP and UDP ports, Application layer protocols; Python packages of interest for IoT.
IoT PHYSICAL DEVICES & ENDPOINTS: IoT device, Exemplary device, Board, Linux on raspberry Pi, Interfaces, Programming on IoT devices.

UNIT - III **L-9**

M2M: M2M, Difference between IoT and M2M.
ESP8266: First projects with the ESP8266, Cloud data logging with the ESP8266, Getting data from yahoo, Posting data to twitter, Facebook, Sending notifications, Email, Message.

UNIT - IV **L-9**

BLYNK: Building your first blynk application, Using notification widgets, Connecting sensors – accelerometer, light sensor and proximity sensor.

UNIT - V **L-9**

CASE STUDIES ILLUSTRATINGG IoT DESIGN: Python Web Application Framework, Django, Designing a REST full web API, Home automation - smart lighting, home intrusion detection.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

Any five from Module 1 and five from Module 2:

Module 1 : ESP8266 Node MCU

1. Familiarization of the equipment
    a. Installing Arduino and downloading the ESP8266 Node MCU supported packages.
    b. Familiarization of Arduino Programming.
    c. Familiarization of ESP8266 Node MCU.
2. Communications
    a. Communicating with PC .
    b. Displaying the data in OLED display.
3. Digital I/O
    a. Interfacing LED and SWITCH.
    b. Interfacing DHT11.
    c. Switching ON and OFF Electric bulb using Relay.
    d. Interfacing IR sensor.
4. Analog I/O: Interfacing Ultrasonic sensor.

5. Services
    a. Interfacing GPS.
    b. Sending an SMS and Email using IFTTT cloud.
6. Thingspeak: Interface any sensor and upload the same to Thingspeak cloud.
7. Blynk app: Door lock using android app.
8. Motors
    a. Interface DC Motor.
    b. Interface Stepper Motor.
9. Webpage: Counting the number of people entered into the room and storing it in a webpage.

MODULE 2 : RASPBERRY PI

1. Familiarization of the equipment
    a. Downloading and installing Raspbian on Raspberry pi, Introduction to Python language, Putty and VNC viewer.
    b. Familiarization of Raspberry pi board.
2. Switching ON and OFF buzzer.
3. Sending an Email.
4. Make Raspberry pi as MQTT broker and control the ESP8266 NodeMCU as publisher and subscriber.
5. Camera
    a. Capturing and Storing an image.
    b. Recording a video.
6. Setting up Raspberry pi server and writing data into it using Django.
7. Home automation using Django.

TEXT BOOKS:

1. Macro Schwartz, “Internet of Things with ESP8266”, 1st edition, PACKT Publishers, 2016.
2. Prodeeka Senevirotne , “Hands on Internet of Things with Blynk”, 1st edition, PACKT Publishers, 2018.
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things A Hands-On- Approach”, 1st edition, University Press, 2015.

REFERENCE BOOKS:

1. Adrian McEwen, “Designing the Internet of Things”, 1st edition, Wiley Publishers, 2013.
2. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st edition, Apress Publications, 2013.
3. Adrian Holovaty and Jacob Kaplan-Moss, “The definitive guide to Django”, 2nd edition, Apress Publications, 2009.

Source: https://encrypted

19HS206 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

COURSE DESCRIPTION AND OBJECTIVES:

To improve the overall communication skills (LSRW) of students and prepare them for their profession as engineers and managers. To provide them exposure to conventions of corporate communication and training them on how to function in the business world.

COURSE OUTCOMES:

Upon completion of the course, student will able to achieve the following outcomes.

COs	Course Outcomes
1	Communicate effectively both in their academic as well as professional environment.
2	Clear grasp on the register of business language.
3	Possess the ability to write business reports and proposals clearly and precisely to succeed in their future.
4	Make effective presentations and participate in formal meetings.

SKILLS:

- ✓ *Articulate effective spoken and listening abilities needed for professional and social success in interpersonal situations, group interactions, and personal and professional presentations.*
- ✓ *Explore specific functions and vocabulary in a business context.*
- ✓ *Produce short business reports, proposals and correspondence.*
- ✓ *Write various business documents through reading techniques.*

UNIT - I **P - 6**

Business English Vocabulary: Glossary of most commonly used words (formal and informal usage).

Elements of Technical Writing: Sentence structure, reducing verbosity, arranging ideas logically, building coherence, cohesive devices and transitional words.

Mechanics of Writing: Stylistic elements, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication.

Activity: Basic grammar practice, framing paragraphs on topics allocated, paraphrasing an article or a video, finding topic sentences in newspaper articles, finding out new words from a professional viewpoint and understanding the meaning and its usage.

UNIT - II **P - 6**

Business Correspondence: E-mail: nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo.

Letter-Writing: Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiry, claim letter – letter of apology], introductory and concluding paragraphs and clear call for action.

Professional Proposal/Report: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts of a report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusion and recommendations).

Activity: Perusing samples of well-prepared business e-mails, memo, letter writing and short proposals and reports; Students will draft business correspondence writing tasks and different proposals/reports on topics assigned.

UNIT - III **P - 6**

Speaking: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power-point presentation (making PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/ proposal/report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations.

Activity—watching videos/listening to audios of business presentations, classroom activities of team and individual presentations, using PPTs, mock exercises for BEC speaking, presenting (speaking) the written components completed in Unit 1.

UNIT - IV **P - 6**

Reading: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

ACTIVITIES:

- *Paraphrasing an article or a video in own words and finding topic sentence in newspaper articles.*
- *Finding out new words from a professional view point and understanding the meaning and its usage.*
- *Reviewing samples of well prepared proposals and reports.*
- *Drafting different proposals / reports on assigned topics .*
- *Classroom activities of team and individual presentations.*
- *Finding missing appropriate sentence in the text.*
- *Using vocabulary in context.*

Activity - Hand-outs; matching the statements with texts, finding missing appropriate sentence in the text from multiple choice, using right vocabulary as per the given context and editing a paragraph.

UNIT - V **P - 6**

Listening: Specific information in business context, listening to telephonic conversations/messages and understanding the intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion.

Activity- Working out BEC/TOEFL/IELTS listening exercises with hand-outs; matching the statements with texts, finding missing appropriate sentence in the text from multiple choices, using right vocabulary in context-editing a paragraph, listening to a long conversation such as an interview and answer MCQs based on listening.

REFERENCE BOOKS:

1. Guy Brook Hart, "Cambridge English Business Bench Mark: Upper Intermediate", 2nd edition, Cambridge University Press, 2014.
2. CUP, Cambridge: BEC VANTAGE Practice Papers, Cambridge University Press, 2002.
3. Schnurr, "Exploring Professional Communication: Language in Action". London: Routledge, 2013.
4. Seely John, "The Oxford Guide to Effective Writing and Speaking", Oxford University Press, 2005.

19PC014 INTER-DEPARTMENTAL PROJECTS - II

Hours Per Week :

L	T	P	C
0	0	4	2

COURSE DESCRIPTION AND OBJECTIVES:

These projects are aimed at enabling students understand the relationship between the courses of various programs. Students will get an idea of how interesting technologies or processes, prototype or working model can be developed by culmination of technologies from courses of different programs.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Map different courses to gain the knowledge of inter-disciplinary engineering.
2	Function effectively as an individual and as a member or leader in diverse teams.
3	Comprehend and write effective reports and make effective presentations.

LIST OF INTER - DEPARTMENTAL PROJECTS - II

- Design And Implementation on the Intelligent Management System of Garage.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- RF Based Multilevel Speed Limit for Highways.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- A Vehicular Wireless Sensor Network for Vehicle Emissions Monitoring.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- Driving Guidance System Based on Wireless Sensor Network.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- Automated Smoking Zone Monitoring & Alerting Project.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Chemical Engineering).

- Rain Sensing Automatic Car Wiper.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- Home and Industrial Safety Using Fire And Gas Detection System.
  (*Combination of courses from the Branches of Electronics and Communication Engineering and Petroleum Engineering).*
- Monitoring of Anaeroponic Green house with a Sensor Network.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Computer Science Engineering).
- Real-Time Automization of Agricultural Environment for Social Modernization of Indian Agricultural System.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Agriculture Engineering).
- Remote Sensing and Control of an Irrigation System using Wireless Sensor Network.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Agriculture Engineering).
- Wireless Sensor Network for Environmental Monitoring in Green House.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Agriculture Engineering).
- An Infant Monitoring System Using CO_2 Sensors.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- Bio-Enabled Remote Area Vehicle Controlling with Webcam.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- Bio-Medical Signal Processing using GPS and GSM.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).
- Biomedical Signal Processing System for Door Access Security.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).
- Design and Development of a Hand-glove Controlled Wheel Chair.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Mechanical Engineering).
- The Implementation of a Low-Power Biomedical Signal Processor for Real-Time Epileptic Seizure Detection on Absence Animal Models.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).
- Integrating RFID with Wireless Sensor Networks for Inhabitant, Environment and Health Monitoring.
  (Combination of courses from the Branches of Electronics and Communication Engineering and BiomedicalEngineering).
- Multi-sensor Strategies to Assist Blind People: A Clear-Path Indicator.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- RF Based Wireless Heart Beat Rate Monitoring System.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Biomedical Engineering).

