

B.Tech Computer Science and Engineering Syllabus Structure and Details (July 2019 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: 26		13	3	9	41
Semester III						Semester IV					
UECE306	Digital Electronics & Logic Design	3	0	0	6	UCSE401	Computer Organization & Architecture	3	0	0	6
UCSE301	Data Structures & Algorithms	3	1	0	8	UCSE402	Probability Theory and Random Process	2	0	0	4
UMA302	Discrete Mathematics	3	1	0	8	UCSE403	Design & Analysis of Algorithms	3	0	0	6
UCSE302	Elementary Number Theory and Algebra	3	0	0	6	UCSE404	Database Management Systems	3	0	0	6
UCSE303	Object Oriented Programming using Java	3	0	0	6	UHSS401	Engineering Economics	3	0	0	6
UCSE373	Object Oriented Programming Lab	0	0	3	3	UCH401	Environmental Sciences	2	0	0	0
UCSE371	Data Structures & Algorithms Lab	0	0	3	3	UHSS471	Language Lab	0	0	2	2
UCSE374	System Software Lab	0	1	3	5	UCSE473	Design & Analysis of Algorithms Lab	0	0	3	3
						UCSE474	Database Management Systems Lab	0	0	3	3
Total Contact Hours 27		15	3	9	45	Total Contact Hours 24		16	0	8	36
Semester V						Semester VI					
UCSE501	Computer Networks	3	0	0	6	UCSE601	Compiler Design	3	0	0	6
UCSE502	Operating Systems	3	0	0	6	UCSE602	Software Engineering	2	0	0	4
UCSE503	Formal Language & Automata Theory	3	0	0	6	UCSE603	Machine Learning	3	0	0	6
UCSE51*	Professional Elective-I	3	0	0	6	UCSE61*	Professional Elective-II	3	0	0	6
UHSS501	Industrial Management Entrepreneurship	3	0	0	6	UCSE675	Implementation of Programming Languages Laboratory	0	2	3	7
UCSE571	Computer Networks Lab	0	0	3	3	UCSE672	Software Engineering Laboratory	0	0	3	3
UCSE572	Operating Systems Lab	0	0	3	3	UHSS601	Professional Communication	2	0	0	4
UCSE573	Hardware Laboratory	0	1	3	5	UCSE601	Compiler Design Laboratory	0	0	3	3
						UCSE691	Design Lab	0	0	2	2
Total Contact Hours 25		15	1	9	41	Total Contact Hours 26		13	2	11	41
Semester VII						Semester VIII					
UCSE701	Optimization	3	0	0	6	UCSE81*	Professional Elective-V	3	0	0	6
UCSE71*	Professional Elective-III	3	0	0	6	**	Open Elective-III	3	0	0	6
UCSE71*	Professional Elective-IV	3	0	0	6	**	Open Elective-IV	3	0	0	6
**	Open Elective-I	3	0	0	6	UECE893	Project II	0	0	12	12
UCSE792	Project I	0	0	8	8	UECE894	Grand Viva	0	0	2	2
UCSE794	Industrial Training	0	0	0	0						
Total Contact Hours: 20		12	0	8	32	Total Contact Hours: 23		9	0	14	32
Total Mandatory Credits: 310											

Semester I

Paper code: UPH101

Paper name: Engineering Physics Credit: 8

Total contact hours: 40L-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, 1st and 2nd 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 & Hrishikesh Dhasmana, 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

Paper code: UPH171

Credit: 3

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 conductivity of a bad conductor (glass) by using Lee's Disc apparatus.

Experiment No 5: To study 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

Total contact hours: 40L-T-P: 3-1-0

Credit: 8

Module 1: Calculus-I

(15hours)

Successive derivative, Libnitz's Theorem, Tangent and 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.

