B. Tech Electronics & Communication Engineering Syllabus Structure and Details (July 2020 onwards)

Course No.	Course Name	L	T	P	C	Course No.	Course Name	L	T	P	C
Semester I						**Semester II**					
UPH101	Engineering Physics	3	1	0	8	UCH201	Engineering Chemistry	3	1	0	8
UMA101	Engineering Mathematics-I	3	1	0	8	UMA201	Engineering Mathematics-II	3	1	0	8
UEE101	Basic Electrical Engineering	3	1	0	8	UCSE201	Programming for Problem Solving	4	1	0	10
UHSS101	English Communication	2	0	0	4	UCE201	Engineering Drawing and Computer Graphics	1	0	0	2
UME101	Engineering Workshop	1	0	0	2	UHSS201	Professional Ethics and Human Value	2	0	0	4
UPH171	Engineering Physics Lab	0	0	3	3	UCH271	Engineering Chemistry Lab	0	0	2	2
UEE171	Basic Electrical Engineering Lab	0	0	2	2	UCSE271	Programming for Problem Solving Lab	0	0	3	3
UHSS171	English Communication Practice	0	0	2	2	UCE271	Engineering Drawing and Computer Graphics Lab	0	0	4	4
UME171	Workshop Practice	0	0	4	4						
Contact Hours: 26		**12**	**3**	**11**	**41**	**Contact Hours: 25**		**13**	**3**	**9**	**41**
Semester III						**Semester IV**					
UECE301	Electronic Devices	3	0	0	6	UECE401	Analog and Digital Communication	3	0	0	6
UECE371	Devices & Network Lab	0	0	2	2	UECE471	Analog and Digital Communication Lab	0	0	2	2
UECE302	Digital System Design	3	0	0	6	UECE402	Analog Circuits	3	0	0	6
UECE372	Digital System Design Lab	0	0	2	2	UECE472	Analog Circuits Lab	0	0	2	2
UECE303	Signals and Systems	3	0	0	6	UECE403	Microcontrollers	3	0	0	6
UECE304	Network Theory	3	0	0	6	UECE473	Microcontrollers Lab	0	0	2	2
UCSE306	Data Structure using C	3	0	0	6	UMA401	Numerical Methods and Computer Programming	3	1	0	8
UCSE376	Data Structure using C lab	0	0	2	2	UMA471	Numerical Methods and Computer Programming Lab	0	0	2	2
UHSS371	Group Discussion	0	0	2	2	UCSE404	Data Base Management System	3	0	0	6
UECE305 *	Slot for MC ****										
Total Contact Hours: 23		**15**	**0**	**8**	**38**	**Total Contact Hours: 24**		**15**	**1**	**8**	**40**
Semester V						**Semester VI**					
UECE501	Electromagnetic Waves	3	0	0	6	UECE601	Control Systems	3	0	0	6
UECE571	Electromagnetic Waves Lab	0	0	2	2	UECE602	Computer Network	3	0	0	6
UECE502	Computer Architecture	3	0	0	6	UECE672	Computer Network Lab	0	0	3	3
UECE503	Probability Theory and Stochastic Processes	3	0	0	6	UECE673	VLSI Design lab	0	0	3	3
UECE504	Digital Signal Processing	3	0	0	6	UECE694	Mini Project/ Electronic Design workshop	0	0	4	4
UECE574	Digital Signal Processing Lab	0	0	2	2	UECE615	A. Antennas and Propagation B. Speech and Audio Processing	3	0	0	6
UECE515	A. Nano electronics B. Scientific computing	3	0	0	6	UECE616	A. CMOS IC Design B. Power Electronics (OE-2)	3	0	0	6
UECE516	A. Bio-Medical Electronics B. Introduction to MEMS (OE-1) C. Optimization Theory	3	0	0	6	UHSS601	Engineering Economics	3	0	0	6
Total Contact Hours 22		**18**	**0**	**4**	**40**	**Total Contact Hours 25**		**15**	**0**	**10**	**40**
Semester VII						**Semester VIII**					
UECE711	A. Microwave Theory and Techniques B. Spread Spectrum Communication	3	0	0	6	UECE811	A. Fiber Optic Communications B. Mobile Communication and Networks	3	0	0	6
UECE712	A. Signal Detection and Estimation Theory B. RADAR and Electronic Navigation Systems	3	0	0	6	UECE812	A. Information Theory and Coding B. Error correcting codes	3	0	0	6
UECE713	A. Adaptive Signal Processing B. Satellite Communication (OE-3)	3	0	0	6	UECE813	A. Digital Image & Video Processing B. Wireless Sensor Networks (OE-5)	3	0	0	6
UECE714	A. Embedded systems B. Wavelets C. Machine Learning and Computer Vision (OE-4)	3	0	0	6	UECE814	A. Mixed Signal Design B. High Speed Electronics (OE-6)	3	0	0	6

ECE795	Project Stage-**I**	0	0	8	8	UECE895	Project Stage-**II**	0	0	8	8
ECE796	Industrial Training	0	0	2	2	UECE896	Seminar	0	0	4	4
UHSS701	Industrial Management	3	0	0	6	UECE897	Grand Viva	0	0	4	4
Contact Hours: 25		**15**	**0**	**10**	**40**	**Contact Hours: 28**		**12**	**0**	**16**	**40**
Total Mandatory Credits: 320											

Semester I

Paper code: UPH101
Paper name: Engineering Physics **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

1. **Mathematical Physics:**
   Vector and Scalar field, grad, divergence, curl, Laplacian, line integral, surface integral, volume integral, physical examples in the context of electricity and magnetism, Stokes theorem, Gauss theorem (No proof). [5]