- ZigBee and RFID based System to Assist Visually Impaired in Navigation.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- A Controller based Networked Autonomous Weather Server.
  (Combination of courses from the Branches of Electronics and Communication Engineering and Civil Engineering).
- Wireless Industrial Device Control System using RF.
  (Combination of Courses from the Branches of Electrical & Electronics Engineering and Electronics and Communication Engineering).
- Refrigeration Control System using Microcontroller.
  (Combination of Courses from the Branches of Electrical & Electronics Engineering and Electronics and Communication Engineering).
- High Speed Protection based Programmable Current Relay.
  (Combination of Courses from the Branches of Electrical & Electronics Engineering and Electronics and Communication Engineering).
- Stepper Motor Speed and Direction Controller by IR Remote.
  (Combination of Courses from the Branches of Electrical & Electronics Engineering and Electronics and Communication Engineering).
- Oil Temperature Monitoring with Automatic Circuit Breaker Operation for Transformers.
  (Combination of Courses from the Branches of Electrical & Electronics Engineering and Electronics and Communication Engineering).
- Device Monitoring and Control System by using GSM/Cell Phone.
  (Combination of Courses from the Branches of Electrical & Electronics Engineering and Electronics and Communication Engineering).
- Speed Control of DC motor using Android mobile.
  (Combination of Courses from the Branches of Computer Science and Engineering & Electronics and Communication Engineering).
- ATmega16A based GPS Receiver.
  (Combination of Courses from the Branches of Computer Science and Engineering & Electronics and Communication Engineering).
- PC-Based GPS Receiver.
  (Combination of Courses from the Branches of Computer Science and Engineering & Electronics and Communication Engineering).
- Automatic Off Timer Circuit.
  (Combination of Courses from the Branches of Computer Science and Engineering & Electronics and Communication Engineering).
- Doorbell cum Visitor Indicator.
  (Combination of Courses from the Branches of Computer Science and Engineering & Electronics and Communication Engineering).

NOTE: The afore - mentioned list is not exhaustive and the objective is to provide an idea of some of the projects that can be executed by students arising from a combination of courses from various branches. Students are given full flexibility to choose any projects of their choice under the supervision of faculty mentors from a combination of different departments.

IV

YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.

I SEMESTER

19MS303	-	Principles of Management and Organizational Behavior
19EC401	-	VLSI Design
19PC015	-	Societal - Centric and Industry related Projects
	-	Department Elective - III
	-	Department Elective - IV
	-	Department Elective - V

II SEMESTER

19PC016/19PC017	-	Internship / Project Work

COURSE CONTENTS

I SEM AND II SEM

19MS303 PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

SOURCE:
https://goricastanisic.files.wordpress.com/2013/11/save-pictures-as.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with human behavior in organizations, conceptual frameworks, case discussions, and skill-oriented activities applied to course topics which include: motivation, group dynamics, leadership, communication, diversity, organizational design, and culture. Class sessions and assignments are intended to help participants acquire skills and concepts to improve organizational relationships and effectiveness.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Differentiate personality traits, job attitudes of people.
2	Understand person-organization fit.
3	Apply group decision making techniques.
4	Analyze the effectives of various communication channels.
5	Aware of challenges of OB.

SKILLS / ACTIVITIES :

- ✓ *Study organizational structures of any 10 companies and classify them into different types of organizations which are studied in Unit 2 and justifying why such structures are chosen by those organizations.*
- ✓ *Prepare the leadership profiles of any 5 business leaders and study their leadership qualities and behaviors with respects to the trait, behavioral and contingency theories studied.*
- ✓ *Identify any five job profiles and list the various types, abilities required for those jobs and also the personality traits/attributes required for the jobs identified.*

UNIT - I **L-9**

INTRODUCTION TO OB: Management functions, Roles, Skills, Organizational behavior: Disciplines that contribute to the OB field; Diversity in organizations; Attitudes: Components, Major job attitudes

UNIT - II **L-9**

EMOTIONS, MOODS & VALUES: Emotions and Moods: Functions & sources of emotions and moods, Emotional intelligence; Personality: The MBTI, The big five personality models, Other personality traits relevant to OB; Values: Importance, Terminal, Instrumental and generational values.

UNIT - III **L-9**

PERCEPTION & MOTIVATION: Perception: Meaning, Factors that Influence perception, Person perception, Common shortcuts in judging others; Motivation: Early theories of motivation, Contemporary theories of motivation.

UNIT - IV **L-9**

THE GROUP: Defining and classifying groups, Stages of group development, Group properties: Roles, Norms, Status, Size, and cohesiveness; Diversity – Group decision making: Group think and group shift, Group decision-making techniques; Work teams: Differences between groups and teams, Types of teams; Creating effective teams; Context, Composition, Processes

UNIT - V **L-9**

COMMUNICATION: Communication: Functions, Process, Direction, Interpersonal communication, Organizational communication, Choice of communication channel, Persuasive communication, Barriers to effective communication – Organization structure: Designs – Organizational culture: Functions

TEXT BOOK:

1. Robbins, Judge, and Vohra, “Essentials of Organizational Behavior”, 15th edition, Pearson Education India, 2014.

REFERENCE BOOKS :

1. Fred Luthans, “Organisational Behavior”, 12th edition, McGraw-Hill, 2010.
2. Debra L. Nelson and James C. “Quick : ORGB”, 4th edition, Cengage Learning, 2014.
3. John R. Schermerhorn, “Organizational Behavior”, 12th edition, John Wiley & Sons, 2011.

19EC401 VLSI DESIGN

Hours Per Week :

L	T	P	C
3	-	2	4

SOURCE:
https://www.amrita.edu/sites/default/files/vlsi-design-and-security.jpg

PREREQUISITE COURSES: Electronic Devices and Circuits; Analog Circuits.

COURSE DESCRIPTION AND OBJECTIVES:

Students should have an understanding of the basic electrical properties characteristics of CMOS circuit construction and also introduce the concepts and techniques of fabrication.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Analyze the operation and electrical behavior of MOS transistors.
2	Understand the fabrication process of different MOS technologies.
3	Design VLSI circuits and layouts of simple MOS circuits using Lambda based design rules.
4	Apply the circuit concepts and scaling models to find the performance of MOS circuits.
5	Develop and verify subsystems (digital circuits) using various logic methods.

SKILLS:

- ✓ *Estimate the layout area and power dissipation of the circuit.*
- ✓ *Customize a model for the particular logic system.*
- ✓ *Identify the design flow of front end and back end.*
- ✓ *Identify the different colour codes for the layouts.*

UNIT - I **L-9**

MOS TRANSISTOR INTRODUCTION: NMOS and PMOS Transistor operation, I_{DS}-V_{DS} relationship, Channel Length Modulation, Transistor parameters - threshold voltage, body effect, trans-conductance, output conductance, figure of merit; NMOS inverter, Various pull ups, CMOS Inverter, Static CMOS logic gates, Introduction of Bi-CMOS inverter.

UNIT - II **L-9**

VLSI FABRICATION TECHNIQUES: Silicon gate-NMOS and PMOS process, CMOS processes - NWell, PWell, Twin tub and Silicon on insulator; An overview of fabrication, Wafer processing, Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation.

UNIT - III **L-9**

OVERVIEW OF VLSI DESIGN METHODOLOGY: VLSI design process, Architectural design, Logical design, Physical design; Layout styles - full custom, semi custom approaches.
STICK DIAGRAM ANDLAYOUT DESIGN RULES: MOS Circuit Design, MOS layers, Stick diagrams and layout design rules for NMOS, CMOS and BICMOS circuits.

UNIT - IV **L-9**

CIRCUIT CONCEPTS: Sheet resistance, Area Capacitance, The delay unit, Inverter delays, Driving capacitive loads, Propagation delays, Wiring capacitances, choice of layers.
SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling.

UNIT - V **L-9**

LOGIC DESIGN: Pass transistor, Transmission gate logic, Alternate forms of CMOS logic – pesudo NMOS logic, dynamic CMOS logic, clocked CMOS logic, domino CMOS logic and DCVS logic.
CMOS SUBSYSTEM DESIGN: Combinational circuit design - adders, multipliers, parity generator, comparator, zero and one detector; Sequential Circuit Design - design of latches and flip-flops.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

PART-A

Design and simulate the following schematics in NMOS and CMOS Technology in Cadence.

Logic gates like NOT, NAND, NOR, AND, OR, Ex-OR, Ex-NOR, AOI, OAI.

PART-B

Design and simulate the following in Xilinx Software using VHDL.

1. Logic gates: NOT, NAND, NOR, AND, OR, Ex-OR.
2. Arithmetic Circuits: Adders, Subtracters, Multiplier and ALU.
3. Combinational Circuits: Decoder, Encoder, Multiplexer, De-multiplexer, Parity Generators and Checkers.
4. Sequential Circuits: Flip-Flops, Counters, Shift Registers.

