~~PROPOSED~~

B.TECH (CSE) CURRICULUM

[W.E.F. 2019 – 2020]

A four year fulltime semester based degree programme in

Computer Science and Engineering

Department of Computer Science & Engineering

Aliah University

II A/27, New Town

Kolkata – 700160, West Bengal, India

SEMESTER I

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	MENUGES01	Engineering Mechanics	3	1	0	4	4
2	EENUGES01	Basic Electrical Engineering **(ECE & EEN)**	3	0	0	3	3
	ECEUGES01	Basic Electronics Engineering **(CEN, CSE & MEN)**					
3	MATUGBS01	Engineering Mathematics I	4	0	0	4	4
4	PHYUGBS01	Engineering Physics	3	0	0	3	3
5	UCCUGAU01	Elementary Arabic and Islamic Studies	4	0	0	4	0
Total Theory						18	14
B. PRACTICAL							
1	CENUGES01	Engineering Graphics & Design	0	1	3	4	2.5
2	EENUGES02	Basic Electrical Engineering Lab **(ECE & EEN)**	0	0	3	3	1.5
	ECEUGES02	Basic Electronics Engineering Lab **(CEN, CSE & MEN)**					
3	PHYUGBS02	Engineering Physics Lab	0	0	3	3	1.5
Total Practical						10	5.5
Total Semester						**28**	**19.5**

SEMESTER II

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGES01	Programming for Problem Solving	3	0	0	3	3
2	ECEUGES01	Basic Electronics Engineering **(ECE & EEN)**	3	0	0	3	3
	EENUGES01	Basic Electrical Engineering **(CEN, CSE & MEN)**					
3	MATUGBS02	Engineering Mathematics II	4	0	0	4	4
4	CHMUGBS01	Engineering Chemistry	3	0	0	3	3
5	ENGUGHU01	Communicative English	3	0	0	3	3
Total Theory						16	16
B. PRACTICAL							
1	CSEUGES02	Programming for Problem Solving Lab	0	0	4	4	2
2	ECEUGES02	Basic Electronics Engineering Lab **(ECE & EEN)**	0	0	3	3	1.5
	EENUGES02	Basic Electrical Engineering Lab **(CEN, CSE & MEN)**					
3	MENUGES02	Workshop Practice	0	1	2	3	2
4	CHMUGBS02	Engineering Chemistry Lab	0	0	3	3	1.5
5	ENGUGHU02	Language Lab	0	0	2	2	1
Total Practical						15	8
Total Semester						**31**	**24**

SEMESTER III

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGPC01	Data Structures & Algorithms	3		0	3	3
2	CSEUGPC02	Digital Logic	3	0	0	3	3
3	**MATUGBS04**	Discrete Mathematics	4	0	0	4	4
4		Open Elective – I	3	0	0	3	3
5		Open Elective – II	3	0	0	3	3
6	UCCUGMC03	Indian Constitution	2	0	0	2	0
Total Theory						18	16
B. PRACTICAL							
1	CSEUGPC03	Data Structures Lab	0	0	3	3	1.5
2	CSEUGPC04	Digital Logic Lab	0	0	3	3	1.5
Total Practical						6	3
Total Semester						**24**	**19**

SEMESTER IV

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGPC05	Object Oriented Programming Systems	3	0	0	3	3
2	CSEUGPC06	Computer Organization & Architecture	3	0	0	3	3
3	**MATUGBS05**	Probability & Statistics	3	0	0	3	3
4		Open Elective – III	3	0	0	3	3
5	BIOUGBS01	Biology for Engineers	2	0	0	2	2
6	UCCUGMC02	Environmental Science	2	0	0	2	0
Total Theory						16	14
B. PRACTICAL							
1	CSEUGPC07	Object Oriented Programming Lab	0	0	3	3	1.5
2	CSEUGPC08	Computer Organization & Architecture Lab	0	0	3	3	1.5
3	CSEUGPC09	Scripting Lab	0	0	3	3	1.5
Total Practical						9	4.5
Total Semester						**25**	**18.5**

SEMESTER V

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGPC10	Operating Systems	3	0	0	3	3
2	CSEUGPC11	Database Management Systems	3	0	0	3	3
3	CSEUGPC12	Design & Analysis of Algorithms	3	0	0	3	3
4	CSEUGPC13	Formal Language & Automata Theory	3	1	0	4	4
5		Open Elective – IV	3	0	0	3	3
Total Theory						16	16
B. PRACTICAL							
1	CSEUGPC14	Operating Systems Lab	0	0	3	3	1.5
2	CSEUGPC15	Database Management Lab	0	0	3	3	1.5
3	CSEUGPC16	Design & Analysis of Algorithms Lab	0	0	2	2	1
Total Practical						8	4
Total Semester						**24**	**20**

SEMESTER VI

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGPC17	Software Engineering	3	0	0	3	3
2	CSEUGPC18	Compiler Design	3	0	0	3	3
3	CSEUGPC19	Computer Networks	3	0	0	3	3
4	CSEUGPC20	Computer Graphics	3	0	0	3	3
5	CSEUGPC21	Embedded Systems	3	0	0	3	3
6 **Professional Elective – I**	CSEUGPE01	Bioinformatics	3	0	0	3	3
	CSEUGPE02	Data Science & Big Data	3	0	0	3	3
	CSEUGPE03	Image Processing	3	0	0	3	3
	CSEUGPE04	VLSI Design	3	0	0	3	3
	CSEUGPE05	Web Technologies	3	0	0	3	3
Total Theory						18	18
B. PRACTICAL							
1	CSEUGPR01	Seminar and Presentation Skills	0	0	3	3	0
2	CSEUGPC22	Compiler Design Lab	0	0	3	3	1.5
3	CSEUGPC23	Computer Networks Lab	0	0	3	3	1.5
4 **Professional Elective – I Lab**	CSEUGPE06	Bioinformatics Lab	0	0	3	3	1.5
	CSEUGPE07	Data Science Lab	0	0	3	3	1.5
	CSEUGPE08	Image Processing Lab	0	0	3	3	1.5
	CSEUGPE09	VLSI Design Lab	0	0	3	3	1.5
	CSEUGPE10	Web Technologies Lab	0	0	3	3	1.5
Total Practical						12	4.5
Total Semester						**30**	**22.5**

SEMESTER VII

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGPC24	Machine Learning & Soft Computing	3	0	0	3	3
2	MBAUGHU01	Industrial Economics & Management	4	0	0	4	4
3 **Professional Elective – II**	CSEUGPE11	Natural Language Processing	3	0	0	3	3
	CSEUGPE12	Internet of Things	3	0	0	3	3
	CSEUGPE13	Advanced Java Programming	3	0	0	3	3
	CSEUGPE14	Computational Geometry	3	0	0	3	3
4 **Professional Elective – III**	CSEUGPE15	Computer Vision	3	0	0	3	3
	CSEUGPE16	Mobile Computing	3	0	0	3	3
	CSEUGPE17	Visual Programming & Multimedia	3	0	0	3	3
	CSEUGPE18	Information and Coding Theory	3	0	0	3	3
	CSEUGPE19	E – Commerce and ERP	3	0	0	3	3
Total Theory						13	13
B. PRACTICAL							
1	CSEUGPR02	Project – I	0	0	8	8	4
2	CSEUGPR03	Summer Internship ***	0	0	0	0	2
3	CSEUGPC25	Machine Learning & Soft Computing Lab	0	0	3	3	1.5
4	**MBAUGHU03**	Soft Skills	0	0	3	3	0
Total Practical						14	7.5
Total Semester						**27**	**20.5**

***** A student must undergo summer internship of 2-4 weeks duration during the summer break after 6th semester (before commencement of 7th semester). The same will be evaluated during 7th semester.**

SEMESTER VIII

A. THEORY							
Sl No	**Code**	**Subject Name**	**L**	**T**	**P**	**Total**	**Credit**
1	CSEUGPC26	Cryptography and Network Security	3	0	0	3	3
2	MBAUGHU02	Professional Values and Ethics	2	0	0	2	2
3 **Professional Elective – IV**	CSEUGPE20	CAD for VLSI	3	0	0	3	3
	CSEUGPE21	Distributed Systems	3	0	0	3	3
	CSEUGPE22	Operations Research	3	0	0	3	3
	CSEUGPE23	High Performance Computer Architecture	3	0	0	3	3
	CSEUGPE24	Real Time Systems	3	0	0	3	3
	CSEUGPE25	Digital Topology	3	0	0	3	3
4 **Professional Elective – V**	CSEUGPE26	Adhoc & Sensor Networks	3	0	0	3	3
	CSEUGPE27	Cloud Computing	3	0	0	3	3
	CSEUGPE28	Data Warehousing and Data Mining	3	0	0	3	3
	CSEUGPE29	GIS & Remote Sensing	3	0	0	3	3
	CSEUGPE30	Parallel Computing Techniques	3	0	0	3	3
Total Theory						11	11
B. PRACTICAL							
1	CSEUGPR04	Project – II	0	0	16	16	8
2	CSEUGPC27	Comprehensive Viva – Voce	0	0	0	0	2
Total Practical						16	10
Total Semester						**27**	**21**

Summary of Credit

B.Tech (CSE)	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester	**Total**
	19.5	24	19	18.5	20	22.5	20.5	21	**165**

List of Open Elective Courses

Semester	Code		Course	Offering Dept
	Existing code A.Y. 2018 – 2019	**Proposed code A.Y. 2019 – …**		
3rd	OCE 201	CENUGOE01	Building Materials	CEN
	OCS 201	CSEUGOE01	Data Structures & Algorithms Analysis	CSE
	OEE 201	EENUGOE01	Circuit Theory & Networks	EEN
	OEC 201	ECEUGOE01	Electronic Devices & Circuits	ECE
	OME 201	MENUGOE01	Materials Engineering	MEN
	OMA 201	MATUGOE01	Numerical Methods	MAT
4th	OCE 202	CENUGOE02	Engineering Geology	CEN
	OCS 202	CSEUGOE02	Computer Organization	CSE
	OEE 202	EENUGOE02	Electrical Measurement	EEN
	OEC 202	ECEUGOE02	Principal of Communication Systems	ECE
	OEC 204	ECEUGOE03	Digital Electronics	
	OME 202	MENUGOE02	Thermodynamics	MEN
5th	OCE 301	CENUGOE03	Transportation Engineering	CEN
	OCS 301	CSEUGOE03	Object Oriented Programming	CSE
	OEE 301	EENUGOE03	Introduction to Electrical Machines	EEN
	OEC 301	ECEUGOE04	Microprocessor & Its Applications	ECE
	OME 301	MENUGOE03	Strength of Material	MEN
6th	OCE 302	CENUGOE04	Environmental Engineering	CEN
	OCS 302	CSEUGOE04	Data Communication & Computer Networks	CSE
	OEE 302	EENUGOE04	Control System	EEN
	OEC 302	ECEUGOE05	Microelectronics	ECE
	OME 302	MENUGOE04	Mechatronics	MEN
7th	OCE 401	CENUGOE05	Hydraulics Engineering	CEN
	OCS 401	CSEUGOE05	Digital Image Processing	CSE
	OEE 401	EENUGOE05	Generation Transmission Distribution of Electric Power	EEN
	OEC 401	ECEUGOE06	Radar System	ECE
	OME 401	MENUGOE05	Non-conventional Energy Utilization	MEN
8th	OCE 402	CENUGOE06	Construction Management	CEN
	OCS 402	CSEUGOE06	Data Science	CSE
	OEE 402	EENUGOE06	Renewable Energy Resources	EEN
	OEC 402	ECEUGOE07	Laser Technology	ECE
	OEC 404	ECEUGOE08	Neural Network	
	OME 402	MENUGOE06	Finite Element Method	MEN
5th onwards	*	MBAUGOE01	Entrepreneurship Development	MBA

Summary of Credit

B.Tech (CSE)	1st Semester	2nd Semester	3rd Semester	4th Semester	5th Semester	6th Semester	7th Semester	8th Semester	**Total**
	19.5	24	19	18.5	20	22.5	20.5	21	**165**

Semester wise credit segregation

Semester	HU	BS	ES	PC	PE	OE	PR	MC	TOTAL
1st	-	8.5	11	-	-	-	-	√	**19.5**
2nd	4	8.5	11.5	-	-	-	-	x	**24**
3rd	-	4	-	9	-	6	-	√	**19**
4th	-	5	-	10.5	-	3	-	√	**18.5**
5th	-	-	-	17	-	3	-	x	**20**
6th	-	-	-	18	4.5	-	-	x	**22.5**
7th	4	-	-	4.5	6	-	6	x	**20.5**
8th	2	-	-	5	6	-	8	x	**21**
TOTAL	**10**	**26**	**22.5**	**64**	**16.5**	**12**	**14**	**0**	**165**

Course code and definition

Category Index	Course Code	Definitions / Category of Course
HSMC	HU	Humanities and social science including management
BSC	BS	Basic Science course
ESC	ES	Engineering Science course
PCC	PC	Professional core courses
PEC	PE	Professional elective courses
OEC	OE	Open elective course
PROJ	PR	Project, seminar, internship in industry
MC	MC	Mandatory courses

B.TECH (CSE) SYLLABUS

[W.E.F. 2019 – 2020]

A four year fulltime semester based degree programme in

Computer Science and Engineering

Department of Computer Science & Engineering

Aliah University

II A/27, New Town

Kolkata – 700156, West Bengal, India.

Semester I:

Engineering Mechanics

Code: MENUGES01
Contracts: 3L+1T
Credits: 4

This is the foundation course that will help to understand the advanced courses in the subsequent semesters. A working knowledge of statics using force equilibrium and free body diagrams. It provides an understanding of deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behaviour of materials under various load conditions.

Module no	Content	Allotted hour
1	Importance of Mechanics in engineering. Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force as a vector; Transmissibility of a force.	**3**
	Introduction to Vector Algebra; Parallelogram law; Lami's theorem; Co-ordinate representation of vector; Cross product and Dot product and their applications.	**3**
	Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces	**4**
2	Concept and Equilibrium of forces; Free body concept and diagram; Equations of equilibrium, plane frames and trusses.	**4**
	Concept of Friction; Coulomb friction; Angle of Repose; Coefficient of friction	**4**
3	Distributed Force: Centroid and Centre of Gravity; Centroids, circular sector, quadrilateral, composite areas consisting of different figures.	**4**
	Moments of inertia: Parallel axis theorem; Perpendicular axis theorem; Mass moment of inertia of symmetrical bodies e.g. cylinder, sphere, cone etc.	**4**
	Concept of virtual work and energy; Concept of simple stresses and strains; Torsion; Concept of fluid statics	**4**
4	Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs.	**4**
	Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). Relative motion.	**4**
5	Kinetics of particles: Newton's second law; Equation of motion; D'Alembert's principle and free body diagram; Principle of work and energy; Principle of conservation of energy; Power and efficiency;	**6**

	Impulse and Momentum.	
	Steady flow; Vibration	**2**

Upon completion of this course, students will able to grasp the following concepts –

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
- Understand basic dynamics concepts – force, momentum, work and energy;
- Understand and be able to apply Newton's laws of motion;
- Understand and be able to apply other basic dynamics concepts – the Work-Energy principle, Impulse – Momentum principle and the coefficient of restitution;
- Learn to solve dynamics problems choosing an appropriate solution strategy;
- Attain an introduction to basic machine parts such as pulleys and mass-spring systems etc.