Module 2: 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 field, 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, 11th Reprint, 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

Total contact hours: 39

Credit: 4

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	Contact hours: 4

1.6 techniques of writing precisely	
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 <i>The Guide</i> 7.2 Poem: John Keats <i>Ode to a Nightingale</i> and <i>Ode to a Gracian Urn</i>	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 Heasley, 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: 40L-T-P-C: 0-0-2-2

Module 1: Listening 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 Heasley, 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

Total contact hours: 12

Credits: 2

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

(2 hrs)

- 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

(2 hrs)

- 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

(6 hrs)

- 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

Total contact hours: 40

Credit: 8

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 theorems superposition. 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-phase 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

Total contact hours: 18

Credit: 2

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

Total contact hours: 40

Credit: 8

L-T-P: 3-1-0

UNIT:1 Molecular 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, 1st law and 2nd 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:5 Structure, 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:6 Polymerization: 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:7 Industrial 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
Papercode: UCH271

Credit: 2
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 by dry and wet tests.

Experiment-4: Aim of the experiment: To identify basic radicals by 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 $\text{H}_2\text{C}_2\text{O}_4$

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

Total contact hours: 40

Credit: 8

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's form.

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

Total contact hours: 75

Credit: 10

L-T-P: 4-1-0

Module 1: Introduction to ProgrammingContact 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

Total contact hours: 45

Credit: 3

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 GraphicsCredit: 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 Surfaces Contact 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 Drawingll, 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 Parthasarathy And 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

Total contact hours: 48

Credit: 4

L-T-P: 0-0-4

Module 1: Lettering and drawingplane curves Contact 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 surfaces Contact 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

Total contact hours: 40

Credit: 4

L-T-P-C: 2-0-0-4

<p>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</p>	<p>Contact hours: 4</p>
<p>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</p>	<p>Contact hours: 4</p>
<p>Module 3: Responsibility for safety Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk</p>	<p>Contact hours: 4</p>
<p>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</p>	<p>Contact hours: 4</p>
<p>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</p>	<p>Contact hours: 4</p>

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

UECE306: Digital Electronics & Logic Design
Total Contact Hours: 45

Credit: 6
L-T-P: 3-0-0

Module 1:

Contact hours: 15

Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes.

Floating point representation

Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, QuineMc-Clusky method (Tabular method).

Module 2:

Contact hours: 10

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers

Module 3:

Contact hours: 10

Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.

Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.

Module 4:

Contact hours: 6

Memory and programmable logic: RAM, ROM, PLA, PAL.

Design at the register transfer level: ASMs, design example, design with multiplexers.

Module 5:

Contact hours: 4

Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

Books/References:

1. *M. Morris Mano and M. D. Ciletti, Digital Design, 4th Edition, Pearson Education*
2. R. H. Katz and G. Boriello, **Contemporary Logic Design**, 2/e, Prentice Hall of India, 2009.
3. A. P. Malvino, D. P. Leach and G.Saha, **Digital Principles and Applications**, 7/e, McGraw Hill, 2010.
4. Z. Kohavi and N. Jha, **Switching and Finite Automata Theory**, 3/e, Cambridge University Press, 2010.
5. S. C. Lee, **Digital Circuits and Logic Design**, Prentice Hall of India, 2006.
6. J. F. Wakerly, **Digital Design Principles and Practices**, 4/e, Prentice Hall of India, 2008.

UCSE301: Data Structures and Algorithms
Total Contact Hours: 60

Credit: 8
L-T-P:3-1-0

Module 1:

Contact hours: 14

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Abstract Data Types (ADT).

Performance of algorithms: space and time complexity measures, asymptotic, worst case and average case analyses, lower and upper bounds. Operations on data;

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List- Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

Module 2:

Contact hours: 10

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion

Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

Module 3:

Contact hours: 6

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm. Application of trees;

Module 4:

Contact hours: 10

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm, Introduction to Activity Networks

Module 5:

Contact hours: 12

Searching: Sequential search, Binary Search, Comparison and Analysis

Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees

Module 6:

Contact hours: 8

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

File Structures: Sequential and Direct Access, Relative files, Indexed files, B+ tree as index, Multi-index files, Hashed files.

Books/References:

1. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, J. E. Ullman,

Addison Wesley.