TEXT BOOKS:

1. Douglas A Pucknell and Kamran Eshranghian, “Basic VLSI Design”, 3rd edition, Prentice Hall of India, 2011.
2. S.M. Sze, “VLSI Technology”, 2nd edition, TMH, 2007.

REFERENCE BOOKS:

1. Neil H E Weste and Kamran Eshranghian, “Principles of CMOS VLSI Design: A system Perspective”, 4th edition, Addison Wesley, 2009.
2. Amar Mukherjee, “Introduction to nMOS and CMOS VLSI System Design”, 1st edition, Prentice Hall, 1986.
3. Ajay Kumar Singh, “Digital VLSI Design”, 1st edition, PHI Learning Private Limited, 2011.

19PC015 SOCIETAL-CENTRIC AND INDUSTRY RELATED PROJECTS

Hours Per Week :

L	T	P	C
0	0	6	3

COURSE DESCRIPTION AND OBJECTIVES:

The major objective of the societal-centric projects is to connect students to society through their technical knowledge. The prerequisite to start the project is to submit a report pertaining to the Societal-centric or industry related problem in the preceeding semester.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	Study the problems which are related to the society in their production / occupational activities.	2
2	Work on technology applications which can either solve the problems or make the activities less stenuous.	3
3	Design an implement or process to achieve the second outcome.	4

LIST OF SOCIETAL-CENTRIC AND INDUSTRY RELATED PROJECTS

- Drone based crop and soil management using Augmented Reality in precession Agriculture.
- Electronic Patient Monitoring System with Cloud based system.
- RFID based Attendance System.
- Vehicle Anti-Theft Face Recognition System.
- Women Safety Application.
- Color Based Product Sorting Machine Project.
- Object Tracker & Follower Robot.
- Drunk Driving Detection with Car Ignition Locking.
- Image Processing Based Fire Detection.
- Accident Avoiding System with Crash Detection and GPS Notification.
- Remote Controlled Robotic Arm Using RF.
- Automated Paralysis Patient Healthcare System.
- Car Over speed Detection.
- Vehicle Theft Alert & Engine Lock System.
- Automatic Weather Reporting System.
- Smart Toll Booth Manager System.
- Heart Attack Detection & Heart Rate Monitor.
- Electronic Water Level Controller.

NOTE : The afore - mentioned list is not exhaustive and the objective is to provide an idea of some of the projects that can be executed by students pertaining to societal or industry related problems. Students are given full flexibility to choose any project of their choice under the supervision of faculty mentor.

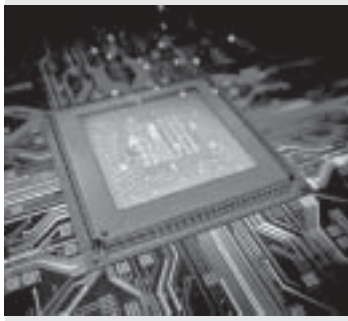
DEPARTMENT ELECTIVES

B.Tech.

- 19EC331 - Digital Design through Verilog
- 19EC332 - PYTHON Programming
- 19EC333 - Computer Architecture and Organization
- 19EC334 - Optical Communication
- 19EC335 - Information Theory and Coding
- 19EC336 - Digital TV and Broadcasting
- 19EC337 - Embedded Systems
- 19EC338 - Cellular and Mobile Communications
- 19EC431 - Mobile OS and Application Development
- 19EC432 - RF and Microwave Engineering
- 19EC433 - Wireless Sensor Networks
- 19EC434 - Machine Learning
- 19EC435 - Satellite Communications
- 19EC436 - Radar Systems
- 19EC437 - Digital Image and Video Processing
- 19EC438 - Software Defined Radio

COURSE CONTENTS

19EC331 DIGITAL DESIGN THROUGH VERILOG



SOURCE: *https://wallpaperlayer.com/img/2015/8/high-tech-wallpaper-3430-3639-hd-wallpapers.jpg*

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSE: Digital System Design.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers knowledge about Hardware Description Language (HDL) used for designing digital systems. The course objective is to introduce the concepts and techniques associated with the HDL and to model the logical expressions of various combinational and sequential circuits.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply the concepts of Digital design to create digital building blocks using Verilog.
2	Design of combinational and sequential logic circuits using different modeling styles of HDL.
3	Model the CMOS circuits using switch level modeling.
4	Understand system tasks, functions ,compiler directives and FSM.

SKILLS:

- ✓ *Generate a HDL code for a given specific application.*
- ✓ *Identify the outcome of the system for various inputs.*
- ✓ *Choose the required modeling style for the given application.*

UNIT - I **L-9**

INTRODUCTION TO VERILOG: Verilog as HDL, Levels of design description, Concurrency, Simulation and synthesis, Functional verification, System tasks, Programming language interface (PLI), Module, Simulation and synthesis tools, Test benches, Keywords, Identifiers, White space characters, Comments, Numbers, Strings, Logic values, Strengths, Data types, Scalars and vectors, Parameters, Memory, Operators, System tasks, Exercises.

UNIT - II **L-9**

GATE LEVEL MODELING: Introduction, AND gate primitive, Module structure, Other gate primitives, Illustrative examples, Tri-state gates, Array of instances of primitives, Additional examples, Design of flip-flops with gate primitives, Delays, Strengths and contention resolution, Net types, Design of basic circuits, Exercises.

UNIT - III **L-9**

BEHAVIORAL MODELING: Introduction, Operations and assignments, Functional bifurcation, Initial construct, Always construct, Examples, Assignments with delays, Wait construct, Multiple always blocks, Designs at behavioral level, Blocking and non blocking assignments, The case statement, Simulation flow, If and if-else constructs, Assign-deassign construct, Repeat construct, For loop, The disable construct, While loop, Forever loop, Parallel blocks, Force-release construct, Event.

UNIT - IV **L-9**

DATA FLOW AND SWITCH LEVEL MODELING: Introduction, Continuous assignment structures, Delays and continuous assignments, Assignment to vectors, Operators, Basic transistor switches, CMOS switch, Bi-directional gates, Time delays with switch primitives, Instantiations with strengths and delays, Strength contention with trireg nets, Exercises.

UNIT - V **L-9**

SYSTEM TASKS,FUNCTIONS AND COMPILER DIRECTIVES: Introduction, Parameters, Path delays, Module parameters, System tasks and functions, File-based tasks and functions, Compiler directives, Hierarchical access, General observations, Exercises, Function, Tasks, User- defined primitives (UDP), FSM design (moore and mealy machines).

TEXT BOOKS:

1. T.R. Padmanabhan and B. Bala Tripura Sundari, “Design through Verilog HDL”, 2nd edition, WSE, 2014 IEEE Press.
2. J. Bhaskar, “A Verilog Primier”, 2nd edition, BSP, 2013.

REFERENCE BOOKS:

1. Stephen. Brown and ZvonkoVranesic, “Fundamentals of Logic Design with Verilog”, 3rd edition, TMH, 2012.
2. Charles H Roth, “Digital Systems Design using VHDL”, Jr.Thomson Publications, 4th edition, 2012.
3. Michael D. Ciletti, “Advanced Digital Design with Verilog HDL”, 3rd edition,PHI, 2013.
4. Charles H Roth Jr, “Digital systems Design using VHDL”, 2nd edition, Thomson Publications, 2010.

19EC332 PYTHON PROGRAMMING

SOURCE:
https://programwithus.com/media/products/pythonWebinar_k51NM2Q.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

This course provides basics of python programming such as data types, program flow control functions, file operations and object oriented programming.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Apply the concepts of Tuples, lists and data types to write the required programs using python.
2	Analyze the program flow for looping, function execution, modules, packages and file operations.
3	Understand and apply the concept of class, object, package and exception handling in python programming.
4	Visualize the data using matplotlib, pandas and Scikitkitlibraries.

SKILLS:

- ✓ *Design and develop applications for automation, data processing and testing in various domains like VLSI, Embedded Systems etc.*
- ✓ *Design and development of web applications.*

UNIT - I **L-9**

INTRODUCTION TO PYTHON AND DATA TYPE: Introduction to Python, Installation and working with Python, Understanding Python variables, Python basic operators, Understanding python blocks, Python data types, Declaring and using numeric data types: int, float, complex; Using string data type and string operations, Defining list and list slicing, Use of Tuple data type.

UNIT - II **L-9**

PROGRAM FLOW CONTROL AND FUNCTIONS: Python program flow control, Conditional blocks - using if, else and elif, simple for loops in python; For loop using ranges, String, List and dictionaries, Use of while loops in python, Loop manipulation using pass, Continue, Break and else, Programming using Python, Conditional and loops block, Python Functions, Modules and packages, Organizing python codes using functions, Organizing python projects into modules, Importing own module as well as external modules, Understanding Packages, Powerful Lambda function in python, Programming using functions, modules and External packages.