Suggested Books:

1. Meriam &Kraige: "Engineering Mechanics [Vol I & II]",Wiley India.
2. R.C. Hibbeler: "Engineering Mechanics: Statics & Dynamics",Pearson.
3. F. P. Beer and E. R. Johnston: "C++: Vector Mechanics for Engineers [Vol I & II]", TMH.
4. Timoshenko, Young and Rao: "Engineering Mechanics",TMH.

Basic Electronics Engineering

Code: ECEUGES01
Contracts: 3L
Credits: 3

Module No.	Content	Lecture
1	**Semiconductor Basics:** Energy band theory, Fermi levels, Conductors, Semiconductors and Insulators: electrical properties, Semiconductors: intrinsic and extrinsic, P-type and N-type semiconductors; electrical conduction phenomenon, drift and diffusion carriers, mass action law.	**7**
2	**Rectifying Devices:** Formation of P-N junction, formation of depletion zone, Junction capacitance-I characteristics, Zener breakdown, Avalanche breakdown. Linear piecewise model; rectifiers: half wave, full wave, ripple factor, efficiency, Clipper and Clamper circuits	**6**
3	**Transistors:** Formation of PNP / NPN junctions, principle of operation, configurations, transistor characteristics. Biasing and Bias stability: small signal low frequency operation of transistors; equivalent circuits h parameters, Transistors as amplifier: voltage gain, current gain, input impedance and output impedance, Decibel power.	**7**

4	**Field Effect Transistor:** Construction and characteristics of JFET and MOSFET characteristics; depletion and enhancement type, FET small signal model.	**4**
5	**Feed Back Amplifier:** Block diagram, properties, positive and negative feedback, loop gain,topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities(qualitative),bandwidth stability	**4**
6	**Operational Amplifier:** Introduction to integrated circuits, operational amplifier and its terminal properties; concept of virtual earth, Gain-frequency and Slew rate; inverting and non-inverting mode of operation, voltage summing, difference, voltage follower, integrator, and differentiator.	**4**
7	**Electronic Instruments:** Principle of operation of CRO; Electron ballistics and electron beam deflection; Concept of time base; Measurement of voltage, and frequency.	**4**

Suggested Books:

1. Rakshit & Chattopadhyay, Foundation of Electronics, New Age.
2. Cathey, Electronic Devices and Circuits, Shaum series, TMH
3. Boylestead & Nashlesky, Electronic Devices and Circuits, Pearson
4. Millman and Halkias, Integrated Electronics, TMH

Engineering Mathematics I

Code: MATUGBS01
Contracts: 4L
Credits: 4

Module	Content	Lecture
1	Basics of sequence and series ; Power series, Limit, Continuity.	**14**
2	Differentiation, Mean value theorems and its application; Taylor's theorem, Maclaurin's infinite series; Maxima and minima; L Hospital's rule.	**12**
3	Reduction formulae, Beta and Gama functions.	**2**
4	Lines and planes, Polar coordinates, Quadric surfaces, Volume, Area, length.	**10**
5	Continuity, Differentiability of vector functions, Arc length; Curvature, Torsion, Serret-Frenet formulas, Double, triple integrals, Jacobian .	**10**
6	Green theorem, Gauss theorem and Stokes Theorems and its application.	**6**

Suggested Books:

1. Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : R.K. Jain & S. R. K lyengar
3. Advanced Engineering Mathematics : C. R. Wylle & L. C. Barrett
4. Differential & Integral Calculus : N. Plskunov

Engineering Physics

Code: PHYUGBS01
Contracts: 3L
Credits: 3

Module No.	Content	Lecture
1	**Mechanics** **Classical mechanics:** scalars and vectors, vector multiplication, central force, mechanics of system of particles, elastic properties, rotational motion, fluid dynamics: viscocity, Stoke's law, streamline flow, equation of continuity, Reynold's number, Bernoulli's theorem **Quantum mechanics:** Photoelectric effect, de-Broglie's hypothesis, matter wave, Hysenberg's uncertainty principle, wave function,Schrodinger equation and simple problems **Statistical mechanics:** Necessity of statistical mechanics, Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac distribution formula	12
2	**Optics** Huygen's principle, Interference of light, Young's double-slit experiment, Newton's ring; Diffraction: Fresnel and Fraunhofer class, Fresnel's half-period zones, zone plate, Fraunhofer diffraction due to single slit and plane transmission grating (elementary theory); Polarization: plane, circular and elliptically polarized light, Brewster's law, Polaroid, optical activity. Coherence length and time; Einstein's A and B coefficients; spontaneous and induced emissions, condition for laser action, population inversion, He-Ne laser Optical Fiber, core and cladding; total internal reflection; optical fiber and waveguide; communication through optical fiber, energy loss, attenuation and dispersion	6
3	**Electrostatics & Electricity** Coulomb's law, intensity and potential of point charge, Gauss's theorem and simple applications, electric-dipole, Electric displacement, capacitor, parallel plates and cylindrical, Thermoelectricity, Magnetic effects of currents, Self-inductance, Mutual inductance, TransformerElectric circuit elements and AC, DC circuit analysis.	6

4	**Solid State Physics** Crystalline nature of solid, diffraction of X-ray, Bragg's law, Mosley's law, explanation from Bohr's theory, Origin of the energy gap, band theory; metal, semiconductor and insulators; intrinsic and extrinsic semiconductors, dia, para and ferro magnetic materials, superconductivity	**6**
5	**Nuclear Physics** Binding energy of nucleus, Binding energy curve and stability, Radioactivity, successive disintegration, radioactive equilibrium, radioactive dating, radioisotope and their uses, Nuclear transmutation, fission & fusion, nuclear reactor	**6**

Suggested Books:

1. Wiley precise Text, Engineering Physics, Wiley India Private Ltd., New Delhi. Book series – 2014,
2. S.O.Pillai, Solid State Physics, New Age International. Sixth Edition.
3. Chintoo S Kumar ,K Takayana and K P J Reddy, Shock waves made simple, Willey India Pvt. Ltd. New Delhi,2014
4. A Marikani, Engineering Physics, PHI Learning Private Limited, Delhi - 2013
5. Prof. S. P. Basavaraju, Engineering Physics, Subhas Stores, Bangalore – 2
6. V Rajendran ,Engineering Physics, Tata Mc.Graw Hill Company Ltd., New Delhi - 2012
7. S Mani Naidu, Engineering Physics, Pearson India Limited – 2014

Elementary Arabic and Islamic Studies

Code: UCCUGAU01
Contracts: 4L
Credits: 0

--- No syllabus found.

Engineering Graphics & Design

Code: CENUGES01
Contracts: 1T+3P
Credits: 2.5

Module No.	Content	Lecture
1	**Introduction to Engineering Graphics:** Drawing instruments and accessories, BIS – SP 46. Use of plane scales,Diagonal Scales and Representative Fraction. **Engineering Curves:** Classification and application of Engineering Curves, Construction of Conics, Cycloid Curves, Involutes and Spirals along with normal and tangent to each curve.	**30**
2	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes. **Projections of Planes:** Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	**30**
3	**Projections of Solids and Section of Solids:** Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section	**20**
4	**Drawing practice:** Drawing practise using software like AUTO CAD	**20**

Suggested Books:

1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi.
2. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand.
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi.

Basic Electronics Engineering Lab

Code: ECEUGES02
Contracts: 3P
Credits: 1.5

Module No.	Content	Lecture
1	Familiarization of Electrical and Electronics Components	**3**
2	Familiarization of Various Instruments like Power Supply, Digital Multimeter, Function	**3**
3	Generator, CRO etc.	**3**
4	Study of Junction Diode Characteristics	**3**
5	Study of Zener Diode Characteristics	**3**
6	Study of Clipping Circuits	**3**
7	Study of Clamping Circuits	**3**
8	Study of Rectifier Circuits	**3**
9	Study of BJT Characteristics	**3**
10	Study of FET Characteristics	**3**
11	Study of fundamental characteristics of OP-AMP	**3**
12	Determination of Slew rate and bandwidth of an OP-AMP.	**3**

Engineering Physics Lab

Code: PHYUGBS02
Contracts: 3P
Credits: 1.5

List of experiments:

1. Measurements of length (or diameter) using vernier scale, slide caliper, screw gauge and travelling microscope.
2. Determination of the radius of curvature of a spherical surface by using spherometer.
3. Determination of moment of inertia of (a) a cylinder and (b) a rectangular solid bar.
4. To determine the focal length of a concave lens by combination method and hence to determine the refractive index of the material of the lens by measuring the radii of curvature of both lenses
5. Determination of the average resistance per unit length of the meter bridge wire by Carey-Foster's method and hence to determine an unknown resistance
6. Determination of the horizontal component of the earth's magnetic field and the magnetic moment of a magnet by employing magnetometers
7. Determination of Young's Modulus of elasticity of a material of a bar by the method of flexure.
8. Determination of rigidity modulus of a material of a wire by static method.
9. Determination of rigidity modulus of a material of a wire by dynamic method.
10. Determination of unknown frequency of a tuning fork by using a sonometer

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Semester II

Programming for Problem Solving

Code: CSEUGES01
Contracts: 3L
Credits: 3

Module no	Content of the module	Allotted hour
1	**Introduction to computing:** block architecture of a computer, bit, bytes, memory, and representation of numbers in memory.	1
2	**Introduction to problem solving:** Basic concepts of an algorithm, program design methods, flowcharts.[1]	1
3	**Introduction to C programming:** A Brief History of C, C is middle-level Language, is a Structured Language, Complier Vs Interpreters, The Form of a C Program, Library & Linking, Compilation & Execution process of C Program . [2]	2
4	**Variables, Data Types, Operator & Expression:** Character Set, Token, Identifier & Keyword, Constant, Integer, Floating Point, Character, String, Enumeration, Data Types in C, Data Declaration & Definition Operator & Expression, Arithmetic, Relational, Logical, Increment & Decrement, Bit wise, Assignment, Conditional, Precedence & Associability of Operators.	3
5	**Console I/O:** Introduction, Character input & Output, String Input & Output, Formatted Input/Output (scanf/printf), sprintf&sscanf.	2
6	**Control Statement:** Introduction, Selection Statements, Nested if, if-else-if, The "?" Alternative, The Conditional Expression, switch, Nested switch, Iteration Statements, for loop, while loop, do-while loop, Jump Statements, Goto& label, break & continue, exit() function.	4
7	**Array & String:** Single Dimension Arrays, Accessing array elements, Initializing an array, Multidimensional Arrays, Initializing the arrays, Memory Representation, Accessing array elements, String Manipulation Functions, searching, sorting an array.	6
8	**Function:** Introduction, advantages of modular design, prototype declaration, Arguments & local variables, Returning Function Results by reference & Call by value, passing arrays to a function, Recursion.	4
9	**Storage Class & Scope:** Meaning of Terms, Scope - Block scope & file scope, Storage Classes Automatic Storage, Extern Storage, Static, Storage, Register Storage.	2
10	**Pointers:** Introduction, Memory Organization, The basics of Pointer, The Pointer operator Application of Pointer, Pointer Expression, Declaration of Pointer, Initializing Pointer, De-referencing Pointer,Void Pointer, Pointer Arithmetic, Precedence of &, * operators Pointer to Pointer, Constant Pointer, Dynamic memory allocation, passing pointer to a function, array of pointers, accessing arrays using pointers, handling strings using pointers.	4

11	**Structure, Union, Enumeration & typedef:** Structures, Declaration and Initializing Structure, Accessing Structure members, Structure, Assignments, Arrays of Structure, Passing, Structure to function, Structure Pointer, Unions.	2
12	**C Preprocessor:** Introduction, Preprocessor Directive, Macro Substitution, File Inclusion directive, Conditional Compilation.	2
13	**File handling:** Introduction, File Pointer, Defining & Opening a File, Closing a File, Input/Output Operations on Files, Operations on Text mode files and binary mode files, Error Handling During I/O Operation, Random Access To Files, Command Line Arguments	3

Suggested Books:

1. B.S. Gottfried: "Programming in C", TMH.
2. B.W. Kernighan and D.M. Ritchie: "The C Programming Language", PHI.
3. H. Schildt: C++: "The Complete Reference", TMH, 4e.
4. B. Stroustrup: "The C++ Programming Language", Addison-Wesley.
5. E. Balagurusamy: "Programming in ANSI C", TMH.
6. Yashwant Kanetkar: "Let Us C", BPB Publications.
7. K. N. King: "C Programming: A Modern Approach", W. W. Norton and Company.
8. Pradip Dey and Manas Ghosh: "Programming in C", Oxford University Press

Basic Electrical Engineering

Code: EENUGES01
Contracts: 3L
Credits: 3

Module no	Content of the module	Allotted hour
1	**Introduction:** Basic concepts of Electrostatics and Electromagnetic.	4
2	**DC Circuit**: Introduction of Electric Circuit & Elements, Loop Analysis, Node analysis, Star (Y) - Delta (Δ) & Delta (Δ)-Star (Y) Transformations.	6
3	**DC Network Theorem**: Superposition Theorem, Thevenin's theorem, Norton's theorems, Maximum Power Transfer Theorem, Reciprocity Theorem, Time-domain analysis of first-order RL and RC circuits.	8
4	**Single-phase AC Circuits** Generation of Sinusoidal Voltage Waveform (AC) and Some Fundamental Concepts, Representation of Sinusoidal Signal by a Phasor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	8
5	**Transformer:** Definition, working principle & construction, EMF equation, Equivalent circuit, Open circuit & Short circuit tests, Efficiency & Regulation.	4

6	**DC Machines**: Constructional Features of D.C Machines , Principle of Operation of D.C Machines, EMF & Torque Equation , D.C Generators, D.C Motors, Losses, Efficiency, 3-point Starter and speed control of DC shunt Motor.	4
7	**Three-phase Induction Motor**: Introduction to 3-phase induction motor	1
8	**Introduction to Power System:** Basic concepts of Power System	1

Suggested Books:

1. D.P. Kothari & I.J. Nagrath: "Basic Electrical Engineering", TMH.
2. Hughes: "Electrical and Electronics Technology", Pearson Education.
3. V.N Mittle& Arvind Mittal, "Basic Electrical Engineering", TMH [Second Edition].
4. V. D. Toro: "Electrical Engineering Fundamentals", Prentice Hall India.
5. C L Wadhwa: "Basic Electrical Engineering", New Age International Publishers.