2. Fundamentals of Data Structures, E. Horowitzz, S. Sahni, Galgotia Publ.
3. Data Structures using C, A.S. Tanenbbaum
4. Algorithms, Data Structures, and Problem Solving, Addision Wesley.
5. Data Mangement and File Structures, Loomis, Marry, PHI
6. Data Structures & Algorithm Analysis in C++, M. A. Weiss, Addision Wesley.
7. Theory and Problems of Data Structures, Lipshutz, McGraw Hill.
8. Learning with C++, Neil Graham, MacGraw Hill

UMA302: Discrete Mathematics

Total Contact Hours: 60

Credit: 8

L-T-P: 3-1-0

Module 1:

Contact hours: 10

Sets, Relations and Functions:

Basic operations on sets, Cartesian products, disjoint union (sum) and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.

Module 2:

Contact hours: 10

Propositional Logic:

Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic, introduction to first order logic and first order theory.

Module 3:

Contact hours: 10

Partially ordered sets:

Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices, Boolean and pseudo Boolean lattices.

Module 4:

Contact hours: 15

Algebraic Structures:

Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, subgroup, normal subgroup, homomorphism. Congruence relation and quotient structures. Algebraic structures with two binary operations- ring, integral domain, and field. Boolean algebra and Boolean ring (Definitions and simple examples only).

Module 5:

Contact hours: 15

Introduction to Graphs:

Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian graph, walk, trees.

Books/References:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
2. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, WorldScientific, 1999.
3. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., AddisonWesley, 1994.
4. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
6. N. Deo, Graph Theory, Prentice Hall of India, 1974.
7. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.

8. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

UCSE302: Elementary Number Theory and Algebra
Total Contact Hours: 45

Credit: 6
L-T-P: 3-0-0

Module 1:

Contact hours: 25

Number theory: Well ordering principle, principle of mathematical induction; Division algorithm, GCD and LCM, Euclidean algorithm, linear Diophantine equation; Primes, the fundamental theorem of arithmetic; Properties of congruences, linear congruences, chinese remainder theorem; Fermat's little theorem; Arithmetic functions, Mobius inversion formula, Euler's theorem; Primitive roots; Introduction to cryptography, RSA cryptosystem, distribution of primes.

Module 2:

Contact hours: 20

Algebra: Groups, subgroups, cyclic groups, permutation groups, Cayley's theorem, cosets and Lagrange's theorem, normal subgroups, quotient groups, homomorphisms and isomorphism theorems; Rings, integral domains, ideals, quotient rings, prime and maximal ideals, ring homomorphisms, field of quotients, polynomial rings, factorization in polynomial rings, fields, characteristic of a field, field extensions, splitting fields, finite fields.

Books/ References:

1. D. M. Burton, Elementary Number Theory, 7th Ed., McGraw Hill, 2017.
2. J. A. Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1998.
3. I. Niven, S. Zuckerman and H. L. Montgomery, An Introduction to the Theory of Numbers, 5th Ed., Wiley-India, 1991.
4. G. A. Jones and J. M. Jones, Elementary Number Theory, Springer, 1998
5. K. H. Rosen, Elementary Number Theory and its Applications, Pearson, 2015
6. I. N. Herstein, Topics in Algebra, Wiley, 2004.
7. J. B. Fraleigh, A First Course in Abstract Algebra, Addison Wesley, 2002.
8. Kenneth H Rosen, Discrete Mathematics and Its Applications, McGraw Hill Education; 7 edition

UCSE303: Object Oriented Programming using Java
Total Contact Hours: 45

Credit: 6
L-T-P: 3-0-0

Module 1:

Contact hours: 4

Basics of Java

Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue.

Module 2:

Contact hours: 3

Array and String

Single and Multidimensional Array, String class, StringBuffer class, Operations on string, Command line argument, Use of Wrapper Class.

Module 3:

Contact hours: 8

Classes, Objects and Methods

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.

Module 4:

Contact hours: 10

Inheritance and Interfaces

Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instanceof operator, Interface inheritance, Dynamic method dispatch, Understanding of Java Object Class, Comparison between Abstract Class and interface, Understanding of System.out.println – statements.