UNIT - III **L-9**

STRINGS, FILE OPERATIONS AND EXCEPTION HANDLING: Python String, List and dictionary manipulations, Building blocks of python programs, Understanding string in build methods, List manipulation using in build methods, Dictionary manipulation, Programming using string, List and Dictionary in build functions, Python file operation: Reading config files in python, Writing log files in python; Understanding read functions: read(), readline() and readlines(); Understanding write functions: write() and writelines(); Manipulating file pointer using seek, Programming using file operations, Exception handling.

UNIT - IV **L-9**

CLASSES, OBJECTS, MODULES AND PACKAGES: Usage of class, object, module/function and package, Built-in Modules: Importing Modules in Python Programs and Working with Random Structure of Python Modules; Modules of SciPy and NUMPY, Web Scraping using Beautiful Soup - data mining from HTML and XML, textblob; Sentiment analysis, Classification (naive bayes, decision tree).

UNIT - V **L-9**

DATA ANALYSIS AND DATA VISUALIZATION: Data visualization: Scatter plots, Line plots, Box plots, bar charts, and histograms with matplotlib Customizing plots, Important attributes and arguments at a analysis using pandas, Scikitkit learn, Introduce the concepts of supervised and unsupervised learning, Learning and predicting.

TEXT BOOKS:

1. Dusty Phillips, “Python 3 Object Oriented Programming”, 3rd edition, Packt Publication, 2010.
2. Alley B. Downey, “Think Python”, 2nd edition, Shroff / O’Reilly Publisher, 2016.

REFERENCE WEBSITES:

1. https://scikit-learn.org/stable/_downloads/scikit-learn-docs.pdf
2. https://textblob.readthedocs.io/en/dev/

19EC333 COMPUTER ARCHITECTURE AND ORGANIZATION

SOURCE:
https://www.sigarch.org/wp-content/uploads/2017/03/Welcome-1080x675.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to analyse the architectures and organizational designs. This course covers a number of issues involved in the design and utilization of high performance computing systems, including Instruction Set, Architecture, Performance Evaluation, Pipelining, Memory, I/O, Multiprocessor and Parallel Computing and Interconnection Network.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the basic structure and operation of a digital computer.
2	Apply the fundamental concepts of CPU design and I/O devices.
3	Analyze various types of internal and external memories.
4	Learn the advanced concepts of parallel processing, pipelining, multiprocessors and interconnection structures.

UNIT - I **L-9**

INTRODUCTION: Introduction to organization and architecture, Brief history of computers, CISC Vs RISC, A Top level view of computer function and interconnection - computer components, computer function, interconnection structures, bus interconnection, PCI.

UNIT - II **L-9**

CENTRAL PROCESSING UNIT: Computer arithmetic, Integer representation, Integer arithmetic, Floating-Point representation, Floating-Point arithmetic, Instruction sets - machine instruction characteristics, types of operands, types of operations, addressing modes, instruction formats; Processor structure and function - processor organization, register organization, stack organization and instruction cycle.

UNIT - III **L-9**

CONTROL UNIT: Control unit operation - micro-operations, control of the processor, hardwired implementation; Basic concepts of micro programmed control.
INPUT / OUTPUT: External devices, I/O modules, Programmed I/O, Interrupt driven I/O, DMA, I/O channels and processors.

UNIT - IV **L-9**

MEMORY: Computer system memory overview, Internal memory – RAM, ROM, cache memory, virtual memory; External memory - magnetic disk, magnetic tapes, RAID, flash memory.

UNIT - V **L-9**

PIPELINE, VECTOR PROCESSING AND MULTIPROCESSORS: Pipeline and vector processing - parallel processing; Pipelining - arithmetic pipeline, instruction pipeline, RISC pipeline; Vector processing, Array processors; Multiprocessors - characteristics of multiprocessors, interconnection structures, inter processor communication and synchronization.

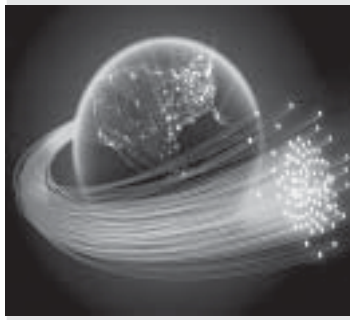
TEXT BOOKS:

1. William Stallings, “Computer Organization and Architecture”, 9th edition, Pearson/PHI, 2013.
2. M.Moris Mano, “Computer Systems Architecture”, 3rd edition, Pearson/PHI, 2013.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th edition, TMH, 2011.
2. John P.Hayes, “Computer architecture and Organization”, 3rd edition, Tata McGraw-Hill, 1998.
3. P. Pal Chaudhuri, “Computer organization and design”, 3rd edition, PHI, 2008.
4. G.Kane and J.Heinrich, “MIPS RISC Architecture”, 2nd edition, Pearson/PHI, Prentice Hall, 1992.

19EC334 OPTICAL COMMUNICATION



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http://www.wiretechworld.com/files/2018/09/FIG1.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSE: Engineering Physics (A).

COURSE DESCRIPTION AND OBJECTIVES:

This course illustrates basic optical laws, definitions and optical link design methods and Expound optical sources, detectors and connectors. It is to expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the basic optical communication system, optic theories and materials.
2	Apply the optical laws and losses to the fundamental propagation mode in optical fiber.
3	Analyze and evaluate the efficiencies of various optical sources, connectors and detector.
4	Evaluate link power budget and rise time budget.

SKILLS:

- ✓ *Estimate the loss and the delay in the fibre link.*
- ✓ *Identify the type of source and detector suitable for specific application.*
- ✓ *Estimate and evaluate the link budget.*

UNIT - I **L-10**

OVERVIEW OF OPTICAL FIBER COMMUNICATION : The general system, advantages of optical fiber communications, Fiber Materials, Optical fiber wave guides - introduction, ray theory transmission, total internal reflection, acceptance angle, numerical aperture; Skew rays, Cylindrical fibers - modes, vnumber, mode coupling, step index fibers, graded index fibers.

UNIT - II **L-9**

SIGNAL DEGRADATION IN OPTICAL FIBERS : Signal distortion in optical fibers - attenuation, absorption, scattering and bending losses, core and cladding losses; Information capacity determination, Group delay, Pulse broadening, Types of Dispersion - material dispersion, waveguide dispersion, polarization mode dispersion; Intermodal dispersion, Overall fiber dispersion in multi mode and single mode fibers.

UNIT - III **L-8**

OPTICAL FIBER CONNECTORS : Connector types, Single mode fiber connectors, Connector return loss, Fiber splicing- Splicing techniques, Splicing single mode fibers; Fiber alignment and joint loss, Single mode fiber joints.

UNIT - IV **L-9**

OPTICAL SOURCES : LEDs - structures, materials, wuantum efficiency, power, modulation, power bandwidth product; Injection laser diodes - modes, threshold conditions, external quantum efficiency, laser diode rate equations.

UNIT - V **L-9**

OPTICAL DETECTORS & SYSTEM DESIGN : Optical detectors, Physical principles of PIN and APD, Comparison of photo detectors, Fundamental receiver operation, Digital signal transmission, Error sources, Optical system design, Considerations, Component choice, Point to point links, System considerations, Link power budget, Rise time budget.

TEXT BOOKS:

1. Gerd Keiser, “Optical Fiber Communications”, 5th edition, Mc Graw-Hill International, 2017.
2. John M. Senior, “Optical Fiber Communications”, 3rd edition, PHI, 2010.

REFERENCE BOOKS:

1. S.C.Gupta, “Text Book on Optical Fiber Communication and its Applications”, PHI, 2005.
2. Govind P. Agarwal, “Fiber Optic Communication Systems”, 3rd edition, John Wiley, 2004.
3. Joseph C. Palais, “Fiber Optic Communications”, 4th edition, Pearson Education, 2004.

19EC335 INFORMATION THEORY AND CODING

Hours Per Week :

L	T	P	C
3	-	-	3

SOURCE:
https://www.kth.se/polopoly_fs/1.685918.1556805330!/image/code.jpg

PREREQUISITE COURSE: Probability Theory and Stochastic Process.

COURSE DESCRIPTION AND OBJECTIVES:

Students should study the several source coding technique, channel coding theorem & various code and Block control coding.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the concepts of information and fundamentals probability.
2	Apply linear block codes for error detection and correction, convolution codes for performance analysis & cyclic codes for error detection and correction.
3	Analyze the channel performance using Information theory and BCH & RS codes for Channel performance improvement against burst errors.
4	Comprehend various error control code properties.

SKILLS:

- ✓ *Perform Encryption and decryption of data.*
- ✓ *Choose appropriate error detection and correction technique for specific channel conditions.*

UNIT - I **L-9**

BASIC OF INFORMATION THEORY : Review of probability theory, Entropy, Joint entropy and conditional entropy, Mutual information, Channel capacity, Bit rate and baud rate, Calculation of entropy / probability and information of binary channel, Source coding theorem - shannon fanon coding, Huffman coding.