Engineering Mathematics II

Code: MATUGBS02
Contracts: 4L
Credits: 4

Module No.	Content	Lecture
1	Matrices: Matrix operations (Addition, Multiplication, Transpose), invertible matrix.	**4**
2	Determinant and their properties.	**2**
3	Row reduced echelon form; Rank of a matrix. Solution of the matrix equation Ax = b; Cramer's rule. Eigenvalues and eigenvectors, characteristic polynomial of a matrix, Cayley–Hamilton theorem and its application. Linear dependence and independence of vectors, basis and dimension. Complex numbers and Complex integrals. Inequalities, Theory of equations.	**32**
4	Complex numbers and Complex integrals. Inequalities, Theory ofequations.	**18**
5	Differential equation of first order and first degree: Exact, separable andhomogeneous differential equations, Bernoulli's equation, ODEs of first order but not of first degree; Clairaut's equation.	**7**
6	Higher order linear equation with constant coefficients: Complementaryfunction, Particular integral, Symbolic Operator D.	**4**
7	Method of undetermined coefficients, Euler's homogeneous equationand deduction to an equation of constant coefficients.	**4**

8	Second order linear equation with variable coefficients: exact equation: reduction of order; variation of parameters; reduction to normal form; change of independent variables. Simple eigen value problems.	**4**
9	System of linear differential equations with constant coefficients.	**2**

Suggested Books:

1. As Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : R.K. Jain & S. R. K lyengar
3. Advanced Engineering Mathematics : C. R. Wylle & L. C. Barrett
4. Differential & Integral Calculus : N. Plskunov

Engineering Chemistry

Code: CHMUGBS01
Contracts: 3L
Credits: 3

Module no	Content of the module	Allotted hour
1	**Thermodynamics:** Importance and scope, definitions of system and surroundings; type of systems; Extensive and intensive properties; Steady state and equilibrium; Zeroth law of thermodynamics; First law of thermodynamics, internal energy and Enthalpy as a state function; Second law of thermodynamics; Kelvin, Planck and Clausius statements; Carnot cycle and refrigerator; Carnot's theorem; Physical concept of entropy.	12
2	**Water and its treatment:** Sources of water, Impurities in water, Hardness of water, Determination of hardness of water, Water quality parameter, Treatment of water for domestic purpose, Waste water.	8
3	**Polymers:** Terminology, Classification of polymers, Polymerization techniques, Molecular weight of polymers, Plastics, Rubbers, Fibers, Conducting and semiconducting polymers, Natural polymers.	8
4	**Green Chemistry:** Definition and concept of green chemistry, Emergence of green chemistry, Alternative solvents, Design of safer chemicals, Microwave radiation of green synthesis, Green laboratory Technology.	8

Suggested Books:

1. K. S. Maheswaramma and M. Chugh: "Engineering Chemsitry"; Pearson, 2016.
2. Wiley: "Engineering Chemistry", Wiley, 2nd Edn., 2014.

Communicative English

Code: ENGUGHU01
Contracts: 3L
Credits: 3

Objectives of the Course: To impart basic Communication skills to the first year UG students in the English language through rigorous practice and use of various categories of common words and their application in sentences; to enable them to achieve effective language proficiency for their social, professional & inter personal communication both in speaking & writing.

Module no	Content of the module
1	**Fundamentals of Communication:** Communication: Meaning, Nature, Process, Importance and Function of Communication; Levels of Communication: Intra-personal, Interpersonal, Organizational, Mass Communications; The Flow of Communication: Downward, Upward, Lateral or Horizontal, Diagonal, Grapevine Communication; Network in an Organization; Principles for Effective Communication; Verbal and Non-Verbal Communication; Barriers to Communication, Gateways to Communication.
2	**Listening and Speaking Skills** The Process of Listening; Barriers to Listening; Types of Listening: Active and Passive Listening; Methods for improving listening skills, Benefits of Effective Listening. Presentation Strategies: Defining Purpose; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech – Accent, Pitch, Rhythm, Intonation, Strong and Weak Forms, Connected Speech- Assimilation and Elision, Paralinguistic Features of Voice; Articulation of Speech Sounds- Vowels and Consonants; Spelling and Pronunciation; Problems of Indian speakers of English and their remedial measures.
3	**Reading and Writing Skills** **Reading Skills:** Purpose, Process, Methodologies, and Strategies; Special Reading Situations – Skimming and Scanning, Intensive and Extensive Reading, Critical Reading, Drawing Inferences, Reading Technical Reports, etc. **Writing Skills:** Words and Phrases: Word Formation, Synonyms and Antonyms, Homophones, One Word Substitutes, Words Often Confused, Word Choice - Right Words, Appropriate Words, Idioms and Phrases; Correct Usage: Parts of Speech, Modals, Concord, Articles, Infinitives, Requisites of Sentence Construction. Elements of Effective Writing, Main Forms of Written Communication: Paragraph - Techniques and Methods (Inductive, Deductive, Linear, Spatial, Chronological etc.), The Art of Condensation- various types (Précis, Summary and Abstract, etc.), Description, Agenda, Minutes, Notices, Circulars, Memo, Advertisements, Drafting an E-mail, Press Release.
4	**Business Communication** Business Letters: Principles; Sales & Credit letters; Claim and Adjustment Letters; Job application and Résumés. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal. Negotiation & Business Presentation skills.

Suggested Books:

1. Sethi, J & et al.:"A Practice Course in English Pronunciation", Prentice Hall of India, New Delhi.
2. Berry Cicely: "Your Voice and How to Use it Successfully", George Harp & Co. Ltd, London
3. Bansal, R.K. and J.B. Harrison:"Spoken English", Orient Longman.
4. Hornby's, A.S.:"Oxford Advanced Learners Dictionary of Current English", 7th Edition, Oxford University Press.
5. Pillai, Sabina &Agna Fernandez: "Soft Skills & Employability Skills",Cambridge Univ. Press.
6. Sudharshana, N.P. & C. Savitha: "English for Technical Communication", Cambridge Univ. Press.
7. Raman, Meenakshi & Sangeeta Sharma: "Technical Communication: Principles and Practice",Oxford Univ. Press.
8. Prasad, P.:"The Functional Aspects of Communication Skills", Delhi.
9. McCarthy, Michael:"English Vocabulary in Use", Cambridge University Press, Cambridge.
10. Leech, G &Svartvik, J. A: "Communicative Grammar of English", Pearson Education. New Delhi.
11. Narayanaswamy V.R.:"Strengthen your Writing", Orient Longman, London.
12. Dean, Michael:"Write it", Cambridge University Press, Cambridge.
13. Sen, Leena:"Communication Skills", Prentice Hall of India, New Delhi.
14. Bown, G.:"Listening and Spoken English", Longman, London

Programming for Problem Solving Lab

Code: CSEUGES02
Contracts: 4P
Credits: 2

Primary goal of this course is to make acquaint the students to know the programming language and also to know how 'C' can be used to write serious program to solve the problems. Programs will be based on the theoretical paper and to cover the concept of basic arithmetic operations, control statements, functions, recursions, arrays, strings, pointers, structures, unions, file handling etc.

Suggested Books:

1. B.S. Gottfried: "Programming in C", TMH.
2. B.W. Kernighan and D.M. Ritchie: "The C Programming Language", PHI.
3. H. Schildt: "C++: The Complete Reference", TMH, 4e.
4. B. Stroustrup: "The C++ Programming Language", Addison-Wesley.
5. E. Balagurusamy: "Programming in ANSI C", TMH.
6. Yashwant Kanetkar: "Let Us C", BPB Publications.
7. K. N. King: "C Programming: A Modern Approach", W. W. Norton and Company.
8. Pradip Dey and Manas Ghosh: "Programming in C", Oxford University Press.

Basic Electrical Engineering Lab

Code: EENUGES02
Contracts: 3P
Credits: 1.5

List of experiments:

1. Verification of Thevenin's Theorem
2. Verification of Norton's Theorem
3. Verification of Superposition Theorem
4. Verification of Maximum Power Transfer theorem
5. Power Measurement of Fluorescent Lamp
6. V-I characteristics of Incandescent Lamp
7. Speed Control of DC motor Using Field and Armature Control Method
8. Starting and reversing of DC motor
9. Open circuit and Short circuit test of Single Phase Transformer
10. Calibration of Voltmeter and Ammeter
11. Characteristics of Series R-L-C Circuit
12. Characteristics of Parallel R-L-C Circuit
13. Resistance measurement and continuity test of DC motor using Megger.

Suggested Books:

1. 1. Hazra Choudhury&Hazra Choudhury:"Elements of Workshop Technology, Vol. I & II", Media Promoters and Publishers Pvt. Ltd.
2. Rajender Singh:"Introduction to Basic Manufacturing Process and Workshop Technology", New Age International.

Workshop Practice

Code: MENUGES02
Contracts: 1T+2P
Credits: 2

Introduction to various hand tools e.g. allen keys, spanners, punch, files, hacksaw, hammers, chisels, vices, marking block, angle plates, etc.
Introduction to basic instruments: Vernier Caliper, Micrometer, Tri-square, Surface Plate, Height Gauge, Vernier Bevel Protractor, Screw Pitch Gauge, Radius Gauge, etc.
Demonstration on different machines and Equipments: Lathe, Milling, Drilling, Shaping, Radial Drilling, Grinding, Welding, Power Saw, Power Press, Planer Machine, Microscope, Profile Projector, etc.
Practical Exercises: Exercises involving the following operations: measuring and marking, sawing, chipping, filing, maintaining of perpendicularity of all surfaces by filing, making of taper surface by filing, making of curved surface by filing, plain turning, step turning and drilling.

Engineering Chemistry Lab

Code: CHMUGBS02
Contracts: 3P
Credits: 1.5

List of experiments:

1. Acidimetric estimation of Sodium Carbonate and Sodium bi-Carbonate in their mixture.
2. Estimation of Total Hardness of water by Complexometric method
3. Estimation of Fe^{II} in Mohr's Salt by Permanganometric Titration.
4. Qualitative analysis of single solid organic compounds.

Language Lab

Code: ENGUGHU02
Contracts: 2P
Credits: 1

Objectives of the Course: To impart basic Communication skills to the first year UG students in the English language through rigorous practice and use of various categories of common words and their application in sentences; to enable them to achieve effective language proficiency for their social, professional & inter personal communication both in speaking & writing; to improve their English pronunciation.

Laboratory Practical:

1. Group Discussion: Practical based on Accurate and Correct Grammatical Patterns.
2. Conversational Skills under suitable Professional Communication Lab conditions with emphasis on Kinesics: Interview, Greeting and Introducing, Leave taking, Asking Questions and Giving Replies, Inviting Friends and Colleagues, Negotiating, Persuading, Taking Initiatives, Praising and Complementing People, Expressing Sympathy, Seeking and Giving Permission, Complaining and Apologizing, Official/Public Speaking, Telephoning etc.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic/ Kinesics.
4. Presentation Skills for Technical Paper/Research Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Extempore, Argumentative Skills, Role Play Presentation with Stress and Intonation.
6. Comprehension Skills based on Reading and Listening Practical on a model Audio-Visual Usage.

Suggested Books:

1. Bansal R.K. & Harrison: "Phonetics in English", Orient Longman, New Delhi.
2. Sethi& Dhamija: "A Course in Phonetics and Spoken English", Prentice Hall, New Delhi.
3. Pandey, L.U.B. &R.P.Singh: "A Manual of Practical Communication", A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans, Daniel:"Cambridge English Pronouncing Dictionary", Cambridge Univ. Press.
5. Sudharshana, N.P. & C. Savitha: "English for Technical Communication", Cambridge Univ. Press.

Semester III:

Data Structures & Algorithms

Code: CSEUGPC01
Contracts: 3L+1T
Credits: 4

Module - 1 [12 Hrs]

Introduction: Data and Information, Program Structures, Abstract Data Type, Data Structure - Static and Dynamic Data Structures.

Array as a Data Structure: Representation of Polynomials and Sparse Matrix, Linear List, Implementation using array, Review of Pointers and Functions.
Linked List representations: Single Linked Lists, Doubly Linked Lists, Circularly Linked Lists, Linked List Representation of Polynomial And Applications.

Module - 2 [12 Hrs]

Concepts of Algorithm Design Techniques: Divide and Conquer, Greedy, Dynamic Programming, Backtracking, Branch and Bound.

Concepts of Algorithm Analysis: Performance Measurement and Analysis, Time Complexity and Space Complexity, Introduction to Order functions, Examples of Analysis.
Sorting and searching algorithms: Bubble sort, Insertion sort, Selection sort, Merge, Quick, Heap, Radix, Bucket sort, Linear and Binary Search.

Module - 3 [12 Hrs]

Stack and Queue: Implementations using Arrays and Linked List, Applications, Expression Evaluation and Conversions.
Trees: Binary Trees, Binary Search Trees, Height-Balanced And Weight-Balanced Trees, 2-3 Tree, B-Trees, B+ -Trees. Applications of Trees.

Module - 4 [12 Hrs]

Recursion: Basic concept, Design of recursive algorithms, Tail recursion.
Graphs: Adjacency Matrix and List, Graph Search Algorithms, Spanning Tree Algorithms, Shortest Path Algorithms.
Hashing: Terminologies, Hashing Functions, Collision Resolution Techniques, Types of Hashing

Suggested Books:

1. E. Horowitz, S. Sahni and S. Anderson-Freed:"Fundamentals of Data Structures in C", Second Edition, Universal Press. 2007.
2. M. A. Weiss:"Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2002.
3. A. V. Aho, J. E. Hopcroft and J. D. Ullman:"Data Structures and Algorithms", First Edition, Pearson Education, 2002.
4. R. K. Kruse, Bruce P. Leung:"Data Structures and Program Design", Prentice Hall, 2006.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein:"Introduction to Algorithms", Third Edition, PHI Learning Pvt. Ltd, 2010.
6. Y. Langsam, J. M. Augenstein, M. A. Tenenbaum:"Data Structures using C and C++", Second Edition, Pearson Education. 2015.