2. **Electrodynamics:**
   Gauss Law of electrostatics, Biot-Savart Law, Ampere's Law, Displacement current, Equation of Continuity, Maxwell's equations in differential and integral form, Maxwell's wave equation in free space, propagation of EM wave in free space, transverse nature of EM wave. [6]

3. **Heat and thermodynamics**:
   Thermodynamic system and state variables, Heat &Work, Zeroth Law, 1^{st} and 2^{nd} laws of thermodynamics, Isothermal and adiabatic changes, Carnot theorem, Carnot engine, entropy, pyrometer. [5]

4. **Wave and Oscillations:**
   - Transverse wave on a string, reflection and transmission of waves at boundary, impedance matching, standing waves and their eigen frequencies, acoustics waves and speed of sound.
   - Simple harmonic motion**,** Damped oscillation-its differential equation, energy decay in a damped oscillation, Forced vibration, Resonance, Sharpness of resonance and quality factor. [8]

5. **Introduction to Quantum Mechanics:**
   Wave-Particle duality, Black body radiation, Photoelectric effect, Compton effect, Uncertainty principle, wave function, the Schrodinger time dependent and time independent equations, application of Schrodinger equation for free particle in one dimensional infinite potential box. [6]

6. **Optics and Optoelectronics:**
   - Huygens' Principle, superposition of waves and interference of light, Young's double slit experiment, Newton's rings, Diffraction, Single slit diffraction, grating.
   - LASER: Einstein's theory of matter radiation interaction and A and B coefficients, amplification of light by population inversion, properties of laser: monochromaticity, coherence, directionality and brightness, different types of laser: gas lasers (He-Ne) and solid state laser (Ruby), applications of laser in science, engineering and medicine.
   - Light emitting diodes (LED): device structure, materials, characteristics and figures of merit. [10]

Books / References:

1. *Engineering Physics, Malik and Singh, Tata Mc Graw Hill*
2. *Engineering Physics, Naidu, Pearson*
3. *Engineering Physics, Gupta & Gaur, Dhanpat Rai*
4. *Quantum Mechanics, Ajay Ghatak S. Lokanathan, Trinity*
5. *Quantum Mechanics: A Text Book for undergraduates, Mahesh C Jain, TMH*
6. *Thermodynamics and kinetic theory of gases*, W. Pauli, Dover Publications, 2010
7. *Electromagnetic Theory, Prabir K. Basu&HrishikeshDhasmana, AneBooks*
8. *Introduction to Electrodynamics, David Griffiths*
9. *Electricity, magnetism and light, W. Saslow*
10. *Oscillations and waves in physics, Ian G. Main,*
11. *The physics of vibrations and waves, H.J. Pain,*
12. *Arthur Beiser, Concepts of Modern Physics (Sixth Edition), Tata McGraw-Hill Publication, New Delhi (1988).*

Paper Name: Engineering Physics Lab **Credit: 3**
Paper code: UPH171 **L-T-P: 0-0-3**

List of experiments:

Experiment No 1: To determine the magnetic moment of a bar magnet and the horizontal component of the earth's magnetic field.

Experiment No 2: To study the Hall Effect in semiconductor (Germanium Crystal) and then to calculate the Hall coefficient.

Experiment No 3: To Verify Stefan-Boltzmann law of thermal radiation by electrical method.

Experiment No 4: To determine the coefficient of thermal conductivityof a bad conductor (glass) by using Lee's Disc apparatus.

Experiment No 5: Tostudy the variation of time period of a bar pendulum about different axes and determine the value of acceleration due to gravity (g) at the place.

Experiment No 6: To determine the wavelength of sodium light by measuring the diameters of Newton's Rings.

Experiment No 7: To determine the wavelength of Laser light by using diffraction grating.

Experiment No 8: To determine the grating element by using sodium vapour lamp.

Experiment No 9: To determine the value of Planck's constant with the help of vacuum phototube.

Experiment No 10: To study the current flowing through an external circuit by a potentiometer and determine the internal resistance of a standard cell.

Paper code: UMA101
Paper name: Engineering Mathematics-I **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

Module 1: Calculus-I **(15hours)**

Successive derivative, Libnitz's Theorem, Tangentand Normal, Derivation of arc length (Cartesian and Polar coordinates), curvature, partial derivatives, homogeneous functions. Expansions of functions using Taylor's theorem

Beta and Gamma functions and their properties,applications of definite integrals.

Module2: Sequences and Series **(10 hours)**

Convergence of sequence and series, tests for convergence (Comparison test, Ratio test,Cauchy's Root test),Fourier series, Change of intervals, Half range sine and cosine series.

Module 3:Multivariable Calculus **(15 hours)**

Differentiation of vector functions, scalar and vector filed, gradient of a scalar function, directional derivatives,divergence, curl and their properties, integration of vector functions, line, surface and volume integral, Green's, Gauss's and Stoke's Theorems.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics

Paper code: UHSS101
Paper name: ENGLISH COMMUNICATION **Credit: 4**
Total contact hours:39 **L-T-P: 2-0-0**