UNIT - II **L-9**

LINEAR BLOCK CODES ; Introduction, Generator and parity check matrices, Repetition and single parity check codes, Binary hamming codes, Syndrome and error detection with linear block codes, Weight distribution and minimum hamming distance of a linear block code.

UNIT - III **L-9**

CYCLIC CODES, RINGS, AND POLYNOMIALS: Introduction, Rings, Quotient rings, Groups, Field, Galois fields and algebraic description of cyclic codes, Cyclic encoding, Syndrome decoding, Binary CRC codes, BCH codes.

UNIT - IV **L-9**

RS CODES, GOLAY CODES, SHORTENED CYCLIC CODES: RS (Reed-Solomon) codes, Decoding of RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes, Burst and random error correcting codes.

UNIT - V **L-9**

CONVOLUTION CODES : Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder.

TEXT BOOKS:

1. Shu Lin and D.J. Costello Jr., “Error Control Coding”, 2nd edition, Pearson Prentice Hall, 2014.
2. T. M. Cover and J. A, Thomas, “Elements of information theory,” 2nd edition, Wiley India, 2006.

REFERENCE BOOKS:

1. N. Abramson, “Information and Coding”, 2nd edition, McGraw Hill, 1963.
2. R.B. Ash, “Information Theory”, 1st edition, Dover Publications, 1990.
3. Ranjan Bose, “Information Theory Coding and Cryptography”, 2nd edition, TMH, 2007.

19EC336 DIGITAL TV AND BROADCASTING

SOURCE:
https://digitalsolutions.nz/wp-content/uploads/2016/10/Blog-Future-of-tv-1.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

This course provides the basic concepts of digital TV and video recording system. The objective of the course is to make the students understand /explain the various colour TV systems, standards, Digital TV, HDTV Technologies, video recording system, display system and its applications.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand fundamentals of television and TV Standards.
2	Analyze the digital TV Systems.
3	Gain the knowledge on advanced TV technologies.
4	Familiarize with different video recording, display and its consumer application.

SKILLS:

- ✓ *Identify connecting cables for television with set-top box.*
- ✓ *Distinguish between normal digital TV and HD TVs.*
- ✓ *Identify types of digital TVs and picture quality.*

UNIT - I **L-9**

FUNDAMENTALS OF TELEVISION AND DISPLAY: Television basics, Elements of TV system, Low level TV transmission, TV receiver block diagram, Production of luminance and colour difference signal, Composite video signal and channel bandwidth, colour TV systems, Colour fundamentals, Mixing of colours, Colour perception, Chromaticity diagram.

UNIT - II **L-9**

TV STANDARDS: NTSC, PAL, SECAM systems, Colour TV transmitter, Colour TV receivers, Remote control, Antennas for transmission and TV pattern generation.

UNIT - III **L-9**

DIGITAL TV: Introduction to digital TV, Principle of digital TV, Digital TV signals and parameters, Digital TV transmitters, MAC signals, Advanced MAC signal transmission, Digital TV receivers, Basic principles of digital video compression techniques, MPEG1, MPEG2, MPEG4.

UNIT - IV **L-9**

HDTV: HDTV standards and systems, HDTV transmitter and receiver/encoder, Digital TV satellite systems, CCTV, CATV, Direct to home TV, Set top box with recording facility, 3D TV systems.

UNIT - V **L-9**

VIDEO RECORDERS AND CONSUMER APPLICATIONS: IP audio and video, IPTV systems, Mobile TV, Digital video recorders, Colour TV digital cameras, Display devices - LED, LCD, CD/ DVD player, Blue ray DVD player, Dish TV.

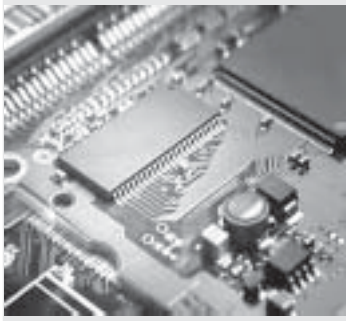
TEXT BOOKS:

1. A.M. Dhake, “Television and Video Engineering”, 2nd edition, TMH, 2006.
2. Kelth Jack, “Video Demisified”, 5th edition, Elsevier, 2007.
3. R.G. Gupta, “Audio Video Systems”, 2nd edition, TMH, 2010.

REFERENCE BOOKS:

1. S. P. Bali, “Color TV Theory and Practice”, 1st edition, TMH, 2007.
2. R. R. Gulathi, “Monochrome and Color TV”, New Age International Publications, 2009.

19EC337 EMBEDDED SYSTEMS



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Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSES: Digital System Design; Microcontrollers.

COURSE DESCRIPTION AND OBJECTIVES:

The learner will obtain a good exposure about embedded components and real time operating systems. This course will help to understand about the design methodologies in hardware as well as software.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Identify the applications, Design metrics and challenges of Embedded system
2	Design, implement and test an embedded system.
3	Write the programs for embedded system.
4	Describe the various components and operating systems used in real-time embedded systems.
5	Identify Fundamental Issues, Computation models in Hardware-soft ware co-design, and Hardware Software Trade-offs.

SKILLS:

- ✓ *Identify suitable microcontroller and hardware components for a specific application.*
- ✓ *Develop firmware programs and processes for RTOS.*
- ✓ *Design microcontroller based system for given application using UML.*

UNIT - I **L-9**

INTRODUCTION TO EMBEDDED SYSTEMS: Embedded systems overview, Embedded systems Vs general computing systems, History of embedded systems, Classification, Major application areas, Purpose of embedded systems, Characteristics of embedded applications, Design challenges, Common design metrics.

UNIT - II **L-9**

EMBEDDED SYSTEM DEVELOPMENT: Core of the embedded system, General purpose and domain specific processors, ASICs, PLDs, Commercial off the shelf components (COTS), Memory - ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems; Reset circuit, Brown-out protection circuit, Real time clock, Watchdog timer.

UNIT - III **L-9**

EMBEDDED SYSTEM PROGRAM: Embedded firmware, ARM processor architecture, Pipeline, Registers, Instructions, Thumb mode, Exceptions, Embedded firmware design approaches and Development languages.

UNIT - IV **L-9**

REAL-TIME OPERATING SYSTEMS: Architecture of the kernel, Tasks and task scheduler, Scheduling algorithms, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem, Overview of off the shelf operating systems - MicroC/OS II, Vxworks.

UNIT - V **L-9**

HARDWARE–SOFTWARE CO DESIGN AND PROGRAM MODELLING: Fundamental issues in hardware-software co-design, Computation models in embedded system design, Introduction to Unified Modeling Language (UML), Hardware-Software trade-offs.

TEXT BOOKS:

1. K.V. Shibu, “Introduction to Embedded Systems”, 1st edition, Tata McGraw Hill, 2009.
2. Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley India, 2009.

REFERENCE BOOKS:

1. K.V.K.K. Prasad, “Embedded/Real-Time Systems: Concepts, Design and Programming”, Dreamtech, 2005.
2. Lyla B. Das, “Embedded Systems: An Integrated Approach”, Pearson, 2013.
3. David E. Simon, “An Embedded Software Primer”, Pearson Education, 2009.
4. Santanu Chattopadhyay, “Embedded System Design”, 2nd edition, PHI, 2013.

19EC338 CELLULAR AND MOBILE COMMUNICATIONS

SOURCE:
http://www.pongcase.com/blog/wp-content/uploads/2013/08/shutterstock_Smart PhoneAnte-250x252.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSES: Analog and Digital Communications.

COURSE DESCRIPTION AND OBJECTIVES:

This course gives an overall understanding of different generations of cellular communication systems, WANs and PANs. The course objective is to give the students mathematical and engineering concepts in the analysis and design of mobile communication systems, an understanding of digital cellular systems (GSM, CDMA), 3G systems, LTE and understanding of PANs like WLAN, Bluetooth Technologies.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Familiarize basic cellular mobile system and multiple access techniques for mobile communications.
2	Analyze various methodologies to improve the cellular capacity.
3	Knowledge about different generations of cellular technologies evolution and architectures of various wireless applications.
4	Gain the basic design concepts Personnel Area Networks such as WLAN, Bluetooth.

SKILLS:

- ✓ *Determine cell size and number of cells and cell locations for a given topological area.*
- ✓ *Finalize the frequency allocation for various cells with maximum reuse.*
- ✓ *Identify the handoff strategies.*
- ✓ *Estimate system capacity for minimum C/I.*
- ✓ *Suggest methods to improve the signal coverage.*
- ✓ *Choose proper accessing techniques for various generations of cellular communications.*

UNIT - I **L-9**

INTRODUCTION TO WIRELESS COMMUNICATIONS AND MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: Evolution to mobile radio communications, Mobile radiotelephony in USA and around the world, Examples of wireless communication systems - paging, cordless telephone systems and cellular telephone systems; Trends in wireless and personnel communications, Multiple access techniques for wireless communication - introduction, FDMA, TDMA; Spread spectrum, Multiple access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols.