Module 5:

Contact hours: 4

Package

Use of Package, CLASSPATH, Import statement, Static import, Access control

Exception Handling

Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class.

Module 6:

Contact hours: 5

Multithreaded Programming

Use of Multithread programming, Thread class and Runnable interface, Thread priority, Thread synchronization, Thread communication, Deadlock

Module 7:

Contact hours: 6

IO Programming

Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader

Collection Classes

List, AbstractList, ArrayList, LinkedList, Enumeration, Vector, Properties, Introduction to Java.util package

Module 8:

Contact hours: 5

Networking with java.net

InetAddress class, Socket class, DatagramSocket class, DatagramPacket class

Introduction to Object orientation

Introduction to Object orientation, Modeling as a Design Technique Modeling Concepts, abstraction, The three models, Class Model, State model and Interaction model.

Books/References:

1. Java Fundamentals A comprehensive introduction By Herbert Schildt, Dale Skrien, McGraw Hill Education.
2. Programming with Java A Primer – E. Balaguruswamy, McGrawhill
3. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, - TMH.
4. Core Java Volume-I Fundamentals Horstmann & Cornell, - Pearson Education. - Eight Edition
5. Object Oriented Modeling and Design with UML Michael Blaha and James Rumbaugh – PEARSON second edition
- 6) UML Distilled: A Brief Guide to the Standard Object Modeling Language (3rd Edition) by Martin Fowler

UCSE374: System Software Lab
Total Contact Hours: 15

Credit: 5
L-T-P: 0-1-3

Module 1:

Contact hours: 4

Overview of Unix system, commands and utilities;

Basic Linux administration and installation: grub, rpm, yum, disk partitioning; basic Linux utilities, logging, backup, authentication;

Module 2:

Contact hours: 4

Internet mail system: send mail, elm, mail administration;

Program maintenance: make, sccs, debugging with gdb and ddd;

Archiving: shar, tar; shell use: redirection, .cshrc, environment variables;

Module 3:

Contact hours: 5

Regular expression parsing: grep, egrep, sed, awk; Unix system calls related to processes, the file structure & devices and inter-process communication;

Shell programming: bash; scripting Languages like Perl, Python, Java Script;

Module 4:

Contact hours: 2

Documentation and presentation: document writing and slides using LaTeX.

Books/ References:

1. E. Nemeth, G. Snyder and T. R. Hein, Linux Administration Handbook, Prentice Hall PTR, 2002.
2. L. Wall, T. Christainsen and J. Orwant, Programming PERL, 3rd Ed, OReilly, 1999.
3. B.W. Kernighan and R. Pike, The UNIX Programming Environment, Pearson, 2015.
4. S. Kochan and P. Wood, Unix Shell programming, 3rd Ed, SAMS, 2003.
5. S. Das, Unix System V.4 Concepts and Applications, 3rd Ed, Tata Mcgraw-Hill, 2003.
6. J. Corbet, A. Rubini, G. Kroah-Hartman, Linux Device Drivers 3rd Edition, O'Reilly & Associates, 2005.
7. D. Flanagan, Javascript: The Definitive Guide, Fifth Edition, O'REILLY, 2006.
8. W.R. Stevens and S.A. Rago, Advanced Programming in the UNIX Environment, 3rd Edition, Addison-Wesley, 2013.
9. L. Lamport, LaTeX: A Document Preparation System, 2nd Edition, Addison-Wesley Series, 1994.

UCSE371: Data Structures and Algorithms Lab

Credit: 3

Total Contact Hours: 45

L-T-P: 0-0-3

Laboratory Experiments:

Linear Data Structure

1 Implementation of array operations

2 Stacks and Queues: adding, deleting elements Circular Queue: Adding & deleting elements

3 Merging Problem: Evaluation of expressions operations on Multiple stacks & queues:

4 Implementation of linked lists: inserting, deleting, inverting a linked list. Implementation of stacks & queues using linked lists

5 Polynomial addition, Polynomial multiplication

Non Linear Data Structure

6 Recursive and Non-recursive traversal of Trees

7 Threaded binary tree traversal. AVL tree implementation

8 Application of Trees. Application of sorting and searching algorithms

9 Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Laboratory Experiments may get modified in consonance with the material covered in UCSE301.