Digital Logic

Code: CSEUGPC02
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]
Number Systems, Boolean Algebra & Logic Gates: Binary numbers & Boolean algebra, Venn diagram, Logic gates, Truth Tables and function minimization using algebraic method, Karnaugh map, Quine- Mcclusky method; BCD, ASCII, EBDIC, Gray codes and their conversions, Signed binary number representation with 1's and 2's complement methods, Maxterm, Minterm, Representation in SOP and POS forms ;Realization of Boolean functions using NAND/NOR gates, two-level and multilevel logic circuit synthesis.

Module-2: [12 Hrs]
Combinational circuits: Adder and Subtractor circuits (half & full adder &subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and checker; ROM, PLA .

Sequential Circuits: Latch, Flip-flop. Design of Flip-flops with logic gates, counters, registers. Design and analysis of sequential circuits -Moore and Mealy model description, state diagram and state table – Minimization methods. Memory unit. Racing and Logic hazards. Implementation of hazard free logic circuit, asynchronous sequential circuit synthesis.

Module-3: [12 Hrs]
Digital Integrated Circuits: Diode as switch. Use of diodes in AND, OR Circuits.Transistor as a switch. RTL, DTL, TTL logic gate circuits. MOS as a switch.Basic MOS inverter.MOS and CMOS logic gates. Fan -in and Fan-out of logic gates, propagation delay, Tristate logic.

Suggested Books:

1. Floyed and Jain: "Digital Fundamentals", Pearson Education.
2. Morries Mano: "Digital Logic Design", PHI.

3. Leach &Malvino: “Digital Principles & Application, 5/e”, Tata McGraw Hill.
4. Kharate: “Digital Electronics”, Oxford.
5. BigmellandR.Donovan: “Digital Electronics - Logic & Systems”, Cambridge Learning.
6. D.J.Comer: “Digital Logic and State Machine Design, 3/e”, OUP.
7. P.Raja: “Digital Electronics”,Scitech Publications.
8. R.P.Jain: “Modern Digital Electronics, 2/e”,Tata McGraw Hill.
9. H.Taub and D.Shilling: “Digital Integrated Electronics”,Tata McGraw Hill.
10. D.RayChaudhuri: “Digital Circuits, vol I & II, 2/e”, Platinum Publishers.
11. Tocci and Widmer: “Moss-Digital Systems, 9/e”, Pearson Education.
12. J. Bignell andR.Donovan: “Digital Electronics, 5/e”, Cenage Learning.

Discrete Mathematics

Code: MATUGBS04
Contacts: 4L
Credits: 4

Unit-I: [10 Hrs]
Fundamentals: Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identitites on sets, pigeonhole principle. Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Function: Definition and types of function, composition of functions, recursively defined functions.

Unit-II: [8 Hrs]
Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.

Unit-III: [8 Hrs]
Combinatories: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations, generating function

Unit-IV: [8 Hrs]
Relations and digraphs: Relations and digraphs, binary relations, equivalence relations, ordering relations, lattices, paths and closures, directed graphs, adjacency matrices.

Unit-V: [8 Hrs]
Graphs: Graphs, Isomorphism, Trees, Spanning trees, Binary trees, Walk, Trail, Path, Cycle, Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Vertex coloring, Edge coloring, Chromatic Polynomials.

Suggested Books:

1. Kenneth H. Rosen: "Discrete Mathematics and its Applications", McGraw Hill, 2002.
2. J.P.Tremblay& R. Manohar: "Discrete Mathematical Structure with Applications to Computer Science",Mc.Graw Hill, 1975.
3. V. Krishnamurthy: "Combinatories:Theory and Applications", East-West Press.
4. Seymour Lipschutz, M.Lipson: "Discrete Mathemataics", Tata McGraw Hill, 2005.
5. Kolman, Busby Ross: "Discrete Matheamatical Structures", Prentice Hall International.
6. N Deo: "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall.

Indian Constitution

Code: UCCUGMC03
Contacts: 2L
Credits: 0

Module No.	Content	Lecture
1	Meaning of the constitution law and constitutionalism	
2	Historical perspective of the Constitution of India	
3	Salient features and characteristics of the Constitution of India	
4	Scheme of the fundamental rights	
5	The scheme of the Fundamental Duties and its legal status	
6	The Directive Principles of State Policy – Its importance and implementation	
7	Federal structure and distribution of legislative and financial powers between the Union and the States	
8	Parliamentary Form of Government in India – The constitution powers and status of the President of India	
9	Amendment of the Constitutional Powers and Procedure	
10	The historical perspectives of the constitutional amendments in India	
11	Emergency Provisions : National Emergency, President Rule, Financial Emergency	
12	Local Self Government – Constitutional Scheme in India	
13	Scheme of the Fundamental Right to Equality	
14	. Scheme of the Fundamental Right to certain Freedom under Article 19	
15	Scope of the Right to Life and Personal Liberty under Article 21	

Suggested Books:

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.

2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi

Data Structures Lab

Code: CSEUGPC03
Contacts: 3P
Credits: 1.5

Experiments should include but not limited to:

1. Implementation of various sorting algorithms such as Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort, Shell sort, Heap sort, Radix sort, Bucket sorting.
2. Implementation of Linear and Binary Search.
3. Implementation of stacks and queues using arrays.
4. Implementation of stacks and queues using linked lists.
5. Applications of linked lists: polynomial arithmetic, set operations, etc.
6. Sparse Matrices: Multiplication, addition.
7. Implementation of Binary Trees, Binary Search Trees, B-Trees, B+-Trees.
8. Implementation of Hash tables.

Digital Logic Lab

Code: CSEUGPC04
Contacts: 3P
Credits: 1.5

1. **Logic family:** Implementation of OR and AND gates using diodes, Study on characteristics of DTL and TTL inverters using discrete components, Study on characteristics of TTL and CMOS gates.

2. **Combinational logic circuits:** Design and implementation of combinational circuits such as, Adders, comparators, parity generator and checker. Implementation of Boolean functions using multiplexer and decoder/de-multiplexer.

3. **Sequential circuits:** Study of latch and flip-flop, design of counters.

Semester IV:

Object Oriented Programming Systems

Code: CSEUGPC05
Contacts: 3L
Credits: 3

Unit-I: [3 Hrs]
Object Oriented Thinking: Need for OOP Paradigm, Principles of Object Oriented Languages, Benefits of OOP, Applications of OOP.

Unit-II: [6 Hrs]
Java Basics: History of Java, Java Buzzwords, Java Virtual Machine, Platform Independence, Data Types, Variables, Scope and Life time of variables, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program.

Unit-III: [5 Hrs]
Classes and Objects: Concepts of Classes, Objects, methods, constructors, this keyword, garbage collection, Compile time polymorphism: overloading methods and constructors, parameter passing, command line arguments, Recursion, nested and inner classes, Exploring String, String Buffer classes, Arrays.

Unit-IV: [4 Hrs]
Inheritance: Hierarchical abstractions, Base class object, subclass, subtype, forms of inheritance, benefits of inheritance, Member access rules, Usage of super, staticand final with inheritance, Run time polymorphism: method overriding, abstract classes, the Object class.

Unit-V: [3 Hrs]
Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASSPATH, access control, differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

Unit-VI: [5 Hrs]
Exception Handling: Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception classes: throw and throws.

Unit-VII: [6 Hrs]
Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

Unit-VIII: [4 Hrs]
Applet Programming: Applet & Application, Applet Architecture, Parameters to Applet, Embedding Applets in Web page, Applet Security Policies

Suggested Books:

1. E Balagurusamy: "Programming with Java", McGraw Hill Education
2. Herbert Schildt:"Java: The Complete Reference",McGraw Hill Education
3. Sachin Malhotra and Saurabh Choudhary:"Programming in Java", Oxford University Press
4. Y. Daniel Liang:"Introduction to Java Programming, Brief Version", Pearson Education
5. Y. Daniel Liang:"Introduction to Java Programming, Comprehensive Version", Pearson Education
6. Cay S. Horstmann: "Core Java - Vol. I, Vol. II and Vol. II", Pearson Education
7. E. Balagurusamy: "Object-Oriented Programming with C++", McGraw Hill Education
8. Bjarne Stroustrup: "The C++ Programming Language", Pearson Education
9. R. Lafore: "Object Oriented Programming in C++", Pearson Education
10. Debasish Jana: "C++ and Object-Oriented Programming Paradigm", PHI Learning

Computer Organization& Architecture

Code: CSEUGPC06
Contacts: 3L+1T
Credits: 4

Unit-I: [9 Hrs]
Introduction: History of computing, von Neumann machine, Instruction and data, fixed-point and floating point numbers, errors, IEEE standards

Unit-II: [7 Hrs]
Processor design: Instruction Set Architecture-Instruction format, opcode optimization; operand addressing; Instruction implementation-data movement, branch control, logical, Input/output and debugging instructions; arithmetic instruction implementation–addition and subtraction, multiplication-division, 2's complement multiplication; Booth's algorithm–theory and examples; bit-pair algorithm; high performance arithmetic

Unit-III: [8 Hrs]
Control unit design: Hardwired control, micro-programmed control design – micro-instruction formats, control optimization;

Unit-IV: [9 Hrs]
Memory subsystem: Memory technology, memory interfacing, Memory hierarchy–introduction to virtual memory system; Cache memory – performance, address mapping, content addressable memory (CAM), Floppy Disks

Unit-V: [7 Hrs]
Peripherals: Basic properties, bus architectures, interfacing of I/O devices, data transfer schemes –programmed I/O, DMA, mass storage, RAID

UNIT VI: [3 Hrs]
Pipelining: Pipelining datapath and instructions, speed up, CPI, latency; linear / non-linear pipeline–reservation table, MAL; super-pipelined and super-scalar processors

Suggested Books:

1. Mano, M.M., "Computer System Architecture", PHI.
2. BehroozParhami: "Computer Architecture", Oxford University Press
3. Hayes J. P.: "Computer Architecture & Organisation", McGraw Hill,
4. Hamacher: "Computer Organisation", McGraw Hill,
5. N. senthil Kumar, M. Saravanan, S. Jeevananthan: "Microprocessors and Microcontrollers" OUP.
6. Chaudhuri P. Pal: "Computer Organisation & Design", PHI.
7. P N Basu: "Computer Organization & Architecture", Vikas Publishing.
8. J. L. Hennessy and D. A. Patterson:"Computer Architecture: A Quantitative Approach", 3rd & 4th ed, Elsevier.
9. Kai Hwang:"Advanced Computer Architecture: Parallelism, Scalability, Programmability", TMH.

Probability & Statistics

Code: MATUGBS05
Contacts: 3L
Credits: 3

Unit-I: [5 Hrs]
Mathematical Theory of Probability: Basic concepts, Classical and axiomatic approaches, Sample space and events, Properties of probability functions, Conditional probability and independent events.

Unit-II: [8 Hrs]
Single Random variables & probability distributions: Random variables - Discrete and continuous. Probability distributions, mass function/ density function of probability distribution. Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution. Binomial, Poisson & normal distributions and their properties. Moment generating functions of the above three distributions, and hence finding the mean and variance

Unit-III: [7 Hrs]
Multiple Random variables, Correlation & Regression: Joint probability distributions- Joint probability mass/ density function, Marginal probability mass & density functions, Covariance of two random variables, Correlation Coefficient of correlation, Regression Coefficient, Central limit theorem.

Unit-IV: [7 Hrs]
Sampling Distributions & Parameter estimation: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of mean and sampling distribution of variance, likelihood estimate, interval estimations.

Unit-V: [6 Hrs]
Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors - critical region, confidence interval, Level of significance, One sided test, Two sided test, Student t-distribution, F-distribution, Chi-square test of goodness of fit.

Unit-VI: [7 Hrs]
Queuing Theory and Stochastic processes: Structure of a queuing system, Operating characteristics of queuing system, Introduction to Stochastic Processes - Classification of Random processes, Methods of description of random processes, Stationary and non-stationary random process, Markov process, Markov chain.

Suggested Books:

1. Seymour Lipschutz and John J. Schiller: "Introduction to Probability and Statistics",
2. S. K. Mapa: "Higher Algebra (Abstract & Linear)",
3. A. Banerjee, S. K. De and S. Sen: "Mathematical Probability",
4. C.W.Helstrom: "Probability and Stochastic Processes for Engineers",
5. K.B.Datta and M.S.Sriniva: "Mathematics for Engineers", Cengage Publications.
6. T.K.V.lyengar&B.Krishna Gandhi Et: "Probability and Statistics",
7. S C Gupta and V.K.Kapoor: "Fundamentals of Mathematical Statistics",

Biology for Engineers

Code: BIOUGBS01
Contracts: 2L
Credits: 2

Module No.	Content of the module	Allotted hour
1	Diversity of Life-prokaryotes and eukaryotes, non chordates and chordates; Origin of life and Darwinian Evolution, Synthetic theory of evolution	5
2	Cell and Cell theory, Cellular structure and function, central dogma of molecular Biology, Concept of Gene and Allele, Genetic disorder, Genetic code, Understanding inheritance patterns through pedigree	5
3	Organismal physiology, Bioenergetics, Exothermic and endothermic vs. Exergonic and endergonic reaction (include Glycolysis, Krebs cycle and photosynthesis)	4
4	Biomolecules, monomers and polymers, Nucleotides and DNA/RNA, Amino acids and proteins, carbohydrates and lipids, hierarchy of protein structure, structure function correlation , enzymes and their mode of action	5
5	Immunology- Self vs. Non Self, pathogens, human immune system , antigen-antibody reactions, Vaccines, Nervous system- impulse transmission	4
6	Biosafety, bioresources, Drug design principle	2
7	Engineering designs inspired by examples in biology (compare eye and camera, bird flight and aircraft	3
8	Engineering aspects of some Nobel Prizes in physiology and Medicine	2

Suggested Books:

1. Cell and Molecular Biology-P.K.Gupta
2. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
3. T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.

Environmental Science

Code: UCCUGMC02
Contacts: 2L
Credits: 0

Unit-I: [4 Hrs]

Basic ideas of environment, basic concepts related to environmental perspective, man, society and environment, their inter relationship.

Mathematics of population growth and associated problems, definition of resource, types of resource: renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, pollutant and contaminant. Environmental impact assessment.