UNIT - II **L-9**

THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS: Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies - prioritizing handoffs, practical handoff considerations, interference and system capacity, co-channel Interference and system capacity, channel planning for wireless systems, adjacent channel interference, power control for reducing interference, trunking and grade of service; Improving coverage and capacity in cellular systems - cell splitting, sectoring, repeaters for range extension, microcell zone concept.

UNIT - III **L-9**

CELLULAR WIRELESS NETWORKS: First generation analogue system - spectral allocation, operation, AMPS control channels; Second generation (2G) TDMA systems - first and second generation cellular systems, TDMA design consideration, GSM network and its architecture, GSM signalling protocol Architecture; 2G CDMA systems - CDMA, CDMA design consideration, IS-95; 3Gsystems - CDMA design considerations, 3G WCDMA(UMTS), 3G TD-SCDMA; Introduction to LTE systems.

UNIT - IV **L-9**

WIRELESS LANS: WLAN overview, Infrared LANs, Spread spectrum LANs, Narrowband microwave LANs, Wi-Fi and IEEE 802.11 wireless LAN standard, IEEE 802 protocol architecture, IEEE 802.11 architecture and services, IEEE 802.11 medium access control, IEEE 802.11 physical layer.

UNIT - V **L-9**

WIRELESS PANS AND OTHER SYSTEMS: Bluetooth and IEEE 802.15.1, Bluetooth overview, Radio specification, Baseband specification, Link manager specification, Logical link control and adaptation protocol, Zigbee, Cordless systems, Wireless local loop, WiMAX, Mobile IP.

TEXT BOOKS:

1. Theodore. S. Rapport, “Wireless Communications”, 2nd edition, Pearson education, 2002.
2. William Stallings, “Wireless Communications and Networks”, 2nd edition, Pearson education, 2005.

REFERENCE BOOKS :

1. W.C.Y. Lee, “Mobile Cellular Telecommunications”, 3rd edition, McGraw Hill, 2006.
2. Cory Beard and William Stallings, “Wireless Communications Networks and Systmes”, 1st edition, Pearson education, 2015.
3. Jon W. Mark and Weihua Zhqung, “Wireless Communication and Networking”, 1st edition, PHI, 2005.

19EC431 MOBILE OS AND APPLICATION DEVELOPMENT

SOURCE: *https://www.multidots.com/wp-content/uploads/2014/04/Mobile-application-725x550.jpg*

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

This course helps the students to develop the android apps and also increases learning capabilities among the students how to send the SMS, calls through apps and accessing sensors like GPS, GSM. It also provides an introductory knowledge of emulators, Animations, databases etc.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	Understand the emulators and database operations.	
2	Apply in the field of IoT for data analyzing, remote monitoring and actuating.	
3	Design the app for the android applications.	
4	Develop the android app for Smart Phone, Smart TV, Smart Watches, Single board computers etc.,	

SKILLS:

- ✓ *Develop android app.*
- ✓ *Develop database querying and report generation methods.*
- ✓ *Access the device functions like the camera, accelerometer etc.,*
- ✓ *Get familiar with various SDKs that can be used for development of an application.*

UNIT - I **L-9**

ANDROID USER INTERFACE : Understanding the components of a screen, Linear layout, Absolute layout, Frame layout, Relative layout designing your user interface with view, Text View, Button, A standard push button, Image Button, Edit Text, Check Box, Toggle Button, Radio Button and Radio Group, Progress Bar, Auto complete Text View.

UNIT - II **L-9**

VIEWS: Spinner, List View, Grid View, Image View, Scroll view, Custom Toast Alert, Time and Date Picker, Activities and Intents **-** understanding activities, linking activities using intents, displaying notifications, summary.

UNIT - III **L-9**

TELEPHONY AND SMS : Hardware support for telephony, Initiating phone calls, Accessing telephony properties and phone state, Monitoring changes in phone state using the phone state listener, Using intent recievers to monitor incoming phone calls, Introducing SMS and MMS – sending and listening SMS.

UNIT - IV **L-9**

UI ANIMATIONS : Animations in Android, The Animations Demo APP, Adding Animations to note to self. Capturing Images: Capturing images mini APP, Where it's snap – coding the capture fragment.

UNIT - V **L-9**

DATABASE: Using SQLite database in APPs, Data base, SQL syntax primer, Android SQLite APP, Database mini APP.

TEXT BOOKS :

1. Wei-Meng Lee, "Beginning Android 4 Application Development", 1st edition, Wiely Publishers, 2011.
2. Prasanna Kumar Dixit, "Android", 1st edition, Vikas Publishers, 2014.
3. Jerome (J.F.) DiMarzio, "Android - A programmers Guide", 1st edition, Tata Mc Graw Hill, 2010.

REFERENCE BOOKS :

1. Reto Meier, "Professional Android 4 Application Development", 1st edition, Wiley Publishers, 2008.
2. John Horton, "Android Programming for Beginners", 1st edition, Pact Publishing, 2015.

19EC432 RF AND MICROWAVE ENGINEERING

SOURCE:
https://sites.google.com/site/rfmwaveengknust/_/rsrc/1454244044780/our-unit/antennas_title-n.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

This course will provide the fundamental concepts associated with RF/microwave circuits and components. The course will allow students to become expert in new and evolving areas of microwave engineering including RF.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the microwave amplifiers and oscillators basic operation, characteristics, parameters, limitations.
2	Apply S-parameter concept to analyze various microwave components.
3	Analyse two cavity klystron, reflex klystron.
4	Familiarize with various microwave cross field tubes and TED's.

SKILLS:

- ✓ *Choose the required component for power coupling in the microwave communication systems.*
- ✓ *Select the high power amplifier/oscillator for the microwave frequency operation.*
- ✓ *Identify the required low power oscillator for receiver applications.*
- ✓ *Measure the impedance value of the given load through VSWR measurement.*

UNIT - I **L-9**

RF TRANSISTOR AMPLIFIER DESIGNS: Introduction to RF concepts. Characteristics of amplifiers, Types of amplifiers, Amplifier power relation and problems, Power gain definitions.

UNIT - II **L-9**

BASIC RF OSCILLATORS: Feedback Oscillator, Negative Resistance Oscillator, Quartz Oscillator, Fixed Frequency Oscillator, Dielectric Resonator Oscillator, YIG-Tuned Oscillator, Voltage Controlled Oscillator, Gunn Element Oscillator.
RF Mixer models: Basic Characteristics of Mixer, Single Ended Mixer, Single Balanced Mixer, Double Balanced Mixer, Integrated Active Mixer, Image Reject Mixer.

UNIT - III **L-9**

MICROWAVE COMPONENTS: Microwave frequencies and band designations, Microwave junctions, E-plane Tee junction, H-plane Tee junction, Magic Tee junction, Applications of magic Tee, Directional couplers, Faraday rotation In ferrite devices, Gyrator, Isolator, Circulator.

UNIT - IV **L-9**

MICROWAVE LINEAR BEAM TUBES (O TYPE): Limitations of conventional tubes at microwave frequencies, Two cavity klystron amplifiers - velocity modulation process, bunching process, output power and beam loading; Reflex klystron oscillator - velocity modulation, power output and efficiency; Operating principles of TWT.

UNIT - V **L-9**

MICROWAVE CROSS FIELD TUBES (M TYPE): Magnetron oscillators - cylindrical magnetron, cross field amplifiers; Microwave solid-state devices - detector diode, PIN diode and its applications; Transferred electron devices - GUNN diode, LSA mode of operation, IMPATT and TRAPATT.

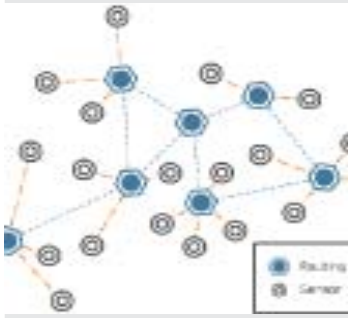
TEXT BOOKS:

1. Reinhold Ludwig and Pavel Bretchko, “RF Circuit Design, Theory Applications”, Pearson Asia Education, 2000.
2. Samuel Y Liao, “Microwave Devices and Circuits”, 3rd edition, Pearson Education, 2003.

REFERENCE BOOKS:

1. M.L. Sisodia and G.S.Raghuvanshi, “Microwave Circuits and Passive Devices”, 3rd edition, New Age International Publishers Ltd., Wiley Eastern Ltd., 1995.
2. Peter A. Rizzi, “Microwave Engineering Passive Circuits”, 1st edition, PHI, 1999.
3. M. Kulkarni, “Microwave and Radar Engineering”, 5th edition, Umesh Publications, 2014.
4. John Wiley and R.E. Collin, “Foundations for Microwave Engineering”, 2nd edition, IEEE Press, 2002.