Module 1: Vocabulary Building: 1.1 Word Formation 1.2 Root words from foreign languages and their use in English 1.3 Understanding prefixes and suffixes to form derivatives 1.4 Antonyms and Synonyms, Functional Vocabulary,Idioms and Phrasal Verbs	**Contact hours: 3**
Module 2: Basic Writing Skills 1.1 Sentence Structure 1.2 use of phrases and clauses in sentences 1.3 Importance of proper punctuation 1.4 Creating Coherence 1.5 Organizing Principles of paragraph in documents 1.6 technicques of writing precisely	**Contact hours: 4**
Module 3: Identifying Common Errors in Writing 1.1 Subject-verb Agreement 1.2 Noun-pronoun agreement 1.3 Effective Principles of Sentence Structure 1.4 Misplaced Modifiers 1.5 Articles 1.6 Prepositions 1.7 Redundancies 1.8 Cliches	**Contact hours: 4**
Module 4: Nature and Style of Sensible Writing 1.1 Describing 1.2 Defining 1.3 Classifying 1.4 Providing examples or evidence 1.5 Writing Introduction and Conclusio	**Contact hours: 4**
Module 5: Business Writing 1.5 Letter Writing, Memo, Report 1.6 Email 1.7 CV, Resume	**Contact hours: 4**
Module 6: Oral Communication (The Unit involves interactive practice sessions in language Lab) 6.1 IPA Symbols, pronunciation, Intonation, Stress and Rhythm 6.2 Listening Comprehension 6.3 Common Everyday Situations: Conversation and dialogues 6.4 Communication at work place 6.5 Interviews 6.6 Formal Presentations	**Contact hours: 4**
Module 7: Learning Language through Literature 7.1 Novel: R.K. Narayan *The Guide* 7.2 Poem: John Keats *Ode to a Nightingale* and *Ode to a Gracian Urn*	**Contact hours: 4**

BOOKS RECOMMENDED:

(1) Practical English Usage, Michael Swan, OUP,1995
(2) Remedial English Grammar, F.T. Wood, Macmillan, 2007
(3) On Writing Well, William Zinsser, Harper Resource Book, 2001
(4) Study Writing, Liz Hamp-Lyons and Ben Heasely, CUP, 2006
(5) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(6) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP

Paper code: UHSS171
Paper name: English Communication Practice **Credit: 2**
Total contact hours:40 **L-T-P-C: 0-0-2-2**

Module 1Listening Practices 1.1 Enhancing listening skills 1.2 Different types of listening 1.3 How to be a good listener 1.4 Barriers to Effective Listening	**Contact hours: 3**
Module 2: Speaking Skills 2.1 The sounds of English 2.2 Benefits of Speaking 2.3 Self Development through Speaking Skills	**Contact hours: 4**
Module 3: Reading Skills 3.1 Definition 3.2 Kinds of reading 3.3 Critical Reading Practices 3.4 Reading Method 3.5 Reading Speed Skimming Scanning Active Reading	**Contact hours: 4**
Module 4: Writing Skills 4.1 Purpose 4.2 Importance of Style 4.3 Essay 4.4 Business Writing	Contact hours: 4
Module 5: Remedial English Grammar 5.1 Tense 5.2 Subject Verb agreement 5.3 Relative Clauses 5.4 Prepositions 5.5 Understanding voice changes	

BOOKS and Software RECOMMENDED:

(1) Practical English Usage, Michael Swan, OUP,1995
(2) Remedial English Grammar, F.T. Wood, Macmillan, 2007
(3) On Writing Well, William Zinsser, Harper Resource Book, 2001
(4) Study Writing, Liz Hamp-Lyons and Ben Heasely, CUP, 2006
(5) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(6) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP
(7) Study Skills in English, Michael J.Wallace, CUP]
(8) Sky Pronunciation
(9) Tense Buster
(10) Business Writing

Paper code: UME101
Paper name: Engineering Workshop **Credits: 2**
Total contact hours: 12 **L-T-P: 1-0-0**

Module 1: Carpentry shop (2 hrs)

i. Introduction with the shop
ii. Various structure of wood and types of wood
iii. Different types of tools, machine and accessories used in Carpentry shop
iv. Safety Precautions in workshop

Module 2: Fitting Shop (2 hrs)

i. Introduction with the fitting shop
ii. Various marking, measuring, cutting, holding and striking tools
iii. Different Operations like chipping, filing, marking drilling etc.
iv. Working principle of drilling machine, lapping dies etc.

Module 3: Welding Shop (2 hrs)

i. Introduction
ii. Types of Welding, Arc Welding, Gas Welding, Gas Cutting
iii. Welding of dissimilar materials, selection of welding rod material, size of rod and work piece
iv. 3 Different types of flames
v. Elementary symbolic Representation
vi. Safety and precautions

Module 4: Machine Shop (2 hrs)

i. Introduction
ii. Study of Different types of Lathe machine, shaping machine, Drilling machine
iii. Study of Different types of hand tools and machine tools and parts
iv. Safety & precautions

Module 5 :Turning shop (2hrs)

i. Introduction
ii. Various marking, measuring, cutting, holding, and string tools
iii. Working principle of Drilling machine, tapping, dies, its uses
iv. Safety precautions

Module 6: Electrical Shop (2hrs)

i. Introduction
ii. Various terms and instruments used in electrical wiring
iii. Study of different tools used in simple house wiring
iv. Difference between ac and dc line

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(ii) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
(iii) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

Paper code: UME171
Paper name: Workshop Practice **Credits: 4**
Total contact hours: 36 **L-T-P: 0-0-4**

Module 1: Carpentry shop (6 hrs)

Demo of different wood working tools and machines
Demo of different wood working processes
Simple joints like T joints, Cross halving joint, dovetail joint etc.
One simple utility job.

Module 2: Fitting Shop (6 hrs)

Demo of different fitting tools and machines and power tools
Demo of different processes in fitting shop
Squaring of a rectangular metal piece
Making a V-block of metal piece
One simple utility job.

Module 3: Welding Shop (6 hrs)

Demo of different welding tools and machines
Demo of Arc Welding, Gas Welding, Gas Cutter and rebuilding of broken parts with welding
Any one Composite job involving lap joint welding process.