Environmental degradation: Acid rain, toxic element, particulates, noise pollution, air pollution, effect of pollution on man. Overall methods for pollution prevention, components of environment, environmental problems and sustainable development

Unit-II: [3 Hrs]

Elements of Ecology:System, open system, closed system, definition of ecology, species, population, community, Ecosystem, biotic and abiotic components. Ecological balance and consequence of change:Effect of abiotic factor on population, flow chart of different cycles with only elementary reaction [oxygen,nitrogen, phosphate, sulphur], food chain

Unit-III: [10 Hrs]

Overview of Air Pollution and Control, Atmospheric Composition: Troposphere, stratosphere, mesosphere, thermosphere, tropo pause, stratopauseand mesopause. Energy Balance: Conductive and convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth albedo]), problems. Green-house effects, Climate, weather: Difference between climate and weather, Global warming and its consequence, Atmospheric dispersion, Source and effect of pollutants, Primary and secondary pollutants: Emission standard, Depletion Ozone layer, Standards and control measures.

Unit- IV: [7 Hrs]

Different Other Types of Pollutions and Way to their Control, Water Pollution: Natural water, Lake, Arsenic pollution. Land Pollution: Lithosphere, Waste and Waste management, Land filling. Noise Pollution: Causes and Effects.

Suggested Books:

1. Masters, G.M.: "Introduction to Enviromental Engineering", Pearson Education India.
2. N NBasak: "Environmental Engineering", McGraw Hill Education.
3. Richard T. Wright, Dorothy F. Boorse: "Environmental Science: Toward a Sustainable Future", Pearson Education.
4. Eugene Odum.: "Fundamentals of Ecology",Cengage Learning.
5. Smith:"Elements of Ecology", Pearson Education India.
6. M. Dash, S. Dash: "Fundamentals Of Ecology", McGraw Hill Education.
7. N.K. Uberoi:"Environmental Management", Excel Books.
8. Anil Kumar De and Arnab Kumar De:"Environmental Studies", New Age International..

Object Oriented Programming Lab

Code: CSEUGPC07
Contacts: 3P
Credits: 1.5

1. Assignments on class, constructor, overloading, inheritance, overriding,
2. Assignments on abstract classes, String handling
3. Assignments on wrapper class, arrays
4. Assignments on developing interfaces- multiple inheritance, extending interfaces
5. Assignments on creating and accessing packages
6. Assignments on Exception handling
7. Assignments on multithreaded programming
8. Assignments on applet programming

Computer Organization &Architecture Lab

Code: CSEUGPC08
Contacts: 3P
Credits: 1.5

1. Design of adders.
2. Memory module design.
3. Implementation of simple memory test logic (such as March test).
4. Realization of data transfer among CPU registers, Main memory and External sources.
5. Swapping of registers' contents.
6. Control design.
7. Familiarity with IC chips, e.g.

a) Multiplexer , b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification
from Data book.

8. Design a BCD adder.
9. Design of a 'Carry Look Ahead' Adder circuit.
10. Use a multiplexer unit to design a composite ALU.
11. Use ALU chip for multibit arithmetic operation.

Scripting Lab

Code: CSEUGPC09
Contacts: 1T+3P
Credits: 2.5

The lab experiments for this course have to ensure that the following concepts of PYTHON LANGUAGE are covered during lab classes:

Introduction: Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.
Modules: Creating modules, import statement, from. Import statement, name spacing, **Python packages** Introduction to PIP, Installing Packages via PIP, Using Python Packages

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding,
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics

Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

Scripting Languages like Shell, Perl, Java Script; Database Driven Web Site: PHP and MySQL;

Suggested Books:

1. Vamsi Kurama:“Python Programming: A Modern Approach”, Pearson.
2. Mark Lutz:“Learning Python”,O’Rielly
3. W.Chun: “Core Python Programming”, Pearson.
4. Introduction to Python, Kenneth A. Lambert, Cengage
5. S. Das:“Unix System V.4 Concepts and Applications”, 3rd Ed., Tata Mcgraw-Hill, 2013.
6. D. Flanagan:“Javascript: The Definitive Guide”, 5th Ed., O'Reilly, 2006.
7. D. Gosselin:“PHP Programming with MySQL”, Course Technology, 2006.

Semester V:

Operating Systems

Code: CSEUGPC10
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]
Introduction to OS: Introduction to Operating System: Operating system functions, Concept of batch-processing, multi-programmed, time-sharing, real-time, distributed system. Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, and system calls.
Processes: Concept of processes, state diagram, process control block, scheduling of processes, operations on processes, co-operating processes, inter-process communication.
Threads: overview, benefits of threads, user and kernel threads.

CPU scheduling: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms like FCFS, SJF, RR, Selfish-RR, Priority, Highest Response ratio Next (HRN), and algorithm evaluation, multi-processor scheduling.

Module-2: [12 Hrs]
Process Synchronization: background, critical section problem, critical region, synchronization hardware, semaphores, discussion of synchronization problems like producer-consumer, readers-writers, dining philosophers, sleeping-barber etc.

Deadlocks: conditions, resource allocation graph, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Memory Management: background, logical vs. physical address space, address translation, swapping, static partitioning, dynamic partitioning, paging, segmentation, segmentation with paging.

Virtual Memory: background, demand paging, performance, page replacement, page replacement algorithms (FIFO, LRU, Optimal page replacement), allocation of frames, thrashing.

Module-3: [12 Hrs]
File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, and indexed), and free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface, kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks, concept of RAID etc.

Protection and Security: Concepts of domain, Access matrix and its implementation, access control, Security of systems- concepts, threats- Trojan horse, virus, worms etc, introduction to cryptography as security tool, user authentication. Case Studies

Suggested Books:

1. A. Silberschatz, P. Galvin and G. Gagne:"Operating Systems Concepts", Wiley India.
2. Gary Nutt, N. Chaki and S. Neogy: "Operating Systems Concepts", Pearson Education.
3. W. Stallings: "Operating Systems", Pearson Education.
4. D. M. Dhamdhere: "Operating Systems: A Concept-based Approach", Tata McGraw-Hill.

Database Management Systems

Code: CSEUGPC11
Contacts: 3L
Credits: 3

Module-1: Introduction [4 Hrs]
Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema Architecture of DBMS

Module-2: Entity-Relationship Model [4 Hrs]
Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features

Module-3: Relational Model [5 Hrs]
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views,Modifications of the Database.

Module-4: SQL and Integrity Constraints [5 Hrs]
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, ReferentialIntegrity Constraints, assertions, Views, Nested Subqueries, Database security application development using SQL, Stored Procedures and Triggers.

Module-5: Relational Database Design [7 Hrs]
Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, 2NF, 3NF,Boyce-Codd Normal Form, Normalization using multi-valued dependencies, 4NF, 5NF, Lossless Decomposition

Module-6: Internals of RDBMS [6 Hrs]
Physical data structures, Query optimization: join algorithm, statistics and cost based optimization. Transaction Processing, Concurrency Control and Recovery Management, Serializability, Lock based protocols, Two Phase Locking.

Module-7: File Organization & Index Structures [5 Hrs]
File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree.

Suggested Books:

1. Abraham Silberschatz, Henry F. Korth and S Sudarshan: "Database System Concepts", McGraw Hill Education.
2. ElmasriRamez and NovatheShamkant: "Fundamentals of Database Systems", Pearson Education.
3. Raghu Ramakrishnan and Johannes Gehrke:"Database Management Systems", McGraw Hill Education
4. Jim Gray and Andreas Reuter:"Transaction Processing: Concepts and Techniques", Moragan Kauffman Publishers.
5. C.J. Date:"An Introduction to Database Systems", Pearson Education
6. R. Panneerselvam: "Database Management Systems", PHI Learning
7. Alexis Leon and Mathews Leon: "Fundamentals of Database Management Systems", McGraw Hill Education.
8. Ullman JD.: "Principles of Database Systems", Galgotia Publications.

Design & Analysis of Algorithms

Code: CSEUGPC12
Contacts: 3L+1T
Credits: 4

Module-1: [12 Hrs]
Models of computation: RAM,TM etc. time and space complexity
Asymptotic Notation: Big-O, omega, theta etc.; finding time complexity of well known algorithms like heap sort, search algorithm etc.
Algorithm design techniques: Recursion: use, limitations, examples.
Divide and conquer: basic concept, use, examples (Merge sort, Quick Sort, Binary Search).

Module-2: [12 Hrs]
Dynamic Programming: basic concept, use, examples (matrix-chain multiplication, all-pair shortest paths, single-source shortest path, travelling salesman problem).
Branch and Bound: basic concept, use, examples (15-puzzle problem).
Backtracking: basic concept, use, examples (Eight queens problem, graph coloring problem, Hamiltonian problem).
Greedy Method: basic concept, use, examples (Knapsack problem, Job sequencing with deadlines, minimum spanning tree).
Lower Bound Theory: Bounds on sorting and sorting techniques using partial and total orders.
Disjoint Set Manipulation: Set manipulation algorithm like UNION-FIND, union by rank, Path compression.

Module-3: [12 Hrs]
Properties of graphs and graph traversal algorithms: BFS and DFS.
Matrix manipulation algorithms: Different types of algorithms and solution of simultaneous equations, DFT & FFT algorithm; integer multiplication schemes.
Notion of NP-completeness: P class, NP-hard class, NP-complete class, Circuit Satisfiability problem, Clique Decision Problem.
Approximation algorithms: Necessity of approximation scheme, performance guarantee, Polynomial time approximation schemes: 0/1 knapsack problem.

Suggested Books:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein: "Introduction to Algorithms", The MIT Press.
2. E. Horowitz, S. Sahni, S. Rajasekaran: "Fundamentals to Computer Algorithms", Springer.
3. C.H. Papadimitriou, E. Steiglitz:"Combinatorial Optimization Algorithms and Complexity", Dover Publications Inc.

Formal Language & Automata Theory

Code: CSEUGPC13
Contacts: 3L+1T
Credits: 4

Module-1 [12 Hrs]
Introduction: Alphabet, Languages, Grammars, Productions, Derivation, Chomsky hierarchy of languages, Regular Expressions and Languages.

Finite Automata (FA): Deterministic finite automata (DFA), Non-deterministic finite automata (NFA), Deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, Minimization of Finite Automata.

Regular Languages: Regular Sets and Languages, Properties of Regular Languages, Pumping Lemma for Regular Languages.

Module-2 [12 Hrs]

Context-Free Languages and Pushdown Automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

Context-Sensitive Languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

Module-3 [12 Hrs]

Turing machines: The basic model for Turing machines (TM), Turing-recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, Variants of Turing machines, Nondeterministic TMs and equivalence with deterministic TMs, Universal TMs, Halting Problem, Recursive Functions and Sets, Recursively Enumerable Sets, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

Undecidability: Church-Turing Thesis, Universal Turing Machine, The Universal And Diagonalization Languages, Reduction Between Languages And Rice's Theorem, Undecidable Problems About Languages.

Suggested Books:

1. John Martin: "Introduction to Languages and Theory of Computation",Tata McGraw Hill.
2. J. E. Hopcroft and J. D. Ullman:"Introduction to Automata Theory, Languages and Computation", Pearson Education.
3. H. R. Lewis and C. H. Papadimitriou:"Elements of the Theory of Computation", Second Edition, Pearson Education.
4. Peter Linz:"An Introduction to Formal Languages and Automata", Narosa.
5. Michael Sipser:"Introduction to the Theory of Computation", Thomson Press.
6. Dexter C. Kozenm:"Automata and Computability", Springer.

Operating Systems Lab

Code: CSEUGPC14
Contacts: 3P
Credits: 1.5

1. **Shell programming:** creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands).
2. **Process:** starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. **Signal:** signal handling, sending signals, signal interface, signal sets.
4. **Semaphore:** programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5. **POSIX Threads:** programming with pthread functions(viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel)
6. **Inter-process communication:** pipes(use functions pipe, popen, pclose), named pipes(FIFOs, accessing FIFO)

Database Management Lab

Code: CSEUGPC15
Contacts: 3P
Credits: 1.5

Overview of Structured Query Language

1. Creating Database
   - Creating a Database
   - Creating a Table
   - Specifying Relational Data Types
   - Specifying Constraints
   - Creating Indexes
2. Table and Record Handling
   - INSERT statement
   - Using SELECT and INSERT together
   - DELETE, UPDATE, TRUNCATE statements
   - DROP, ALTER statements
3. Retrieving Data from a Database
   - The SELECT statement
   - Using the WHERE clause
   - Using Logical Operators in the WHERE clause
   - Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING
4. Clauses
   - Using Aggregate Functions
   - Combining Tables Using JOINS
   - Subqueries
5. Database Management
   - Creating Views
   - Creating Column Aliases
   - Creating Database Users
   - Using GRANT and REVOKE
6. Cursors in Oracle PL / SQL
7. Writing Oracle PL / SQL Stored Procedures

Design & Analysis of Algorithms Lab

Code: CSEUGPC16
Contacts: 3P
Credits: 1.5

1. Implement Binary Search using Divide and Conquer approach
2. Implement Merge Sort using Divide and Conquer approach
3. Sort a given set of elements using the Heap sort method and determine the time taken to sort the elements

4. Sort a given set of elements using Selection sort and hence find the time required to sort elements.
5. Implement Quick Sort using Divide and Conquer approach
6. Find Maximum and Minimum element from an array of integer using Divide and Conquer approach
7. Obtain the Topological ordering of vertices in a given digraph
8. Find the minimum number of scalar multiplication needed for chain of matrix
9. Implement all pair of shortest path for a graph (Floyed- Warshall Algorithm)
10. Implement Traveling Salesman Problem
11. Implement Single Source shortest Path for a graph (Dijkstra, Bellman Ford Algorithm)
12. Implement 15 Puzzle Problem
13. Implement 8 Queen problem
14. Minimum Cost Spanning Tree by Prim's Algorithm >Minimum Cost Spanning Tree by Kruskal's Algorithm
15. Implement Breadth First Search (BFS) >Implement Depth First Search (DFS)

Semester VI:

Software Engineering

Code: CSEUGPC17
Contacts: 3L
Credits: 3

Module 1: [12 Hrs]
Software as an engineering product, Software vs. Program, Software engineering vs conventional engineering, Goals of software engineering, Issues and challenges
Software development process models, Waterfall, Prototyping, Spiral, Incremental, RAD and Component based development model; Comparative analysis

Requirement Engineering - Tools for requirement elicitation and analysis, Analysis issues, System Requirement Specification, Formal techniques– Z Spec, Analysis Models for Structured approach &Object Oriented approach, Requirement Traceability.

Module 2:[12 Hrs]

Software Design &Modelling - Problem partitioning, Top-Down And Bottom-Up design, Structured charts, coupling, cohesion, Modular Design and Structured Programming. Data design, User Interface design.

Coding & Documentation: Coding Standards and Guidelines, Code review & walkthrough, Structured Programming, OO Programming, Information Hiding, Code reuse, System Documentation.

Software testing objectives and principles, Verification vs. Validation, Types of testing, Cyclomatic complexity, Test Case Generation, Test tools & Models, Object-oriented Testing, Model Based testing, Test automation, Regression.