Paper code: UCSE373

Paper name: Object Oriented Programming Lab

Total Contact Hours: 45

Credit: 3

L-T-P: 0-0-3

Laboratory Experiments will be set in consonance with the material covered in UCSE303.

Semester IV

Computer Organization and Architecture (UCSE401)

L-T-P: 3-0-0

Credits: 6

Prerequisites:UECE306: Digital Electronics and Logic Design

Module –I: Introduction (5L)

Generations of computers, Stored programmed Architecture, Basic Components and their interconnection in a computer System, different abstraction levels of computation from problem definition to circuit level implementation, review of digital circuits and digital components.

Module-II: Arithmetic (8L)

Data representation – signed bit, 2's complement, fixed point and floating-point representation (single precision and double precision), different arithmetic algorithms – signed multiplication, restoring and non-restoring division, systolic array multiplication, floating point arithmetic algorithms basic ALU organization.

Module III: CPU Design (6L)

Instruction Set Architecture (ISA): Von Neumann vs. Data Flow. Instruction set, Instruction format, Instruction mode: ISA design trade off, addressing modes, Register Transfer Language and micro operation, design of control unit: microprogrammed and hardwired control unit.

Module IV: Memory (6L)

Memory hierarchy, design of semiconductor memories – SRAM, DRAM, different ROMs, Cache memory – cache mapping techniques, cache replacement algorithms, virtual memory, optical disk – data read/write techniques, magnetic disk -read/write techniques.

Module V: I/O (5L)

Programmed I/O, Concept of handshaking, Polled and Interrupt driven I/O, DMA data transfer; I/O subsystems: I/O interfacing

Module VI: Pipelining and Parallelism (5L)

Basic concepts of pipelining, speedup computation, different pipelining – arithmetic, instruction, stalls in pipelining, remedy from stall, introduction to parallel Processing.

Text Books:

1. M. M. Mano, "Computer System Architecture", Pearson, 3rd Ed., 2007.
2. Stallings, "Computer Organization & Architecture", 8th Ed., Pearson Education, 2009.
3. Hamacher, Zaky, Vranesic, "Computer Organization", TMG, 5th Ed., 2011.

Reference Books:

2. Hennessey and Patterson, "Computer Architecture: A quantitative Approach", 5th Ed., Morgan Kaufman Publication, 2012.

Probability Theory and Random Process (UCSE402)

L-T-P:2-0-0

Credits: 4

Module I: Probability Theory: Definitions of Probability, Axioms of Probability, Probability Spaces, Properties of Probabilities, Joint and Conditional Probabilities, Independent Events, Baye's Theorem and Applications.

Module II: Random Variables: Introduction, Definition of random variable, Discrete and continuous random variables. Probability Distribution Functions, Probability Mass Functions, Probability Density Functions, Joint Distribution of Two Variables, Conditional Probability Distribution and Density, Independent Random Variables, Marginal Probability Distribution, Correlation and Regression.

Module III: Statistical Averages: Functions of Random Variables and Random Vectors, Statistical Averages, Characteristic Function of Random Variables, Inequalities of Chebyshev and Schwartz, Convergence Concepts, Central Limit Theorem and its significant.

Module IV: Random Processes: Stationarity, Ergodicity, Covariance Function and their Properties, Spectral Representation, Weiner-Kinchine Theorem, Linear operations, Gaussian Function, Poisson Processes, Markov Model.

Text Books:

- i) Peebles, P. Probability, Random Variables and Random Signal Principles, 4th Edition, McGraw Hill
- II) Veerarajan, T. Probability, Statistics and Random Process, 3rd Edition, McGraw Hill New Delhi

Reference Books:

- I) Papoulis, A. and Unnikrishna Pillai, S., Probability, Random variables and Stochastic Processes, McGraw Hill
- II) Gardner, W. A: Introduction to Random Processes, (2/e), McGraw Hill.
- III) H. Stark & J.W. Woods: Probability, Random Processes and Estimations Theory for Engineers, (2/e), Prentice Hall.