Module 4: Machine Shop (6hrs)

Demo of different machines and their operations
Preferably prepare a simple job (e.g Turning operation etc)

Module 5 Turning shop (6 hrs)

Demo of lathe machine, drilling machine
One job related to plane and taper turning , threading and knurling
One job related to drilling and tapping

Module 6 Electrical Shop (6 hrs)

Demo of simple house wiring and use of tools
One job related to simple house wiring
Fittings of cut outs, fuses and other simple fittings etc.
Difference between Single phase wiring and three phase wiring

Paper code: UEE101
Paper name: Basic Electrical Engineering **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

Module 1: Contact hours: 2
Introduction: Sources of energy; General structure of electrical power systems, Power transmission and distribution via overhead lines and underground cables.

Module 2: Contact hours: 6
DC circuits: Definitions of active, passive, linear, non-linear circuits elements and networks, Kirchoff's laws, Nodal and mesh analysis, voltage and current sources, network theoremssuperposition. Thevenin's, Norton's, maximum power transfer, millman's, and reciprocity
theorems, analysis of simple circuits with DC excitation.

Module 3: Contact hours: 8
Single phase AC circuits: generation of single phase sinusoidal EMF, instantaneous, average and effective value, form and peak factor, examples of other alternating waveforms and average and effective value calculations, concept of phasor and phasor diagrams, lagging and leading of phasors, pure resistive, inductive and capacitive circuits, power factor, complex power, R-L, R-C and R-L-C series circuits, parallel AC circuits, series and parallel resonance.

Module 4: Contact hours: 4
Three phase AC circuits: Generation of three phase EMF, delta and star connections, line and phase value of emf and current, solutions of simple 3-phase balance circuits with resistive and inductive loads, 3-phase power, comparison between 3-phase and 1-phase systems, applications of 3-phase systems.

Module 5: Contact hours: 5
Magnetic circuits: Ampere's circuital law, B-H curve, definition of mmf, flux, flux-density and reluctance, comparison between electric and magnetic circuits, series, parallel and series-parallel circuits and their solutions, energy stored in magnetic circuit, lifting magnets, electromagnetic induction, self and mutual inductance, hysteresis and eddy current losses.

Module 6: Contact hours: 5
Electrical machines: Introduction of electrical machines, classifications (DC and AC machines), transformers, technical specifications, reading of nameplate data, general applications (especially 1-phase and 3-phae induction motors).

Module 7: Contact hours: 5
Electrical measuring instruments: Classification of instruments, essentials of indicating type instruments – deflecting torque, controlling torque, damping, types of indicating instruments, MC and MI type ammeters and voltmeters, extension of range, use of shunts and multiplier, errors and compensation.

Module 8: Contact hours: 5
Electrical installations: Electrical wiring and type, fuse and its ratings, types of wires and cables, LT switch gears: MCB, ELCB, MCCB etc. Earthing and its importance. Electrochemical power sources: primary and secondary cells, classifications of secondary cells based on applications, Lead-acid cell, electrical characteristics of lead-acid cell, maintenance, charging methods of batteries.

Books / References:
(i) D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(ii) D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(iii) B.L. Thereja, A.K. Thereja, " A Textbook of Electrical Technology", S.Chand

Paper code: UEE171
Paper name: Basic Electrical Engineering Lab **Credit: 2**
Total contact hours: 18 **L-T-P: 0-0-2**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, rheostat and wattmeter.
2. Make a measured resistance from a given rheostat
3. Verification of Kirchhoff's laws
4. Verification of Superposition theorem
5. Verification of Thevenin's theorem
6. Verification of Maximum Power Transfer theorem
7. Measurement of voltage, current, power and power factor in single phase AC circuits.
8. Measurement of lamp's filament resistance.
9. Wiring

Semester II

Paper code: UCH201
Paper name: Engineering Chemistry **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

UNIT:1Molecular Structure and Quantum Mechanics: Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.Molecular orbital and quantum mechanics: Schrodinger equation, Eigen function, orthogonal and orthonormal. (6L)

UNIT:2 Electrochemistry: Electrochemical Cells – EMF of a cell, Electrodes, reference electrodes, application of Nernst equation and related problems. Principle of fuel cell, lead acid battery. Corrosion and material oxidation (4L)

UNIT:3 Reaction dynamics and Thermodynamics: Reaction laws: rate and order; molecularity; first and second order kinetics; (Arrhenious equation) catalysis.Laws and applications of thermodynamics, 1^{st} law and 2^{nd} law, Carnot cycle and related problems.
(8L)

UNIT:4 Instrumental Methods of Analysis: Introduction to sophisticated instrumental techniques for characterization of compounds, materials, metals such as Powder X-ray diffraction, surface area, IR, UV,-Vis, NMR, SEM, TEM and GCMS (3L)

UNIT:5Structure, Reactivity of Organic Molecules and Synthesis of Drug Molecule: Concept of electron displacement and their applications, types of intermediate organic species, brief study of some addition, elimination and substitution reaction, cyclization and ring openings. Benzyne reaction, Chichibabin reaction, Hoffman Exhaustive reactions, few important name reactions, to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule. (5L)

UNIT:6Polymerization: Concepts, classifications and industrial applications; polymerization processes, degree of polymerization (addition and condensation polymerization); preparation, structure and use of some common polymers: plastic (PE, PP, PVC, Bakelite), rubber (natural rubber, SBR, NBR), fibre (nylon 6,6; polyester); conducting and semiconducting polymers.
(4L)

UNIT:7Industrial Chemistry: Solid liquid and gaseous fuels; constituents of coal, carbonization of coal, coal analysis, proximate and ultimate analysis, classification of coal, petroleum, gasoline. Octane number, cetane number, aviation fuel, natural gas, water gas.
(4L)

UNIT:8 Materials Engineering: Concept of nano-chemistry, new forms of carbon, S.W.C.N.T., M.W.C.N.T., Liquid crystals. (4L)

UNIT:9 Biochemistry: Carbohydrates, lipids, amino acids, proteins, Nucleic acid– DNA and RNA, Vitamins and hormones – sources and application. (2L)