Module 3:[12 Hrs]

Software Project Management: Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Quality factors, Quality standards – TQM, ISO, SEI CMM, PCMM, Six sigma, Reliability; Project Monitoring; Software Project Estimation - Estimation Metrics- Size Oriented and Function Point Oriented; Cost Estimation - Algorithmic Cost Modeling, COCOMO, advanced COCOMO, Personnel Productivity &team structure.

Overview of models in software development – UML, DFD, ERD, Modeling concurrent& distributed systems - PetriNets, High Level Petri Nets;

CASE tools: Concepts, use and application.

Suggested Books:

1. C. Ghezzi, M. Jazayeri, D. Mandrioli: "Fundamentals of Software Engineering",Pearson.
2. Sommerville: "Software Engineering", Pearson.
3. Martin L. Shooman: "Software Engineering", TMH.
4. Roger Pressman: "Software Engineering - A practitioner's approach", Mcgraw-Hill Companies, Inc.
5. Rajib Mall: "Software Engineering", PHI.

Compiler Design

Code: CSEUGPC18
Contacts: 3L
Credits: 3

Module-1 [8 Hrs]
Introduction to Compiling: Compilers, Analysis-synthesis model, The phases of the compiler, Cousins of the compiler.
Lexical Analysis: The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering, Specifications of tokens, Recognition of tokens, Finite automata, From a regular expression to NFA, From a regular expression to DFA, Design of a lexical analyzer generator (Lex).

Module-2 [10 Hrs]
Syntax Analysis: The role of a parser, Context free grammars, Writing a grammar, Top down Parsing, Non-recursive Predictive parsing (LL), Bottom up parsing, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.
Syntax directed translation: Syntax directed definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Top-down translation, Bottom-up evaluation of inherited attributes.

Module-3 [8 Hrs]
Type checking: Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions, Overloading of functions and operators.
Run time environments: Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.

Module-4 [10 Hrs]

Intermediate code generation: Intermediate languages - Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples), Declarations, Assignment statements, Boolean expressions.

Code generations: Issues in the design of code generator, The target machine, Run-time storage management, Basic blocks and flow graphs, A simple code generator, Register allocation and assignment, The DAG representation of basic blocks, Peephole optimization.

Code optimization: Introduction, The principle sources of optimization, Optimization of basic blocks, Loops in flow graphs.

Suggested Books:

1. Aho, Sethi, Ullman: "Compiler Principles, Techniques and Tools", Pearson Education.
2. K. V. N. Sunitha: "Compiler Construction", Pearson Education.
3. O.G. Kakde: "Compiler Design", Laxmi Publications.
4. Holub: "Compiler Design in C", PHI.
5. Tremblay and Sorenson: "Compiler Writing", McGrawHill International.
6. Chattopadhyay: "Compiler Design", PHI.

Computer Networks

Code: CSEUGPC19
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]

Introduction: Data communications concepts, direction of data flow (simplex, half duplex, full duplex). Networks: physical structure (type of connection, topology), categories of network (LAN, MAN, WAN). Internet: brief history, internet today. Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical level: Overview of data (analog & digital), review of signal (analog & digital), transmission (analog & digital) & transmission media (guided & non-guided). TDM, FDM, WDM. Circuit switching and packet switching concepts

Data link layer: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC.

Module-2: [12 Hrs]

Medium access sub layer: Point to point protocol, token bus, token ring. Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD. Traditional Ethernet, Fast Ethernet.

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router. Addressing: Internet address, classful and classless addressing, subnetting. Routing: techniques, static vs. dynamic routing, routing table for classful address.

Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing. Protocols: ARP, RARP, IP, ICMP, IPV6. Unicast and multicast routing protocols

Module-3: [12 Hrs]
Transport layer: Process to process delivery, UDP, TCP, Congestion control algorithms. Quality of service, techniques to improve QoS.

Application layer:DNS, SMTP, SNMP, FTP, HTTP & WWW.
Security: cryptography, user authentication, security protocols in internet, Firewalls.

Wireless LAN: IEEE 802.11; Introduction to Bluetooth, VLAN's, Cellular telephony & Satellite network.

Suggested Books:

1. B. A. Forouzan: "Data Communications and Networking (3rd Ed.)", TMH.
2. A. S. Tanenbaum: "Computer Networks (4th Ed.)", Pearson Education/PHI.
3. W. Stallings: "Data and Computer Communications (5th Ed.)", PHI/ Pearson Education.
4. Zheng& Akhtar:"Network for Computer Scientists & Engineers", OUP.
5. Black, Data & Computer Communication", PHI.
6. Miller: "Data Communication & Network", Vikas.
7. Miller:"Digital & Data Communication", Jaico.
8. Shay:"Understanding Data Communication & Network", Vikas.

Computer Graphics

Code: CSEUGPC20
Contacts: 3L
Credits: 3

Module I: [5 Hrs]
Introduction to Computer Graphics & Graphics Systems: Overview of computer graphics, graphical display devices, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics softwares; Character generation.

Module II: [6 Hrs]
Scan Conversion: Points and lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon fill algorithm, boundary fill algorithm, flood fill algorithm.

Module III: [4 Hrs]
2D Transformation: Basic transformations - translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection, shear, Transformation of points, lines, parallel lines, intersecting lines.

Module IV: [4 Hrs]

Viewing in 2D: Viewing pipeline, Window to viewport co-ordinate transformation, clipping operations, point clipping, line clipping, Cohen Sutherland Algorithm, clipping circles, polygons & ellipse, Sutherland Hodgeman algorithm.

Module V: [4 Hrs]

3D Transformation and Viewing : Translation, rotation, scaling & other transformations, Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

Module VI: [5 Hrs]

Curves and Surfaces : Object representation; Curve and surface designs, Bezier curves, Continuity conditions; B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

Module VII: [4 Hrs]

Hidden Surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

Module VIII: [4 Hrs]

Color and Shading Models: Light andcolor model; interpolative shading model; Texture; Ray tracing; Animation

Suggested Books:

1. D. Hearn and M.P. Baker: "Computer Graphics C version", Pearson Education.
2. Samit Bhattacharya: "Computer Graphics", Oxford University Press.
3. David F.Rogers: "Procedural Elements for Computer Graphics", TMHpublication.
4. David F. Rogers and J. A.Adams: "Mathematical Elements for Computer Graphics", TMH publication.
5. J.D. Foley, A. van Dam, S.K.Feiner and F. H. John: "Computer Graphics Principles &Practice in C", Pearson.
6. S. Harrington: "Computer Graphics – A Programming Approach", TMHpublication.
7. A.N. Sinha and A.D. Udai: "Computer Graphics", TMH publication.

Embedded Systems

Code: CSEUGPC21
Contacts: 3L
Credits: 3

Unit-I: [6 Hrs]
Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Unit-II: [8 Hrs]
Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Unit-III: [5 Hrs]
Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit-IV: [6 Hrs]
RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit-V: [5 Hrs]
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Unit–VI: [6 Hrs]
8051, AVR, PIC, ARM Microcontroller Interfacings with: LEDs and LCD,DC Motor and Stepper Motor, Switches and Relays ,HEX Keypad, ADC CENTRE

Suggested Books:

1. Shibu K.V: “Introduction to Embedded Systems”, Mc Graw Hill.
2. Raj Kamal: “Embedded Systems”, TMH.
3. Frank Vahid, Tony Givargis,: “Embedded System Design”, Wiley.
4. Lyla: “Embedded Systems”, Pearson, 2013.
5. David E. Simon: “An Embedded Software Primer”, Pearson Education.

PROFESSIONAL ELECTIVE – I

Bioinformatics

Code: CSEUGPE01
Contacts: 3L
Credits: 3

Module-1 [12 Hrs]
Background: Why computational biology, biological information, challenges in computational biology.
Sequence Assembly: Fragment assembly, Sequencing by hybridization, Overlap-layout-consensus
Sequence Alignment: Introduction to biological sequences, DNA sequence, dynamic programming methods for global and local alignment, gap penalty functions, heuristics in alignment, BLAST, pairwise sequence alignment, multiple sequence alignment

Module-2 [12 Hrs]:
Biological Database and its Types: Introduction to data types and Source. Population and sample, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum)
Phylogenetic Trees: Distance, parsimony, and probabilistic methods of phylogenetic tree construction, models of sequence evolution

Module-3 [6 Hrs]
Clustering approaches to biological datasets: High-throughput technologies, clustering algorithms, evaluation of clusters.
Gene Expression analysis: Representation of patterns and relationship General introduction to Gene expression in prokaryotes and eukaryotes, transcription factors binding sites. SNP, EST, STS. Introduction to Regular Expression, Hierarchies, and Graphical models (including Marcov chain and Bayes notes). Genetic variability and connections to clinical data

Module-4 [6 Hrs]
Modelling and analysis of biological networks: Biological networks, computational problems in network biology, Bayesian networks, module networks, parameter and structure learning, regression-based network inference, network applications. Machine Learning algorithms and its usage in modelling biological data.

Suggested Books:

1. JIN XIONG: "Essential Bioinformatics", Cambridge University Press.
2. Joachim Selbig and Stefanie Hartmann: "Introductory Bioinformatics: Fourth Edition",
3. Jonathan Pevsner: "Bioinformatics and Functional Genomics", Wiley- Blackwell.
4. S.C. Rastogi, N Mendiratta, P Rastogi: "Bioinformatics: Methods & Applications", PHI.
5. Stanley I. Letovsky: "Bioinformatics: Databases and Systems", Springer.
6. Sorin Draghici: "Bioinformatics Databases: Design, Implementation, and Usage (Chapman & Hall/ CRC Mathematical Biology & Medicine)",
7. Arthur M.Lesk: "Data base annotation in molecular biology, Principles and Practices", Wiley.

Data Science & Big Data

Code: CSEUGPE02
Contacts: 3L
Credits: 3

Unit I. Data Definitions and Analysis Techniques [6 hrs]
Elements, Variables, and Data categorization; Levels of Measurement; Data management and indexing; Introduction to statistical learning and R-Programming

Unit II. Descriptive Statistics and Basic Analysis Techniques[8 Hrs]
Measures of central tendency; Measures of location of dispersions; Practice and analysis with R; Statistical hypothesis generation and testing; Chi-Square test; t-Test; Analysis of variance; Correlation analysis; Maximum likelihood test; Practice and analysis with R

Unit III. Data Analysis Techniques [10 Hrs]
Relation analysis; Regression analysis; Classification techniques; Clustering; Association rules analysis; Practice and analysis with R

Unit IV. Big Data Processing [8 Hrs]
Big data concepts; Introduction to Hadoop; Hadoop Distributed File System; Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Typesand Formats, Map Reduce Features; Hadoop EcoSystem

Unit V. Case Studies and Projects [4 Hrs]
Understanding business scenarios; Feature engineering and visualization; Scalable and parallel computing with Hadoop and Map-Reduce; Sensitivity Analysis

Suggested Books:

1. Joel Grus: "Data Science from Scratch", O'Reilly Publisher.
2. R. Myers and R. Walpole: "Probability and Statistics for Engineers and Scientists", Pearson.
3. Seema Acharya and SubhasiniChellappan: "Big Data Analytics", Wiley Publisher.
4. Tom White: "Hadoop: The Definitive Guide", O'Reilly Publisher.

Image Processing

Code: CSEUGPE03
Contacts: 3L
Credits: 3

Module – 1: Image formation [3 Hrs]

Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems

Module – II: Introduction [4 Hrs]

Overview of Image Processing System, Image Digitization (Sampling and Quantization), Digital Image, Fundamentals of Color image, Color Models (RGB, YCbCr, HIS), Image File Format

Module – III: Spatial Domain Image Enhancement [3 Hrs]

Contrast Intensification (linear and non-linear stretching), Histogram Equalization, Spatial Domain Smoothing and Sharpening Filters, Correlation and Convolution.

Module – IV: Frequency Domain Image Enhancement [4 Hrs]

Fourier Transform (1-D and 2-D), Frequency Domain image, Image smoothing, Image sharpening, Correlation and Convolution, Discrete Cosine Transform, Discrete Wavelet Transform.

Module – V: Morphological Image Processing [3 Hrs]

Dilation and Erosion, Opening and Closing, Some Basic Morphological Algorithms, Extensions to Gray-Scale Images.

Module – VI: Image Segmentation [5 Hrs]

Point Detection, Line Detection, Edge Detection **,**Edge Linking and Edge Following by Local Processing, Hough Transform, Thresholding, Region segmentation

Module – VII: Image Representation, Feature Extraction & Object Recognition [9 Hrs]

Boundary Representation by Chain Codes, Polygonal Approximation, Skeletons Component Labeling and Counting Geometrical, Texture Analysis, Geometric Moments Texture Descriptor, Gray-level Co Occurrence Matrix, some object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition, Texture Description, Pattern & Pattern Classes, Template Matching.

Module – VIII: Image Compression [5 Hrs]

Fundamentals, Compression Models, Error-Free compression, Lossy Compression

Suggested Books:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing".
2. B. Chanda and D. Dutta Majumder, "Digital Image Processing and Analysis".
3. D. Forsyth and J. Ponce , "Computer Vision - A modern approach", Prentice Hall.

VLSI Design

Code: CSEUGPE04
Contacts: 3L
Credits: 3

Unit – I [9 Hrs]
MOS transistor principle: NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

Unit- II [9 Hrs]
Combinational logic circuits: Examples of Combinational Logic Design, Elmore"s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles.

Unit- III [9 Hrs]
Sequential logic circuits: Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design.

Unit- IV [9 Hrs]
Designing arithmetic building blocks: Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area trade-off.

Unit-V [9 Hrs]
Implementation strategies: Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

Suggested Books:

1. Jan Rabaey, AnanthaChandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997
3. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993

Web Technologies

Code: CSEUGPE05
Contacts: 3L
Credits: 3

Static and Dynamic Web Pages [6 Hrs]
HTML:Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout, need of dynamic web pages; an overview of DHTML, Cascading Style Sheet (CSS), comparative studies of different technologies of dynamic page creation

Active Web Pages [3Hrs]
Need of active web pages;Java Applets:Container Class, Components, Applet Life Cycle, Update method; Parameter passing Applet, Applications.

Java Script [4Hrs]
Data types, variables, operators, conditional statements, Array object, Date object, String object, Function, Errors, Validation.

Extensible Markup Language (XML) [3 Hrs]
Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief.

Cookies & Sessions [3 Hrs]
Definition of cookies; Create and Store a cookie with example; Sessions.