Design & Analysis of Algorithms (UCSE403)

L-T-P: 3-0-0

Credits: 6

Prerequisites:

UCSE201 Programming for Problem Solving

UCSE301 Data Structures and Algorithms

Detailed Syllabus:

Module 1: Introduction [3L]:

Introduction to the RAM machine of computer, asymptotic notations and their mathematical importance, Time and Space Complexity, best, average and worst case. Introduction to the algorithm paradigms – recursion, divide and conquer, greedy, dynamic programming etc.

Module 2: [3L] Recursion:

Definition, time and space complexity evaluation of different recursive algorithms – factorial, tower of Hanoi etc.

Module 3: [5L] Divide and Conquer:

Basic idea, design and complexity evaluations of different algorithms – binary search, merge sort, quick sort etc.

Module 4: [5L] Greedy Method:

Basic idea, design and complexity evaluations of different algorithms- knapsack problem (fractional), Minimum Spanning Tree etc.

Module 5: [5L] Dynamic Programming:

Basic idea, design and complexity evaluations of different algorithms- Rod cutting problem, matrix chain multiplication etc.

Module 6: [4L] Branch and Bound and Backtracking:

Basic concepts, concepts of lower bound, Traveling Salesperson problem, 8 queens' problem etc.

Module 7: [4L] Graph:

Definition, Graph traversal algorithms – BFS and DFS, graph colouring algorithm, Hamiltonian path and cycle, Shortest path algorithm.

Module 8: [5L] NP completeness:

Basic concepts of reduction, reduction problems – Hamiltonian path to Hamiltonian Cycle and vice versa, classes – P, NP, NP hard, NP Complete, SAT problem, Cook's Theorem and applications

Text Book:

1. Introduction to Algorithms, by Cormen, Leiserson, Rivest, and Stein, MIT Press, Third Edition, 2009.
2. A. Aho, J.Hopcroft and J.Ullman "The Design and Analysis of Algorithms"

Reference Books:

1. Computer Algorithms, by Horowitz, Sahni, and Rajasekaran, Silicon Press, 2007.
2. Design And Analysis Of Algorithms 2nd Edition by Dave and Himanshu, Pearson India,2013.

Database Management Systems (UCSE404)

L-T-P:3-0-0

Credits: 6

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, Relation-ships 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. Multivalued 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.

Suggested Text Books & References:

1. Raghu Ramakrishnan and Johannes Gehkre, "Database Management System", Mc. Graw Hill, Third Edition
2. Elmasri, RamexShamkant 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

ENGINEERING ECONOMICS (UHSS401)

L-T-P:3-0-0

Credits: 6

No of Lectures: 45

Module I: Definition of Economics, Consumer behaviour, Utility analysis and demand analysis, Kinds of Demand, Law of Demand and Law of Supply, Elasticity of Demand: Types and Measurement, Scope of Economics including economics of environment and e-commerce.

Module II: Market forms-Perfect and Imperfect markets, Features of Perfect competition, Monopoly and Monopolistic competition, Price and output determination under Perfect Competition, Monopoly, Monopolistic and Oligopoly etc. Concept of Production function, Cost Analysis, Estimation of cost function-Profit and Break Even Analysis.

Module III: National Income, GNP and NNP, Per-Capita Income, Theory of Production, Concepts of Production, Production function, Law of variable proportions and Law of Return to scale, Source of Public Revenue-Tax Revenue and Non-Tax Revenue, Direct and Indirect Tax, Inflation and Deflation. Banking-Definition-Types and function of Bank. Concept of Investment Analysis.

Module IV: Features of Indian Economy, Economic Reforms in India-Concept of Economic Liberalization, Privatization and Globalization, Unemployment Problem in India-Types, Causes, remedial measures and recent employment generation scheme of Government of India.