19EC433 WIRELESS SENSOR NETWORKS



SOURCE:
https://ai2-s2-public.s3.amazonaws.com/figures/2017-08-08/1b9b6bca965b28084afbed617af62d71b0f96732/1-Figure1-1.png

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSE: Data Communications and Computer Networks

COURSE DESCRIPTION AND OBJECTIVES:

The student is made to learn the architecture and protocols of wireless sensor networks and also understand the design issues in ad hoc and sensor networks, different types of MAC protocols, expose to the TCP issues in adhoc networks.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the concepts of network architectures and applications of ad hoc and wireless sensor networks.
2	Analyse the protocol design issues of ad hoc and sensor networks.
3	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues.
4	Evaluate the QoS related performance measurements of wireless sensor networks.

SKILLS:

- ✓ *Implement of MAC and routing protocols for sensor networks.*
- ✓ *Design and implementation of wireless sensor networks for various applications.*
- ✓ *Analyze the energy issues in WSN.*

UNIT - I **L-9**

OVERVIEW OF WIRELESS SENSOR NETWORKS: Challenges for wireless sensor networks, Characteristics requirements, Required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks, Enabling technologies for wireless sensor networks. Physical layer and transceiver design considerations, Personal area networks (PANs), Zigbee.

UNIT - II **L-9**

ISSUES IN DESIGNING A MAC PROTOCOL: Classification of MAC protocols, Contention based protocols, Contention based protocols with reservation mechanisms, Contention based protocols with scheduling mechanisms, Multi channel MAC-IEEE 802.11.

UNIT - III **L-9**

ROUTING PROTOCOLS: Introduction, Issues in designing a routing protocol for Ad Hoc wireless networks, Classification of routing protocols, Table driven routing protocols, On demand routing protocols, Hybrid routing protocols.

UNIT - IV **L-9**

WIRELESS SENSOR NETWORKS ARCHITECTURE: Single node architecture, Hardware and software components of a sensor node WSN network architecture, Typical network architectures, Data relaying and aggregation strategies, Operating systems and execution environments sensor network scenarios.

UNIT - V **L-9**

WSN LOCALIZATION AND QOS: Issues in WSN routing, OLSR, Localization, Indoor and sensor network localization, Absolute and relative localization, Triangulation, QOS in WSN, Energy efficient design, Synchronization, Transport layer issues.

TEXT BOOKS:

1. C. Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols”, PHI, 2004.
2. Jagannathan Sarangapani, “Wireless Ad-hoc and Sensor Networks: Protocols, Performance and Control”, 1st edition, CRC Press 2007.

REFERENCE BOOKS:

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, “Wireless Sensor Networks - Technology, Protocols, and Applications”, John Wiley, 2007.
2. Feng Zhao and Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.
3. C.K. Toh, “Ad-Hoc Mobile Wireless Networks: Protocols & Systems”, 1st edition, Pearson Education.
4. C. S. Raghavendra and Krishna M. Sivalingam, “Wireless Sensor Networks”, Springer, 2004.
5. S Anandamurugan, “Wireless Sensor Networks”, 1st edition, Lakshmi Publications, 2010.
6. Feng Zhao and Leonides Guibas, “Wireless Sensor Networks”, Elsevier Publication, 2002.

19EC434 MACHINE LEARNING

SOURCE:
https://6lli539m39y3hpkelqsm 3c2fg-wpengine.netdna-ssl.com/wp-content/uploads/2017/03/binary-code-digital-shutterstock-1000x-675x380.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSES: Engineering Mathematics - I (E); Probability Theory and Stochastic Process.

COURSE DESCRIPTION AND OBJECTIVES:

The objective is to familiarize students with some basic learning algorithms, techniques and their applications, as well as general questions related to analyzing and handling large data sets.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand various learning algorithms applied on the data.
2	Understand Neural networks insights and various learning algorithms that are based on neural networks.
3	Design and implement machine learning solutions to classification, regression, and clustering problems.
4	Evaluate the performance of the various machine learning algorithms.

SKILLS:

- ✓ *Build algorithms that can take input data and leverage statistical analysis to predict an acceptable output.*
- ✓ *Build machines and enable them to work on their won in industries like banking, healthcare, medical etc.*

UNIT - I **L-9**

INTRODUCTION: Recap of probability theory, Linear algebra, Convex optimization, Statistical decision theory, Regression, Statistical decision theory, Classification, Bias variance, Linear regression, Multivariate regression, Subset selection, Shrinkage methods, Principal component regression, Partial least squares, Linear classification, Logistic regression, Linear discrimination analysis.

UNIT - II **L-9**

NEURAL NETWORKS: Support vector machine algorithm, Perceptron, Introduction to neural networks, Perceptron learning, Neural networks - back propagation, initialization, training and validation, parameter estimation.

UNIT - III **L-9**

DECISION TREES AND BAYESIAN LEARNING: Decision trees, Regression tree, Decision trees, Stopping criterion and pruning, Loss functions, Decision trees, Categorical attributes, Multiway splits, Missing values, Decision trees, Instability, Evaluation measures-1, Bootstrapping and cross validation, class evaluation measures, ROC curve, MDL, Ensemble methods, Bagging, Committee machines and stacking, Ensemble methods – boosting gradient boosting, random forests, multi-class classification, naive bayes, bayesian networks.

UNIT - IV **L-9**

GRAPH AND MIXTURE MODELS: Undirected graphical models, HMM, Variable elimination, belief propagation, Partitional clustering, Hierarchical clustering, Birch algorithm, CURE algorithm, Density based clustering, Gaussian mixture models, Expectation maximization.

UNIT - V **L-9**

LEARNING THEORY: Model selection, Introduction to reinforcement learning, Elements of reinforcement learning, Limitations and scope, Temporal difference learning and applications.

TEXT BOOKS:

1. Tom.M.Mitchell, “Machine Learning”, 1st edition, McGraw Hill, 1997.
2. Bishop, C., **“**Pattern Recognition and Machine Learning Berlin”, Springer-Verlag, 2006.

REFERENCE BOOKS:

1. Baldi, P. and Brunak, S., “Bioinformatics: A Machine Learning Approach”, 2nd edition, MIT Press, 2011.
2. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”,1st edition, MIT Press, 2012.

19EC435 SATELLITE COMMUNICATIONS

SOURCE:
https://cdn3.vectorstock.com/i/1000x1000/27/92/ satellite-communication-3-vector-16572792.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSES: Electromagnetic Waves and Transmission Lines; Digital Communications; Antennas and Wave Propagation

COURSE DESCRIPTION AND OBJECTIVES:

This course covers the fundamentals of satellite communications, its sub-systems, signals and noise associated with satellite communications and transmission concepts. The objective is to introduce the mechanisms of satellites and satellite launchers and also to study the design and operation issues of satellite systems.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand different types of satellite orbits and systems.
2	Compare various multiple access techniques.
3	Compute link budget of a satellite system and satellite links for specified system.
4	Distinguish different types of satellitesbased on their location.

SKILLS:

- ✓ *Recognize the different bands used in satellites.*
- ✓ *Identify the orbital distances.*
- ✓ *Choose the orbit for the given applications.*
- ✓ *Identify the frequency allocation of TT and C.*
- ✓ *Find the launch vehicles for a given satellite.*
- ✓ *Determine uplink and downlink frequencies and the transmitter and receiver powers required to meet the specified CNR (BER).*
- ✓ *Select multiple access technique.*
- ✓ *Estimate satellite performance and life span.*
- ✓ *Understand different applications of GPS.*

UNIT - I **L-9**

INTRODUCTION AND ORBITAL MECHANICS AND LAUNCHERS: Origin of satellite communications, Historical back-ground, Basic concepts of satellite communications, Frequency allocations for satellite services, Applications, Orbital mechanics, Look angle determination, Orbital perturbations, Orbit determination, Launches and launch vehicles, Orbital effects in communication systems performance.

UNIT - II **L-9**

SATELLITE SUBSYSTEMS: Attitude and orbit control system, Telemetry, Tracking, Command and monitoring, Power systems, Communication subsystems, Satellite antenna equipment reliability and space qualification.

UNIT - III **L-9**

SATELLITE LINK DESIGN: Basic transmission theory, System noise temperature and G/T ratio, Design of down links, Up link design, Design of satellite links for specified C/N, System design example.

UNIT - IV **L-9**

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermediation, Calculation of C/N, Time division multiple access (TDMA) frame structure and examples, Satellite switched TDMA on board processing, Code division multiple access (CDMA), Spread spectrum transmission and reception.

UNIT - V **L-9**

LEO AND GEO-STATIONARY SATELLITE SYSTEMS AND GPS: Orbit consideration, Coverage and frequency considerations, Delay and throughput considerations, Radio and satellite navigation, GPS position location principles, GPS receivers and codes, Satellite signal acquisition, GPS navigation message, GPS receiver operation, GPS course acquisition (C/A), Differential GPS.

TEXT BOOKS :

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, “Satellite Communications”, 2nd edition, Wiley Publications, 2003.
2. Gerard Maral and Michel Bousquet, “Satillite Communication Systems”, 5th edition, Wiley Publications, 2009.