Java Servlet and JSP [13Hrs]
Servlet environment and role, HTML support, Servlet API, The Servlet life cycle, Servlet Programs. JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement.

PHP & MySQL [4Hrs]
Overview of PHP, Basics web programming using PHP, Introducing MySQL, Database connectivity using PHP

Suggested Books:

1. Uttam K. Roy: “Web Technologies”, Oxford University Press.
2. Ivan Bayross, Sharanam Shah, Cynthia Bayross, Vaishali Shah: “Java Server Programming for Professionals”, Shroff Publishers and Distributors.
3. C. Xavier: “Web Technology and Design”, New Age.
4. Kogent Learning Solutions Inc.: “Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book”, Dreamtech Press.

5. N.P. Gopalan and J. Akilandeswari:“Web Technology: A Developer's Perspective”, PHI.
6. Luke Welling, Laura Thomson:“PHP and MySQL Web Development”, Pearson Education.
7. Mike McGrath: “PHP and MySQL”, McGraw Hill Education.
8. Meloni J C: “Sams Teach Yourself PHP MY SQL and Apache”, Pearson Education.
9. Jain & Siddiqui with NIIT: “J2EE Professional Projects”, PHI.
10. UttamK. Roy: “Advanced Java Programming”, Oxford University Press.

Seminar and Presentation Skills

Code: CSEUGPR01
Contacts: 3P
Credits: 0

English language and verbal skills; Skills related to seminar and presentation; Selection of (preferably) technical topic; Practice sessions on seminar presentation; Do’s and don’ts in seminar and technical presentation; Listening pre-recorded matters produced by British Council, Universities of Oxford, and University of Cambridge, etc. Preparing final presentation and facing question answer session at the end of presentation; boosting confidence in communication in social as well as professional lives.

Reference Books:

1. SM Gupta:“Current English Grammar and Usage”,
2. Sashi Kumar: “Spoken English (with Cassette)” , TMH.
3. Ishita Bhown:“Improve Your Presentation Skills (with CD)”, V&S Publishers.
4. R. Sharma and Krishna Mohan:“Business Correspondence & Report Writing”, McGraw Hill.

Compiler Design Lab

Code: CSEUGPC22
Contacts: 3P
Credits: 1.5

1. Design a LEX Code to count the number of lines, space, tab-meta character and rest of characters in a given Input pattern.
2. Design a LEX Code to identify and print valid Identifier of C/C++ in given Input pattern.
3. Design a LEX Code to identify and print integer and float value in given Input pattern.
4. Design a LEX Code for Tokenizing (Identify and print OPERATORS, SEPERATORS, KEYWORDS, IDENTIFERS etc.) in a C program-fragment
5. Design a LEX Code to remove the comments from any C-Program given at run-time and store into ‘out.c’ file.

6. Design a LEX Code to extract all html tags in the given HTML file at run time and store into Text file given at run time.
7. Design a DFA in LEX Code which accepts string containing even number of 'a' and even number of 'b' over input alphabet {a, b}.
8. Design a DFA in LEX Code which accepts string containing third last element 'a' over input alphabet {a, b}.
9. Design a DFA in LEX Code to Identify and print Integer & Float Constants and Identifier.
10. Design YACC/LEX code to evaluate arithmetic expression involving operators +, -, * and / without operator precedence grammar & with operator precedence grammar.
11. Design YACC/LEX code that translates infix expression to postfix expression.
12. Design Desk Calculator using YACC/LEX code.

Computer Networks lab

Code: CSEUGPC23
Contacts: 3P
Credits: 1.5

1. **Familiarization with**
   - Networking cables (CAT5, UTP)
   - Connectors (RJ45, T-connector)
   - NIC Installation & Configuration (Windows/Linux)
   - Hubs, Switches
2. **TCP/UDP Socket Programming**
3. **Implementation/Simulation of**
   - Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
   - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
   - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

PROFESSIONAL ELECTIVE – I [Lab]

Bioinformatics Lab

Code: CSEUGPE06
Contacts: 3P
Credits: 1.5

Primary goal of this course is to make acquaint the students to know different bioinformatics tools available and how to use them to perform biological data analysis. All the programming will be performed in R or MATLAB. The syllabus includes but not limited to-

1. Introduction to R programming language
2. Sequence Alignment
3. Phylogenetic Analysis
4. Performing Clustering in biological datasets
5. Classification analysis in biological datasets
6. Gene Expression analysis
7. Modelling and analysis of biological networks

Data Science Lab

Code: CSEUGPE07
Contacts: 3P
Credits: 1.5

- Practice and assignments on elementary operations on data, statistical measures, distributions, hypothesis testing, correlation analysis, etc.
- Practice and assignments on relation analysis, regression, data classification and clustering techniques, association rules analysis, etc.
- Exercise and assignments on big data processing exercises in Hadoop, Sparc or related platform(s).

Image Processing Lab

Code: CSEUGPE08
Contacts: 3P
Credits: 1.5

1. Introduction (1P)	Images and pictures, Images and digital images, Image File Sizes, Image perception, Greyscale images, RGB Images, Data types and conversions, Spatial Resolution
2. Point Processing (2P)	Arithmetic operations, Addition of two images, Subtract one image from other image, Calculate mean value of image, Calculate Brightness, Obtain Negative image, Obtain Flip image, Thresholding, Contrast stretching, Histograms
3. Geometric transformation (1P)	Translation, Scaling, Rotation, Shrinking, Zooming
4. Spatial Domain filtering (3P)	Smoothing & their variants Sharpening & their variants
5. Frequency domain filtering (3P)	Smoothing & their variants Sharpening & their variants

VLSI Design Lab

Code: CSEUGPE09
Contacts: 3P
Credits: 1.5

- **Combinational circuits:**

1. Write a program of AND, NAND, XOR, NOR, OR, NOT, gates using dataflow and behavioural modelling.
2. Write a program of half adder and full adder using structural modelling.
3. Write a program of 1×4 DEMUX and 4×1 MUX using structural modelling.
4. Write a program of 3×8 DECODER and 8×3 ENCODER.
5. Write a program of 4 bit binary to gray and gray to binary code converter.

- **Sequential circuits:**

1. Write a program of JK, SR, D, T flip flop with reset and preset and study its characteristics.
2. Write a program of shift registers.
3. Write a program to count no. of one's by using variable.
4. Write a program of finite state machine

Web Technologies Lab

Code: CSEUGPE10
Contacts: 3P
Credits: 1.5

1. Web Page Design using HTML
2. Use of CSS in Designing Web Pages
3. Applet Design
4. Application of JavaScript in Web Page Development
5. Usage of Cookies & XML
6. Server Side Programming through Servlets
7. Application of Java Server Pages in Server Side programming
8. Application of Java Database Connectivity
9. Web design using PHP and MySQL

Semester VII

Machine Learning & Soft Computing

Code: CSEUGPC24
Contacts: 3L
Credits: 3

Module-1 [12 Hrs]:

Fuzzy Logic and Approximate Reasoning: Conventional and fuzzy sets, Basic concepts of fuzzy logic, Fuzzy expressions: Basic principles of fuzzy logic and fuzzy inference rules, fuzzy relations, fuzzy operators, realization of fuzzy systems using fuzzy relations , application of fuzzy logic in vision, pattern recognition, robotics and linguistics.

Approximate reasoning in Experts Systems, Fuzzy sets in approximate reasoning, Fuzzy propositions in approximate reasoning. Transition Modifier rules, Basic principles of approximate reasoning and rules of inference

Module-2 [12 Hrs]

Genetic Algorithms (GAs) : Introduction to GAs, Binary encodings of candidate solutions, Schema Theorem and Building Block Hypothesis, Genetic operators – crossover and mutation, parameters for GAs, Reproduction mechanism for producing Offspring, Darwinian Principle in evaluating objective function. Convergence Analysis: Simple GA schemes, Stochastic models: GA approaches to optimization problems

Module-3 [12 Hrs]

Machine learning foundations – probabilistic framework, algorithms

Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, k-NN, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm.

Suggested Books:

1. J. S. R. Jang C. T. Sun and E. Mizutani: "Neuro- Fuzzy and Soft Computing : A Computational Approach to Learning and Machine Intelligence", Pearson.
2. T. J. Ross:"Fuzzy Logic with Engineering Applications", Wiley.
3. B. Kosko:"Neural Network and Fuzzy Systems : A Dynamical Systems Approach to Machine Intelligence", PHI, 1992.
4. G. J. Klir, B. Yuan: "Fuzzy sets and Fuzzy logic: Theory and Applications", PHI, 1995.
5. David E. Goldberg: "Genetic Algorithms in Search, Optimization and Machine Learning", Addision Wesley, MA, 1989.
6. S. Haykin: "Neural Networks - A Comprehensive Foundation", Macmillan College Publishing Company, New York, 1994.

Industrial Economics & Management

Code: MBAUGHU01
Contacts: 4L
Credits: 4

Module No.	Content	Allotted hours
1	**Economics:** Introduction and Basic Economics Terms: Nature and Significance of Economics, Role of Economics in Engineering and Technology, Basic Economic: Utility, Saving, Investment, Equilibrium, Micro and Macro Economics, Liberalization, Privatization, Globalisation. Demand Analysis, Elasticity of Demand, Demand Forecasting, Factors of Production. Money Banking and Trade: Functions of money, supply & demand for money, money price level & inflation, black money, meaning, magnitude & consequences. Banking system in India, Functions of Commercial banks, Function of RBI, Sources of public revenue, principles of taxation, direct and indirect taxes, balance of trade and payment.	10
2	**Organizational Behaviour:** Basic concepts of management, objectives, classification and hierarchy, Different Schools of Management Thought, Motivation: Concept, Different Theories (Maslow, ERG, Herzberg) Communication: Purpose, process, Barriers to effective communication, Guidelines to make communication effective. Perception: Process, Importance, Factors influencing perception, Shortcuts for judging people- Halo effect, Stereotyping, Projection.	5
3	**Human Resource Management:** Recruitment and selection, Training, Performance appraisal, Industrial Relations, Trade Union, Collective Bargaining	5
4	**Quality Management**: Concept, Dimensions for goods and services, Cost of Quality, Statistical Quality Control, Control Charts, Acceptance Sampling (single). Quality circle. Total Quality Management: Concept, benefits, Criticism. New Quality Tools: Kaizen, Six Sigma, Quality Circles.	5
5	**Productions Management:** Concept, Difference from Operations Management, Types of Production (Mass, Batch, Project), Functions of Production Management. Productivity: Concept, Different Inputs and Productivity Measures, Efficiency and Effectiveness, Measures to increase Productivity.	6
6	**Marketing Management:** Basic Concepts of Marketing, Difference between Selling and Marketing, Elements of Marketing Mix- the 4 P's., STP. Marketing Research: Definition, Process, Importance, SWOT Analysis, BCG Matrix, GE Matrix.	6
7	**Financial Management:** Use of management science for the efficient administration of economic units, cost benefit analysis, present work and breakeven analysis, budgetary control.	6
8	**Materials Management:** Concept, Functions, EOQ Models, Selective Inventory Control—ABC, VED, FSN analysis	5

Suggested Books:

1. L. C. Jhamb:"A Text Book of Industrial Engineering (Vol.1)",Publisher: Everest Publishing House.
2. Anil Bhat & Arya Kumar: "Management: Principles, Processes and Practices", Publisher: OUP.
3. Martand T. Telsang: "Industrial & Business Management", Publisher: S. Chand.
4. RajanMisra: " (2009) Engineering Economics", University Science Press, An imprint of Laxmi PubliactionsPvt. Ltd., New Delhi.

PROFESSIONAL ELECTIVE – II

Natural Language Processing

Code:CSEUGPE11
Contacts: 3L
Credits: 3

Unit I. Regular Expressions and Automata [2 Hrs]
Introduction to NLP, Regular Expression, Finite State Automata

Unit II. Basic Text Processing [6 Hrs]
Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition, Multi Word Extraction, Spell Checking – Bayesian Approach, Minimum Edit Distance; Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer

Unit III. Language Modeling [8 Hrs]
Introduction to N-grams, Chain Rule, Smoothing – Add-One Smoothing, Witten-Bell Discounting; Backoff, Deleted Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models; Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Parts of Speech Tagging – Rule based and Machine Learning based approaches, Evaluation

Unit IV. Text Classification [6 Hrs]
Text Classification, Naïve Bayes' Text Classification, Evaluation, Sentiment Analysis – Opinion Mining and Emotion Analysis, Resources and Techniques

Unit V. CFG and Lexical Semantics [6 Hrs]

Context Free Grammar and Constituency, Some common CFG phenomena for English, Top-Down and Bottom-up parsing, Probabilistic Context Free Grammar, Dependency Parsing; Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, Computational Lexical Semantics – Thesaurus based and Distributional Word-Similarity

Unit VI. Information Retrieval [8 Hrs]

Boolean Retrieval, Term-document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval – Term Frequency – Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking, Combining different features for ranking, Search Engine Evaluation, Relevance Feedback

Suggested Books:

1. Jurafsky and Martin: "Speech and Language Processing", Pearson Education.
2. Manning and Schutze: "Foundation of Statistical Natural Language Processing", MIT.

Internet of Things

Code: CSEUGPE12
Contacts: 3L
Credits: 3

Module 1: [12 Hrs]

Introduction to IoT: Sensing, Actuation, Basics of Networking. Basics of Networking, Communication Protocols, Sensor Networks. Machine-to-Machine Communications

Module 2: [12 Hrs]

Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi. Cloud Computing

Module 3: [12 Hrs]

Fog Computing, Smart Cities and Smart Homes. Connected Vehicles, Smart Grid, Industrial IoT. Case Study: Agriculture, Healthcare, Activity Monitoring.

Suggested Books:

1. Pethuru Raj and Anupama C. Raman:"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.
2. ArshdeepBahga and Vijay Madisetti:"Internet of Things: A Hands-on Approach", Universities Press.

Advanced Java Programming

Code: CSEUGPE13
Contacts: 3L
Credits: 3

Module-I: Introduction [4 Hrs]

Recapitulation of Basic Concepts in Java: Objects, Classes, Encapsulation, Inheritance, Polymorphism, Packages, Access Protection, interfaces,Arrays, String Handling

Module-II: Exception Handling [3 Hrs]

Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes

Module-III: Multithreading [4 Hrs]

Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

Module-IV: Networking [5 Hrs]

Internet Addressing,InetAddress, Factory Methods, Instance Methods, TCP/IP Client sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams

Module-V: Java Database Connectivity (JDBC) [4 Hrs]

Introduction, Database driver,Different approaches to connect an application to a database server, Establishing a database connection and executing SQL statements, JDBC Prepared statements, JDBC data sources.