Paper name: Engineering Chemistry Lab **Credit: 2**
Papercode: UCH271 **L-T-P: 0-0-2**

Experiment-1: Aim of the experiment:*To determine the coefficient of viscosity of the glycerol by using Ostwald's viscometer.*

Experiment-2: Aim of the experiment:*To determine the surface tension of the given liquid with respect to water at room temperature by using Stalagnometer.*

Experiment-3: Aim of the experiment:*To identify acid radicals be dry and wet tests.*

Experiment-4 Aim of the experiment:*To identify basic radicals be dry and wet tests*

Experiment-5 Aim of the experiment:*Preparation of standard solution of* Na_2CO_3

Experiment-6 Aim of the experiment:*Preparation of standard solution of oxalic acid.*

Experiment-7 Aim of the experiment:*Determination of strength of* H_2SO_4 *by titrating with 0.1 N* Na_2CO_3

Experiment-8 Aim of the experiment:*Determination of strength of NaOH by titrating with 0.1 N HCL*

Experiment-9 Aim of the experiment:*Redox Titration* $KMnO_4$ *Vs* $H_2C_2O_4$

Experiment-10 Aim of the experiment:*Introduction to sophisticated instruments like FT-IR, UV-Visible and GC*

Text/Reference Books:

1. S. Chawla, *A Text Book of Engineering Chemistry*, Dhanpat Rai Publishing Co.
2. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Co.
3. Atkins, *Physical Chemistry*, Oxford.
4. J. D. Lee, *Concise Inorganic Chemistry*, Blackwell Science.
5. V.R. Gowariker, N.V. Viswanathan, J. Sreedhar, *Polymer Science*, New Age International Publisher.
6. A.K. Chandra, *Introductory Quantum Chemistry*, 4th Edition, McGraw-Hill
7. S.K. Ghosh Advanced General Organic Chemistry (A Modern Approach) (Set I & Ii) NCBA Publisher, New Delhi, 2009
8. B. Viswanathan, P. S. Raghavan, Practical Physical Chemistry, Viva
9. Dr. S. Rattan, Experiments in Applied Chemistry, S. K. Kataria& Sons.

Paper code: UMA201
Paper name: Engineering Mathematics-II **Credit: 8**
Total contact hours: 40 **L-T-P: 3-1-0**

Module –1: Matrices **(10 hours)**

Inverse and rank of a matrix,rank-nullity theorem, System of linear equations, Symmetric, skewsymmetric and orthogonal matrices, Determinants, Eigenvalues and eigenvectors, diagonalisation of matrices,Cayley-Hamilton Theorem.

Module-2: **First order ordinary differential equations** **(10 hours)**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree,equations solvable for p, equations solvable for x and y, and Clairaut'sform.

Module -3:Ordinary differential equations of higher orders **(8 hours)**

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation,System of linear differential equations.

Module-4: **Probability and Statistics** **(12 hours)**

Probability spaces, conditional probability, independence; Discrete and continuous random variables and their properties, Independent random variables; Expectation of Discrete and continuous random variables, Moments, mean and variance.

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions.

Reference /Text Books

1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
8. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
9. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
10. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
11. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
12. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

Paper code: UCSE201
Paper name: Programming for Problem Solving **Credit: 10**
Total contact hours: 75 **L-T-P: 4-1-0**

Module 1: Introduction to Programming Contact hours: 10

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm. Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module 2: Arithmetic expressions and precedenceContact hours: 7

Module 3: Conditional Branching and LoopsContact hours: 8

Writing and evaluation of conditionals and consequent branching
Iteration and loops

Module 4:ArraysContact hours: 7

Arrays (1-D, 2-D), Integer arrays and Strings

Module 5: Basic AlgorithmsContact hours: 8

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Module 6:FunctionContact hours: 8

Functions (including using built in libraries), Parameter passing in functions, call by value,
Passing arrays to functions: idea of call by reference

Module 7:RecursionContact hours: 5

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module 8:StructureContact hours: 6

Structures, Defining structures and Array of Structures

Module 9:PointersContact hours: 8

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Module 10:File handlingContact hours: 8

Books / References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Paper code: UCSE271
Paper name: Programming for Problem Solving Lab **Credit: 3**
Total contact hours: 45 **L-T-P: 0-0-3**

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 and 9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Paper code: UCE201
Paper name: Engineering Drawing and Computer Graphics **Credit: 2**
Total contact hours: 12 **L-T-P: 1-0-0**

Module 1: Theory of Lettering and Plane Curves **Contact hours: 2**

Essentials of lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Theory of Projection of Points, Lines and Plane SurfacesContact hours: 2

Introduction to orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Theory of Projection of Solids **Contact hours: 2**

Introduction to the concepts and description of methods of drawing projections of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Theory of Projection of Sectioned Solids and Development of Surfaces
Contact hours: 2
Introduction to the concepts and description of sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Theory of Isometric and perspective projections **Contact hours: 2**

Principles of isometric projection – Introduction to the concepts and description of isometric scale – Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones-combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Module 6: Basics of AutoCAD **Contact hours: 2**

Introduction to AutoCAD, Basics of AutoCAD: applicability and capability, DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Books / References:

1. *Bhatt N.D. and Panchal V.M., —Engineering Drawing‖, Charotar Publishing House, 50th Edition, 2010.*
2. *Basant Agarwal and Agarwal C.M., —Engineering Drawing, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.*
3. *Venugopal K. and Prabhu Raja V., —Engineering Graphics, New Age International (P) Limited, 2008.*
4. *Natrajan K.V., —A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2009.*
5. *Gopalakrishna K.R., —Engineering Drawing (Vol. I&II combined), Subhas Stores, Bangalore, 2007.*
6. *N S ParthasarathyAnd Vela Murali, —Engineering Graphics, Oxford University, Press, New Delhi, 2015.*
7. *Shah M.B., and Rana B.C., —Engineering Drawing, Pearson, 2nd Edition, 2009.*

Paper code: UCE271
Paper name: Engineering Drawing and Computer Graphics Lab **Credit: 4**
Total contact hours: 48 **L-T-P: 0-0-4**

Module 1: Lettering and drawingplane curvesContact hours: 8

Lettering, Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

Module 2: Drawing projection of points, lines and plane surfacesContact hours: 8

Drawing orthographic projection-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module 3: Drawing projection of solids **Contact hours: 8**

Drawing projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Module 4: Drawing projection of sectioned solids and development of surfaces
Contact hours: 8
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.