REFERENCE BOOKS:

1. M. Richharia, “Satellite Communications: Design Principles”, 2nd edition, BS Publications, 2003.
2. Dennis Roddy, “Satellite Communications”, 2nd edition, McGraw Hill, 1996.
3. Wilbur L. Pritchard, Robert A. Nelson and Henri G.Suyderhoud, “Satellite Communications Engineering”, 2nd edition, Pearson Publications, 2003.
4. V. S. Bagad, “Satellite Communications”, 1st edition, Technical Publications, 2009.

19EC436 RADAR SYSTEMS

SOURCE:
https://image.slidesharecdn.com/militaryradar-140325073243-phpapp01/95/military-radar-1-638.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

To introduce the components of a radar system and their relationship to overall system performance, the radar operating environment and techniques used to confront it, and top level measures of performance.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the Basic concepts of Radar Systems.
2	Analyse the performance of different types of Radar System for a given condition/application.
3	Familiarize with tracking of Radar and its antennas.
4	Analyse the Detection of Radar signals and its receivers.

SKILLS:

- ✓ *Knowledge that enables to think creatively about the use of advanced radar systems.*
- ✓ *Design and analyse Radar systems for different applications.*

UNIT - I **L-9**

INTRODUCTION & RADAR RANGE: Introduction, Nature of radar, Maximum unambiguous range, Radar waveforms, Simple form of radar equation, Radar block diagram and operation, Radar frequencies and applications, Radar Equation - prediction of range performance, minimum detectable signal, receiver noise and SNR, integration of radar pulses, radar cross section of targets.

UNIT - II **L-9**

CW AND FMCW RADAR : Doppler effect, CW radar - block diagram, isolation between transmitter and receiver, non-zero IF receiver, receiver bandwidth requirements, applications of CW radar; FM-CW Radar - range and doppler measurement, block diagram and characteristics (approaching/ receding targets), FMCW altimeter, measurement errors, multiple frequency CW radar.

UNIT - III **L-9**

MTI AND PULSE DOPPLER RADAR : Introduction, Principle, MTI radar with-power amplifier transmitter and power oscillator transmitter, Delay line cancellers, Blind speeds, Double cancellation, Staggered PRFs. Range gated doppler filters, MTI radar parameters, Limitations to MTI performance, Non-coherent MTI, MTI versus pulse doppler radar.

UNIT - IV **L-9**

TRACKING RADAR& RADAR ANTENNAS : Tracking with radar, Sequential lobing, Conical scan, Monopulse tracking radar, Antenna parameters, Reflector antennas, Lens antennas, Cosecant squared antenna patterns, Radomes, Electronically steered phased array antennas, Phase shifters, Frequency scan arrays, Radiators for phased arrays.

UNIT - V **L-9**

DETECTION OF RADAR SIGNALS IN NOISE & RADAR RECEIVERS : Introduction, Matched filter receiver response characteristics and derivation, correlation detection, Detection criteria, Detector characteristics, Automatic detection, Constant false alarm rate receiver, Radar receivers - noise figure and noise temperature; Display types, Duplexers branch type and balanced type, Circulators as duplexers. Introduction to phased array antennas basic concepts, Radiation pattern, Beam steering and beam width changes, Series versus parallel feeds, Applications, Advantages and limitations.

TEXTBOOK:

1. Merrill I. Skolnik, “Introduction to Radar Systems” 3rd edition, Tata McGraw Hill, 2015.

REFERENCE BOOK:

1. Byron Edde, “Radar: Principles, Technologies, Applications”, Pearson Education, 2009.

19EC437 DIGITAL IMAGE AND VIDEO PROCESSING

SOURCE: *http://www.e2matrix.com/blog/wp-content/uploads/2018/01/home2.jpg*

Hours Per Week :

L	T	P	C
3	-	-	3

PREREQUISITE COURSES: Signals and Systems; Digital Signal Processing.

COURSE DESCRIPTION AND OBJECTIVES:

Image and Video Processing is the basis of all digital media technology and is an active area of research over a wide range of applications such as Compression and Medical Image Analysis. The course features an introduction to digital image/video processing algorithms that form the core of digital media technology.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Understand the fundamentals of image / video processing techniques.
2	Apply enhancement, segmentation and compression techniques to 2D images.
3	Analyse and represent an image using transform techniques.
4	Interpret image / video in various data formats by applying image transformation / processing techniques for different applications.

SKILLS:

- ✓ *Identify and choose appropriate transform for a specific applications.*
- ✓ *Apply spatial and frequency domain filtering techniques.*
- ✓ *Implement algorithms for enhancement, restoration, compression etc.*
- ✓ *Identify and choose motion estimation technique.*

UNIT - I **L-9**

FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS: Basic steps of image processing system, Sampling and quantization of an Image, Basic relationship between pixels, Image Transforms - 2D discrete fourier transform, Discrete cosine transform (DCT), Discrete wavelet transforms.

UNIT - II **L-9**

IMAGE PROCESSING TECHNIQUES: Image enhancement, Spatial domain methods, Histogram processing, Fundamentals of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Frequency domain methods - basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering; Image segmentation - segmentation concepts, point, line and edge detection, thresholding, region based segmentation.

UNIT - III **L-9**

IMAGE COMPRESSION: Image compression fundamentals, Coding redundancy, Spatial and temporal redundancy, Compression models - lossy and lossless, huffmann coding, arithmetic coding, LZW coding, run length coding, bit plane coding, transform coding, predictive coding, wavelet coding, JPEG standards.

UNIT - IV **L-9**

BASIC STEPS OF VIDEO PROCESSING: Analog video, Digital video, Time varying image formation models - 3D motion models, geometric image formation, photometric image formation; Sampling of video signals, Filtering operations.

UNIT - V **L-9**

2-D Motion Estimation: Optical flow, General methodologies, Pixel based motion estimation, Block matching algorithm, Mesh based motion estimation, Global motion estimation, Region based motion estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in video coding.

TEXT BOOKS:

1. Rafael E. Gonzaleze and Richard E. Woods, “Digital Image Processing”, 4th edition, Pearson, 2018.
2. Yao wang, Jorn Ostermann and Ya – Quin Zhang, “Video Processing and Communication”, 1st edition, Pearson, 2010.

REFERENCE BOOKS:

1. Anil . K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 2002.
2. A.Murat. Tekalp, “Digital video Processing”, Prentice Hall International, 2nd edition, 2015.

19EC438 SOFTWARE DEFINED RADIO

SOURCE:
https://www.electronics-notes.com/images/sdr-ni-usrp-01.jpg

Hours Per Week :

L	T	P	C
3	-	-	3

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to provide knowledge of fundamental and state-of-the art concepts in software defined radio.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes
1	Acquire knowledge on SDR, design principles.
2	Analyse the Performance of RF Receiver Design and subsystem design challenges.
3	Investigate and identify Digital Hardware Choices Key Hardware Elements, DSP Processors, FPGA, through case study of different SDR platforms.
4	Apply concepts of SDR in digital communication systems.

SKILLS:

- ✓ *Identify and choose SDR for a particular application.*
- ✓ *Identify hardware requirement for SDR.*
- ✓ *Choose SDR platform for specific communication application.*

UNIT - I **L-9**

INTRODUCTION TO SDR: Application of SDR in advanced communication systems, Challenges and issues regarding the implementation of SDR, Adaptive wireless communication systems, Spectrum efficiency and soft spectrum usage, Spectrum sensing, design principles of SDR.

UNIT - II **L-9**

CHALLENGE OF RECEIVER DESIGN: RF receiver front-end topologies, Enhanced flexibility of the RF chain with software radios, Importance of the components to overall performance, Transmitter architectures and their issues, Noise and distortion in the RF chain.

UNIT - III **L-9**

ADC AND DAC DESIGN CHALLENGES: Direct digital synthesis with analog signal synthesis, Approaches to direct digital synthesis, Analysis of spurious signals, Spurious components due to periodic jitter, Bandpass signal generation, Performance of direct digital synthesis systems, Hybrid DDS-PLL systems, Applications of direct digital synthesis.

UNIT - IV **L-9**

DIGITAL HARDWARE CHOICES: Introduction, Key hardware elements, DSP processors, FPGA, Trade-offs in using DSPs FPGAs and ASICs, Power management issues, Combinations of DSPs , FPGAs and ASICs.

UNIT - V **L-9**

INTRODUCTION TO COGNITIVE RADIO: Case study of different SDR platforms, Hands on demos on SDR platform to conduct digital communication experiments.

TEXT BOOKS:

1. Jeffrey H. Reed, “Software Radio: A Modern Approach to Radio Engineering”, 1st edition, Pearson Education, 2002.
2. C. Richard Johnson and Jr.William A. Sethares, “Telecommunication Breakdown”, Prentice Hall, 2003.
3. K. Fazel and S. Kaiser, “Multi-carrier and Spread Spectrum Systems”, Wiley and Sons Publication, 2010.

E-BOOKS:

1. e-learning: sdrforum.org.
2. Tools/Hardware for case study suggested: MATLAB/GNU Radio – SDR platforms suggested -HACK RF / WARP V3/ RTL SDR.