Module V: International Trade, Gains from International Trade, The World Trading Environment and Multinational Corporations, BPO etc. Function and Role of IMF, World Bank and WTO. Concept of Stock Exchange Market and Market for Securities.

Reference Books:

- I) Samuelson, P. A. and W. D. Nordhaus, Economics, McGraw Hill, New York
- II) Mishra, Sasmita (2009), Engineering Economics and Costing, Prentice Hall of India Pvt. Limited
- III) Sarma, G. and Debnath, A., Engineering Economics, Kalyani Publishers, New -Delhi
- IV) Dwivedy, D. N. (6th ed), Managerial Economics, Vikas Publishing House
- V) Mishra, R, Engineering Economics, University Science Press, New Delhi
- VI) Datt & Sundharam (latest edition), Indian Economy, S. Chand Publication, New Delhi
- VII) Misra & Puri (latest edition), Indian Economy, Himalaya Publishing House
- VIII) Ahmed, A and Begum, G, Engineering Economics, Chandra Prakesh, Guwahati

Environmental Sciences (UCH401)

(Mandatory non-credit course)

L-T-P:2-0-0 (26 hours)

Credits: 0

Module I: General [1 L]

Basic idea of environment and basic concepts related to perspectives. Man, society and environment and their inter relationship.

Module II: Ecosystem [1 L]

Ecosystem, biotic and a biotic component. Open system, closed system, species, population, community. Ecological balance and consequence of change.

Module III: Population dynamics and Environment [2L]

Mathematics of population growth and associated problems. Different types of resources, renewable, non-renewable and potentially renewable resources and effects of population growth on resources and environment. Environmental impact assessment.

Module IV: Air pollution and Control: [4+3+3+2 L]

Atmospheric composition and energy balance:[4L] Different layers of atmosphere, tropopause, stratopause and mesopause. Conductive and Convective and Radiation heat transfer and concepts of blackbody. Global temperature model (Earth as black body and Earth's albedo) Greenhouse effect and its consequence on global climate change, sea water level, agriculture and marine food.

Atmospheric dispersion of pollutants: [3L] Atmospheric stability, Temperature and Radiation inversions, Adiabatic lapse rate and ambient lapse rate, maximum mixing depth, ventilation coefficient.

Air pollutants sources and biochemical effects: [3L] Toxic chemicals in the air, suspended particulate matter, carbon dioxide, sulphur dioxide, oxides of nitrogen, lead, carbon monoxide. Primary and secondary pollutants, criteria pollutants, sulphurous smog and photochemical smog. CFC and its impact on depletion of ozone layer.

Standards and Control measures:[2L] Industrial commercial and residential air quality standard. Electrostatic precipitator, Cyclone separator, bag house, catalytic converter, scrubber (Venturi).

Module 5: Water Pollution and Control: [2+1+3 L]

Important parameters:[2L] Effect of Oxygen demanding wastes, pathogens, nutrients, dissolved oxygen, Concepts of BOD and COD and BOD reaction rate constant.

Basics of ground water flow: [1L] Aquifers, Hydraulic gradient and ground water flow.

Water treatment:[3L] Drinking water treatment (Coagulation, Flocculation, sedimentation, filtration, disinfection). Waste water treatment, Primary and secondary treatments (Activated sludge process, trickling filters, rotating biological contactor, oxidation ponds) and tertiary treatment.

Module 6: Land Pollution: [2L] Municipal, Industrial, commercial, agricultural and hazardous solid wastes. Recovery and conversion methods. Waste management, land filling, incineration and composting.

Module 7: Noise pollution: [2L] Definition of noise pollution, Concept of decibel (dB) and effects of noise pollution, noise classification and control of noise pollution.