Module 5: Drawing isometric and perspective projections **Contact hours: 8**

Drawing isometric projections – isometric scale –Isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Module 6: AutoCAD practice **Contact hours: 8**

Familiarization of AutoCAD application software, Use of DRAW tools, MODIFY tools, TEXT, DIMENSION, PROPERTIES.

Paper code: UHSS201
Paper name: Professional ethics and human values **Credit: 4**
Total contact hours: 40 **L-T-P-C: 2-0-0-4**

Module 1: Engineering Ethics Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – Kohlberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self-interest – customs and religion – uses of ethical theories	**Contact hours: 4**
Module 2: Engineering as Social Experimentation Engineering as experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – the challenger case study	**Contact hours: 4**
Module 3: Responsibility for safety Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk	**Contact hours: 4**
Module 4: Responsibilities and Rights Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – intellectual property rights – discrimination	**Contact hours: 4**
Module 5: Global issues Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct	**Contact hours: 4**

TEXTBOOKS/REFERENCES:

1. Mike Martin and Roland Schinzinger, "*Ethics in Engineering*", McGraw Hill, New York, 1996.
2. Charles D Fleddermann, "*Engineering Ethics*", prentice Hall, New Mexico, 1999.
3. LauraSchlesinger, "*How Could You Do That: The Abdication of Character, Courage, and Conscience*", Harper Collins, New York, 1996.
4. Stephen Carter, "*Integrity*", Basic Books, New York, 1996.

Semester III

UECE301	**Electronic Devices**	**3L: 0T: 0P Total contact hours: 3**	**6 credits**

Module 1
Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors (10L)

Module 2
Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode (8L)

Module 3
Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell (12L)

Module 4
Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process. (10L)

Total: 40L

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, "Operation and Modelling of the MOS Transistor," Oxford Univ. Press, 2011.

Course Outcomes:

At the end of this course students will demonstrate the ability to
1. Understand the principles of semiconductor physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

UECE371: Devices & Network Lab [0L: 0T: 2P] (2 credits)
Total contact hours: 02/Week

Hands-on experiments related to the course contents **UECE301 and UECE304**

UECE302	Digital System Design	3L: 0T: 0P Total contact hours: 3	6 credits

Module 1
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion. (5L)

Module 2
MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU (8L)

Module 3
Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation (10L)

Module 4
Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices. (10L)

Module 5
VLSI Design flow: Design entry: Schematic, FSM & HDL, different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits. (8L)

Total: 41L

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition, 2012.

Course outcomes:

At the end of this course students will demonstrate the ability to
1. Design and analyze combinational logic circuits
2. Design &analyze modular combinational circuits with MUX/DEMUX, Decoder, and Encoder
3. Design &analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation

UECE372: Digital System Design Laboratory [0L: 0T: 2P] (2 credits)
Total contact hours: 02/Week

Hands-on experiments related to the course contents **UECE302**

UECE303	Signals and System	3L: 0T: 0P Total contact hours: 3	6 credits

Module 1
Signals and systems as seen in everyday life, and in various branches of engineering and science. (4L)

Module 2
Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. (6L)

Module 3
Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behaviour with a-periodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems.System representation through differential equations and difference equations.
(8L)

Module 4
Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases, The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour. (12L)

Module 5
The z-Transform for discrete time signals and systems- Eigen functions, region of convergence, z-domain analysis. (4L)

Module 6
State-space analysis and multi-input, multi-output representation.The state-transition matrix and its role.The Sampling Theorem and its implications- Spectra of sampled signals. (4L)

Module 7
Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects.Relation between continuous and discrete time systems. (4L)
Total: 42L
Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
6. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
10. Ashok Ambardar,"Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.

Course outcomes:
At the end of this course students will demonstrate the ability to
1. Analyze different types of signals
2. Represent continuous and discrete systems in time and frequency domain using different transforms
3. Investigate whether the system is stable
4. Sampling and reconstruction of a signal

UECE304	Network Theory	3L: 0T: 0P Total contact hours: 3	6 credits

Module 1
Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's (10L)

Module 2
Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation. (10L)

Module 3
Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. (10L)

Module 4
Transient behaviour, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviours of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters. (15L)

Total: 45L

Text/Reference Books

1. Van, Valkenburg.; "Network analysis" ; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Course Outcomes:

At the end of this course students will demonstrate the ability to
1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

UCSE306	Data Structure using C	3L: 0T: 0P Total contact hours: 3	6 credits

Module 1
Introduction: Arrays and strings; packing; space arrays; algorithm development; complexity; simple example of algorithm development; recursion. (5L)

Module 2
Search and Sort: Linear search**,** Divide and conquer binary search; selection and insertion sort; merge-sort; quick sort; complexity of sorting and searching. (7L)

Module 3
Linear lists: Stack, operations and applications of stack, queue, operations and applications of queue, circular queue. (5L)

Module 4
Linked list: Single, double linked list, creation and deletion of nodes; circular and deletion of nodes; circular and doubly linked lists; applications of list. (7L)

Module 5
Graphs:graph algorithms; optimisation and greedy method; minimum spanning tree, shortest path, Breadth first and depth first traversal. (6L)

Module 6
Trees: Trees, AVL trees; threaded trees; heap-sort; tries and B-trees, external search. (5L)

Module 7
Tables: hashing, String algorithms-pattern search and text editing. (5L)

Total: 40L

Suggested Text Books & References

1. Wirth Niclaus, "Algorithms +Data Structures = Programs", Prentice Hall International, 1978.
2. Horwitz, E., and Sahni, S. "Fundamentals of data structures", Computer Science Press. 1978.
3. Knuth, D. "The art of computer programming", Vols. 1-2, Addision-Wesley, 1970-80.
4. Aho A.V., Hopcroft, and Ullman; J.E, "Data Structures and Algorithms", Admission Weseley,1982.
5. Tanonbaum, A.M. and Augenstein, M.J., "Data Structures with Pascal", Prentice II all International, 1985.
6. Trembley and Sorenson, "Data Structures using Pascal McGraw Hill", 1985.
7. Stubbas, D., "Data Structures with Abstract Data Types and Modula 2", Brooks & Cole publications Compo 1987.

Course outcomes:

1. Understand basic data structures like single dimensional/multi dimensional arrays, single/double/circular linked lists, stack and queue.
2. Understand advanced data structures such as tree, graphs and heaps.
3. Understand the algorithms, asymptotic notations to represent their complexity (efficiency).
4. Develop algorithms to use the above mentioned data structures in suitable applications for problem solving.
5. Develop algorithms to perform basic operations such as searching, sorting, retrieving, inserting and deleting of data.

UCSE376: Data Structure using CLaboratory [0L: 0T: 2P] (2 credits)
Total contact hours: 02/Week
Hands-on experiments related to the course contents **UCSE306**

Paper code: UHSS371
Paper name: Group Discussion **Credit: 2**
Total contact hours: 40 **L-T-P-C: 0-0-2-2**

Module 1: Introduction 1.1 Why GD 1.2 Group Discussion as a selection Process 1.3 Topics in GD	Contact hours: 3
Module 2: Outome of GD 2.1 Communication Skills in GD 2.2 Knowledge and Ideas on a given subject 2.3 Leadership and Coordinating capabilities	Contact hours: 4
Module 3: Structure of GD 3.1 Initiation Techniques 3.2 Body of the GD 3.3 Summarization and Conclusion	Contact hours: 4
Module 4: Preparation for GD 4.1Practice 4.2Participate 4.3Clarity of speech 4.4 Reading Mocks	Contact hours: 4
Module 5:Successful GD Techniques 5.1Working out with group members 5.2 Avoiding problems 5.3 Time management 5.4 Emotional Outburst 5.5 Quantity and QUALITY 5.6 Egotism/Showing Off 5.7 GD Do's and Don'ts	Contact hours: 4

BOOKS RECOMMENDED:

(1) Soft Skills, S. Hariharan,N.Sundararajan, S.P.Shanmugapriya MJP Publishers, Chennai
(2) Communication Skills, Sanjay Kumar and PushpLata, OUP, 2011
(3) Exercises in Spoken English, Parts-I-III, CIEFL, Hyderabad, OUP

UECE305	**MC : Model Curriculum for Mandatory Non-credit course as per AICTE guidelines** **A: Constitution of India** **or** **B: Essence of IndianTraditional Knowledge**	**0L: 0T: 0P**	**0 credit**

Note: The department will arrange necessary steps to fulfil the requirement for the course in the ECE Department.

Semester IV

UECE401	Analog and Digital Communication	3L: 0T: 0P	6 credits

Module 1 **10L**

Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Module 2 **8L**

Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

Module 3 **6L**

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Module 4 **10L**

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluation (using matched filter). Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band digital modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying (elementary discussion).

Module 5 **8L**

Digital Modulation trade-offs. Optimum demodulation of digital signals over band-limited channels-Maximum likelihood sequence detection (Viterbi receiver). Equalization techniques. Synchronization and Carrier Recovery for Digital modulation.

Total: 42L

Text/Reference Books:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering", John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications", 4th Edition, McGraw Hill, 2000.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behaviour of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

UECE471: Analog and Digital Communication Laboratory [0L: 0T: 2P] (02 credits)
Total contact hours: 02/Week
Hands-on experiments related to the course contents **UECE401**

UECE402	Analog circuits	3L: 0T: 0P	6 credits

Module: 1 **10L**

Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Module: 2 **10L**

High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.); their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Module: 3 **5L**

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.

Module: 4 **8L**

Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.

Module: 5 **5L**

OP-AMP applications: review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.

Module: 6 **7L**

Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc.
Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.
Total: 45L

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, Edition IV
6. Paul R. Gray and Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

Course Outcomes:

At the end of this course students will demonstrate the ability to:
1. Understand the characteristics of diodes and transistors
2. Design and analyze various rectifier and amplifier circuits
3. Design sinusoidal and non-sinusoidal oscillators
4. Understand the functioning of OP-AMP and design OP-AMP based circuits
5. Design ADC and DAC

UECE472: Analog Circuit Laboratory [0L: 0T: 2P] (02 credits)
Total contact hours: 02/Week
Hands-on experiments related to the course contents **UECE402**

UECE403	Microcontrollers	3L: 0T: 0P	6 credits

Module: 1 **4L**

Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086);

Module: 2 **6L**

Introduction to single chip microcontrollers: Intel MCS-51 family features - 8051/8031 architecture - pin configuration - basic assembly language programming & application examples.

Module: 3 **7L**

8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple examples of assembly language program (without loops) to use these instructions.