References Books:

1. Masters, G.M., "Introduction to Environmental Engineering and Science" Prentice – Hall of India Pvt. Ltd., 1991.
2. Basak: Environmental Engineering TMH
3. Nebel, B.J., "Environmental Science", Prentice – Hall Inc., 1987
4. Odum, E.P., "Ecology: The link between the natural and social Sciences", IBH Publishing Com., Delhi.
5. Environmental Management – N.K. Uberoi, EXCELL BOOKS.
6. Fundamentals of Environmental Studies by D.K. Sinha, & A.D. Mukherjee.
7. Environmental Chemistry by A. K. De, New Age International.
8. Environmental Management- Mukherjee, Vikas.
9. Water Pollution and Management – Varshney C.K., New Age International.
10. Water chemistry – Venkateswarlu K.S., New Age International.
11. Water Pollution: Causes, Effects & Control – Goel P.K., New Age International
12. Environmental Pollution Control Engineering – Rao C.S., New Age International
13. Land Treatment of Waste Water – Goghil M.B., New Age International
14. Environmental Pollution Analysis – Khopkar S.M., New Age International
15. Soil Erosion & Conservation – Tripathi R.P., New Age International
16. Environmental Impact Assessments – Barthwal R.R., New Age International

Language Lab (UHSS471)

L-T-P: 0-0-2

Credits- 2

Module 1: Pronunciation Skills (4 hours)

- 1.1 Introduction of English Speech sounds
- 1.2 Vowel sounds, diphthongs and triphthongs
- 1.3 IPA Symbols
- 1.4 Transcription

Module II: Business Writing (8 hours)

- 2.1 Vocabularies used in Business Writing
- 2.2 Successful Letters
- 2.3 Successful E-mails
- 2.4 Resume
- 2.5 Report Writing

Module 3: Remedial Grammars (6 hours)

- 3.1 Tense and subject-verb agreement
- 3.2 Relative Clauses
- 3.3 Prepositions
- 3.4 Preposition
- 3.5 Phrasal Verbs

Module 4: Public Speaking Skills and Presentation Skills (6 hours)

Module 5: Interview Skills (8 hours)

- 5.1 Understanding Interview
- 5.2 Types of interviews
- 5.3 Group Discussion
- 5.4 Telephonic Interview

Module 6: Life Skills and Soft Skills (8 hours)

BOOKS and Software 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
- (4) Business Writing
- (5) Sky Pronunciation
- (6) Tense Buster

Design & Analysis of Algorithms Lab (UCSE473)

L-T-P: 0-0-3

Credits- 3

Lab Experiments:

1: Recursion: factorial, tower of Hanoi etc.

#2: Divide and Conquer: binary search, merge sort, quick sort etc.

#3: Greedy Method: knapsack problem (fractional), Minimum Spanning Tree etc.

#4: Dynamic Programming: Rod cutting problem, matrix chain multiplication etc.

#5: Branch and Bound and Backtracking: Traveling Salesperson problem, 8 queens' problem etc.

#6: Graph: BFS and DFS, graph colouring Shortest path.

Database Management Systems Lab (UCSE474)

L-T-P: 0-0-3

Credits: 3

#1: Draw E-R diagram and convert entities and relationships to relation table for a given scenario. Two assignments shall be carried out i.e. consider two different scenarios (eg. bank, college)

#2: Write relational algebra queries for a given set of relations.

Perform the following:

Viewing all databases, Creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting Records in a Table, Saving (Commit) and Undoing (rollback)

Altering a Table, Dropping/Truncating/Renaming Tables, Backing up / Restoring a Database.

#3: For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions, Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause

#4: For a given set of relation tables perform the following

Creating Views (with and without check option), Dropping views, Selecting from a view

#5: Write a PL/SQL program using FOR loop to insert ten rows into a database table.

#6: Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.

#7: Illustrate how you can embed PL/SQL in a high-level host language such as C/Java And demonstrates how a banking debit transaction might be done.

#8: Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation

#9: Connecting/Executing Database from client side using programming language like (PHP/Java/C/C++/Dart etc.)

#10: A Lab project/projects as determined by the instructor.

Tools and Tutorials

1. MySQL Software, <https://www.mysql.com/>
2. MySQL Workbench, ER -> DB Model, <https://www.mysql.com/products/workbench/>
3. SQL and PL/SQL tutorial: <https://www.w3schools.com/sql/>, <http://www.plsqltutorial.com/>