Module: 4 **8L**

8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops - Delay subroutine, Factorial of an 8 bit number (result maximum 8 bit), Block move without overlap, Addition of N 8 bit numbers, Picking smallest/largest of N 8 bit numbers. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.

Module: 5 **8L**

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin. 8051 Serial Communication-Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.

Module: 6 **7L**

8051 Interrupts and Interfacing Applications: 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a 73 switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804; LCD and stepper motor and their 8051 assembly language interfacing programming.

Total: 40L

Text/Reference Books:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996
2. D A Patterson and J H Hennessy, Computer Organization and Design The hardware and software interface, Morgan Kaufman Publishers.
3. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.
4. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing, 1996.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Do assembly language programming
2. Do interfacing design of peripherals like I/O, A/D, D/A, Timer etc.
3. Develop systems using different microcontrollers
4. Understand RSIC processors and design ARM microcontroller based systems

UECE473: Analog Circuit Laboratory [0L: 0T: 2P] (02 credits)
Total contact hours: 02/Week
Hands-on experiments related to the course contents **UECE403**

UMA401	Numerical Methods and Computer Programming	3L: 1T: 0P	8 credits

Module 1: Transcendental and Polynomial Equations (10 hours)
Methods of iteration for finding solution of algebraic and transcendental equations: Newton Raphson Method, Regula-Falsi Method, Bisection Method, Secant Method. Solution of linear simultaneous equations by Gauss Elimination Method & Gauss Siedal Method.

Module 2: Interpolation and Extrapolation (10hours)
Difference table, Newton's Forward and Backward interpolation formulae, Lagrange's Interpolation Formula.

Module 3: Numerical Differentiation & Integration (10 hours)
Numerical differentiation; Numerical Integration, Trapezoidal, Simpson's Rules and Gaussian Quadrature Formula.

Module 4: Numerical Solution of Ordinary Differential Equations (10 hours)
Euler method, Modified Euler Method, Runge - Kutta Method and Milne's Predictor – Corrector Method.

Total : **40L**

Textbooks/References:

1. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI learning Pvt Ltd.
2. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical Methods for Scientific and Engineering computation, New Age International Publishers.
3. E. Balagurusamy, Numerical Method, Tata McGraw Hill Publication.
4. Xavier: C Language and Numerical Methods.
5. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

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UMA471: Numerical Methods and Computer Programming Lab [0L: 0T: 2P] (02 credits)
Total contact hours: 02/Week
Hands-on experiments related to the course contents **UMA401**

List of Experiments

1. Program to find a root of a nonlinear equation using the Method of Bisection.
2. Program to find a root of a nonlinear equation using the Method of Regula-Falsi method.
3. Program to find the root of a nonlinear equation using the Newton-Raphson method.
4. Program to find the root of a nonlinear equation using the Secant Method.
5. Program to construct Lagrange's interpolation polynomial method.
6. Program to evaluate a definite integral by Trapezoidal rule
7. Program to evaluate a definite integral by Simpson's 1/3 rule.
8. Program to evaluate a definite integral by Simpson's 3/8 rule.
9. Program to find the solution of initial value problem using Euler's method.
10. Program to find the solution of initial value problem using improved Euler's method.
11. Program to find the solution of initial value problem using Modified Euler's method.
12. Program to find solution of initial value problem using fourth order Runge Kutta method.
13. Program to find solution of initial value problem using third order Runge Kutta method.
14. Program for solving ordinary differential equation by Milne method.

Text/ Reference Books

9. Introductory Methods of Numerical Analysis: S.S. Sastry, PHI learning Pvt Ltd.
10. Numerical Methods for Scientific and Engineering computation: M.K Jain, S.R.K Iyengar and R.K Jain, New age Inter-national Publishers.
11. Numerical Method: E. Balagurusamy, Tata McGraw Hill Publication.
12. Xavier: C Language and Numerical Methods.

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UCSE404	Data Base Management System	3L: 0T: 0P	6 credits

Module 1: Foundations [3L]

Introduction: Database System Concepts and architecture, Data models, scheme and instances, Data independence Database language and Interface.

Module 2: Entity Relationship Model and Relational Data Model and Language [9L]

Data Modelling Using the Entity-Relationship Model: ER model concepts, Notations for ER diagram, Extended E.R. model, Relationships of higher degree. Relational Data Model and Languages: Relational data Model concepts, constraints, relational algebra. Relational Calculus, Tuple and Domain calculus. SQL, data definitions queries and up-dates in SQL, QBE, Data definitions, queries and up-dates in QBE

Module 3: DBMS Software [5L]

Example DBMS System (MySQL/ORACLE/INGRESS/SYBASE), Basic architecture. Data definitions Data Manipulation.

Module 4: Database Design [7L]

Functional dependencies, Normal forms, First, second, and third functional personal normal forms. BCNF. Multi-valued dependencies Fourth Normal form. Join Dependencies and Fifth Normal form, Inclusion Dependencies.

Module 5: Query Processing and Optimisation [5L]

Algorithms for executing query operations, Heuristics for query optimisations.

Module 6: Transaction and Concurrency [6L]

Transaction and system concepts, schedules and Recoverability serializability of schedules.
Concurrency Control Techniques: Locking Techniques for concurrency control Time stamping and concurrency control.

Total: 35

Suggested Text Books & References

1. Raghu Ramakrishnan and Johannes Gehkre, “Database Management System”, Mc. Graw Hill, Third Edition
2. Elmasri, Ramex Shamkant B. Navathe, "Fundamentals of Data base Systems".
3. Jeffry D. Ulman, "Principles of Data Base Systems", Second Edition Galgotia Pub.
4. Date, C.J. "An Introduction to Database System", Vol. I, II & IIIrd, Addison-Welsey.
5. Prakash, Naveen., "Introduction to Database Management", Tata McGraw Hill

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