Module-VI: Event Handling [5 Hrs]

Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

Module-VII: Applets [3 Hrs]

Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Module-VIII: Java Swing [8 Hrs]

Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees and Tables.

Suggested Books:

1. E Balagurusamy: "Programming with Java", McGraw Hill Education.
2. Herbert Schildt:"Java: The Complete Reference",McGraw Hill Education.
3. Sachin Malhotra and Saurabh Choudhary:"Programming in Java", Oxford University Press.
4. Y. Daniel Liang:"Introduction to Java Programming, Brief Version", Pearson Education.
5. Y. Daniel Liang:"Introduction to Java Programming, Comprehensive Version", Pearson Education.
6. Cay S. Horstmann: "Core Java - Vol. I, Vol. II and Vol. II", Pearson Education.
7. Paul J. Deitel and H. Deitel: "Java 9 for Programmers", Pearson Education India.
8. Harold Elliotte Rusty: "Java Network Programming", Shroff Publishers & Distributers.
9. George Reese: "Java Database Best Practices: Persistence Models and Techniques for Java Database Programming", O'Reilly.
10. Uttam K. Roy: "Advanced Java Programming", Oxford University Press.

Computational Geometry

Code: CSEUGPE14
Contacts: 3L
Credits: 3

Unit I [6 Hrs]
Introduction, historical perspective, geometric preliminaries. Convex hulls algorithms in 2d and 3d, lower bounds. Triangulations: polygon triangulations, representations, point-set triangulations.

Unit II [8 Hrs]
Voronoi diagrams: algorithms, closest pair problems. Delaunay triangulations: algorithms (divide-and-conquer, flip, incremental), duality of Voronoi diagrams, properties (min-max angle).

Unit III [6 Hrs]
Geometric searching: point-location, 2d linear programming with prune and search. Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems.

Unit IV [8 Hrs]
Arrangements of lines: 2d arrangements, zone theorem, many-faces complexity, algorithms. Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements

Unit V [8L]
Combinatorial geometry: Ham-sandwich cuts, Helly's theorems, k-sets. Rectilinear geometry: intersection and union of rectangles, rectangle searching. Robust geometric computing. Applications of computational geometry

Reference Books

1. Berg, Cheong,Kreveld and Overmars:"Computational Geometry – Algorithms and Applications" 3e, Springer.
2. Preparata and Shamos:"Computational Geometry – An Introduction", Springer.
3. Joseph O'Rourke: "Computational Geometry in C, 2e", Cambridge University Press.
4. David Mount: "Lecture Notes".

PROFESSIONAL ELECTIVE – III

Computer Vision

Code: CSEUGPE15
Contacts: 3L
Credits: 3

Module - 1 [3 Hrs]

Image formation: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems.

Module - 2 [7 Hrs]

Processing & Analysis: Overview of Image Processing System, Image Digitization (Sampling and Quantization), Digital Image, Fundamentals of Color image, Color Models (RGB, YCbCr, HIS), Image File Format, Spatial & Frequency Domain Image analysis

(Filtering, Correlation, Convolution), Morphological Image Processing&Morphological Algorithms.

Module - 3 [6 Hrs]

Segmentation: Point Detection, Line Detection, Edge Detection **,** Edge Linking and Edge Following by Local Processing, Hough Transform, Thresholding, Region segmentation, Active contours, Split and merge, Mean shift and mode finding, Normalized cuts, Graph cuts and energy-based methods.

Module - 4 [9 Hrs]

Representation & Feature Extraction: Boundary Representation by Chain Codes, Polygonal Approximation, Skeletons Component Labeling and Counting Geometrical, Texture Analysis, Geometric Moments Texture Descriptor, Gray-level Co Occurrence Matrix, some object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition, Texture Description.

Module - 5 [5 Hrs]

Motion Structure & Estimation: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion, Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion.

Module - 6 [6 Hrs]

Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding, Recognition databases and test sets.

Suggested Books:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2010.
2. Shapiro, L. & Stockman, G., "Computer Vision". Prentice Hall, 2001.
3. D. Forsyth and J. Ponce, "Computer Vision - A modern approach", Prentice Hall.
4. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision", Publisher: Prentice Hall.
5. Haralick R M and Shapiro L G, "Computer & Robot Vision", Vo: I and II Addison Wesley, 1993.
6. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing".
7. B. Chanda and D. Dutta Majumder, "Digital Image Processing and Analysis".
8. The Computer Vision Homepage" (Carnegie Mellon University): http://www-2.cs.cmu.edu/_cil/vision.html

Mobile Computing

Code: CSEUGPE16
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]
Introduction to wireless networking and characteristics of mobile computing; Fundamentals of wireless transmission - Medium Access Control Protocols FDMA, TDMA, CDMA; Overview of Wireless LAN (IEEE 802.11); Overview of Bluetooth architecture

Module-2: [12 Hrs]
Introduction to Mobile Adhoc Network and routing protocols- DSDV, WRP, CGSR, FSR, AODV, DSR, ABR, TORA etc.; Mobile Networking protocol (Mobile IP); Mobile transport layer - Effects of mobility on Reliable Transport Protocols; Mechanisms for improving TCP performances on wireless links

Module-3: [12 Hrs]
Energy / Power Management; Wireless application Environments Wireless Application Protocol, WML, Push Architecture, Push/Pull Services; Overview of Security in mobile environments; Overview of fault tolerance in mobile computing systems.

Suggested Books:

1. C. Siva Ram Murthy and B. S. Manoj: "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson.
2. Charles Perkins: "Adhoc Networking", Pearson Education.
3. W. Stallings:"Wireless Communication", Pearson.

Visual Programming & Multimedia

Code: CSEUGPE17
Contacts: 3L
Credits: 3

Module 1: Visual Programming [12 Hrs]

WINDOWS PROGRAMMING: Windows environment – a simple windows program – windows and messages – creating the window – displaying the window – message loop – the window procedure – message processing – text output – painting and repainting – introduction to GDI – device context – basic drawing – child window controls

VISUAL C++ PROGRAMMING – INTRODUCTION: Application Framework – MFC library – Visual C++ Components – Event Handling – Mapping modes – colors – fonts – modal and modeless dialog – windows common controls – bitmaps

THE DOCUMENT AND VIEW ARCHITECTURE: Menus – Keyboard accelerators – rich edit control – toolbars – status bars – reusable frame window base class – separating document from its view – reading and writing SDI and MDI documents – splitter window and multiple views – creating DLLs – dialog based applications

Module 2: [12 Hrs]

ACTIVEX AND OBJECT LINKING AND EMBEDDING (OLE): ActiveX controls Vs. Ordinary Windows Controls – Installing ActiveX controls – Calendar Control – ActiveX control container programming – create ActiveX control at runtime – Component Object Model (COM) – containment and aggregation Vs. inheritance – OLE drag and drop – OLE embedded component and containers – sample applications

ADVANCED CONCEPTS: Database Management with Microsoft ODBC – Structured Query Language – MFC ODBC classes – sample database applications – filter and sort strings – DAO concepts – displaying database records in scrolling view – Threading – VC++ Networking issues – Winsock – WinInet – building a web client – Internet Information Server – ISAPI server extension – chat application – playing and multimedia (sound and video) files

Module 3: Multimedia [14 Hrs]

Introduction: Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications

Text and Audio: Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI

Image and Video: Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.

Synchronization: Temporal relationships, synchronization accuracy specification factors, quality of service**, Storage models and Access Techniques:** Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, and CCD

Image and Video Database: Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing

Document Architecture and Content Management: Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications

Suggested Books:

1. Charles Petzold: "Windows Programming", Microsoft Press, 1998.
2. David J. Kruglinski, George Shepherd, Scot Wingo: "Programming Microsoft
3. Visual C++", Microsoft Press, 2006.
4. Kate Gregory: 'Using Visual C++", Prentice Hall of India Pvt., Ltd., 1999.
5. Buford J. K.: "Multimedia Systems" – Pearson Education.
6. Balagurusamy E: "Programming in C#", Tata McGraw Hill, 2010.

Information and Coding Theory

Code: CSEUGPE18
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]
Information Theory: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source.

Module- 2: [12 Hrs]
Source Coding: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels.
Fundamental Limits on Performance: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity.
Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.

Module-3: [12 Hrs]
Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. Convolution Codes, Time domain approach. Transform domain approach.

Suggested Books:

1. K. Sam Shanmugam: "Digital and analog communication systems", John Wiley, 1996.
2. Simon Haykin: "Digital Communication", John Wiley, 2003.
3. Ranjan Bose: "ITC and Cryptography", TMH, II edition, 2007.

E- Commerce and ERP

Code: CSEUGPE19
Contacts: 3L
Credits: 3

Module 1: [12 Hrs]

E – Commerce: Electronic Commerce : Overview, Definitions, Advantages & Disadvantages of E – Commerce, Threats of E – Commerce, Managerial Prospective, Rules & Regulations For Controlling E – Commerce, Cyber Laws.

Technologies : Relationship Between E – Commerce & Networking, Different Types of Networking For E – Commerce, Internet, Intranet & Extranet, EDI Systems, **Wireless Application Protocol :** Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce.

Business Models of e – commerce : Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C, C2B, C2C, E – Governance, **E – strategy:** Overview, Strategic Methods for developing E – commerce. **Four C's :** (Convergence, Collaborative Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence – Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing : Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security.

Module 2: [12 Hrs]

Content Management : Definition of content, Authoring Tools & Content Management, Content – partnership, repositories, convergence, providers, Web Traffic & Traffic Management; Content Marketing, Call Center : Definition, Need, Tasks Handled, Mode of Operation, Equipment , Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).

Supply Chain Management : E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution (SCE), SCE - Framework, Internet's effect on Supply Chain Power. **E – Payment Mechanism :** Payment through card system, E – Cheque, E – Cash, E – Payment Threats & Protections. E – Marketing:. Home –shopping, E-Marketing, Tele-marketing , **Electronic Data Interchange (EDI) :** Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI FACT / GTDI, ANSI X – 12), Data Encryption (DES / RSA), **Risk of E – Commerce :** Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures.

Module 3: [14 Hrs]

Introduction to ERP: Common ERP myths, Evolution of ERP, Advantages, Characteristics, Process integration with ERP system, Implementation costs, Roadmap for successful ERP implementation.

ERP Market and Vendors: ERP market, ERP vendors, Service oriented architecture, ERP package features. **Extended ERP services**: Defining Extended ERP, Supply chain Management (SCM) and ERP, ERP and Business Intelligence (BI), ERP and E-commerce. **Business Process Re-engineering (BPR) and ERP**: Defining BPR, BPR Vs TQM, BPR and change management, approaches in BPR implementation, Methodologies for BPR implementation, BPR success/failure factors.

Planning for ERP: Planning for ERP implementation, understanding organizational requirement, Economic and strategic justification, Project scope, determining resources, organizational commitment to change, budget for ERP, select right ERP package, **Implementation of ERP**: Designs of ERP system, ERP implementation approach, ERP implementation life cycle, different phases of ERP implementation, **Managing ERP projects**: Risk/Failure factors in ERP implementation, Example of ERP failure, Critical success factors, Complexities of ERP projects, Evaluating ERP projects.

ERP: Going Live and post implementation: Preparing to go live, Strategies for migration to new ERP system, Managing ERP after Go Live, Maintenance of ERP system, **ERP, Internet and WWW – ERP II**: The internet explosion, ERP, Internet and WWW, ERP to ERP II, Best practices of ERP II.

Future directions and Trends in ERP: New markets, New channels, Easier communication tools, Business models, Need based applications, Expenditures, Reduction in implementation time, Market snap shots, Shifting revenue models

Suggested Books:

1. David Whitley:"E-Commerce-Strategy, Technologies & Applications", TMH.
2. Kamlesh K. Bajaj:"E-Commerce- The cutting edge of business", TMH.
3. W Clarke: "E-Commerce through ASP", BPB.
4. Mathew Reynolds, Wrox:"Beginning E-Commerce with VB, ASP, SQL Server 7.0 & MTS",WROX Press Ltd.
5. J. Christopher Westland and Theodore H. K Clark:"Global Electronic Commerce- Theory and Case Studies", University Press.
6. Enterprise Resource Planning, Ashim Raj Singla, Cengage Learning India Pvt. Ltd., New Delhi, 2008.
7. Alexis Leon: "Enterprise Resource Planning", 2nd edition, Tata Mcgraw Hill Education Pvt. Ltd., NewDelhi, 2008.
8. Grant Norris, James R. Hurley, Kenneth M.Hartley, John R. Dunleavy, John D. Balls: "E-Business and ERP: Transforming the Enterprise",John Wiley and Sons, 2000.
9. V.K. Garg: "Enterprise Resource Planning: Concepts and Practice", Wiley.

Machine Learning & Soft Computing Lab

Code: CSEUGPC24
Contacts: 3P
Credits: 1.5

In this laboratory students need to perform programming in Matlab and R. A sample assignment list is given below:

1. Fuzzy set: Matlab program to implement the different Fuzzy Membership functions, Fuzzy set operations and its properties, composition of Fuzzy and Crisp Relations, Fuzzy Information System (using GUI based Fuzzy toolbox)

2. Neural network: Write Matlab code to implement McCulloh-Pitts neural network for generate AND, OR functions, Perceptron learning for particular, OR function with bipolar inputs and targets using Adaline network, XOR function with bipolar inputs and targets using Madaline, McCulloh-Pitts model to generate AND, OR functions.

3. Genetic Algorithm : Write a Matlab code for implementing Genetic Algorithm and solve several optimization problems. Perform GA to implement TSP problem.

4. Clustering: Write R code to implement different clustering algorithm such as k-means, hierarchical, density based. R code to validate clustering algorithms (clustering validity index such as DB index, Dunn index, XB index etc), R code to implement **Principal Component Analysis (PCA)** and applied it to reduce high dimensional data.

5. Classification: R code to implement different classification technique such as SVM, K-nn, Tree based classifier, Naïve-baye's etc. Implement R code to classify different dataset and plot ROC curve and accuracy.

Soft Skills

Code: MBAUGHU03
Contacts: 3P
Credits: 0

Basic Communications Skills: Verbal and non-verbal communications, Correct Pronunciations, Listening skills, Intonations

Mock Interview Session: Three Vs of interview, SWOT Analysis, STAR Techniques, Five Ts principle of Life

Personality Development, Confidence building, Body Language-Positive and Negative body language, Postures, Gestures, Appearance and Presentation skills. Presentation abilities, Nature vs. Nurture Individual Counselling & Feedback

Time Management: Managing your time effectively, Setting things on priorities, Team management and team dynamics, Team Work, Role Plays, Game Planning, Co-ordination Etiquettes, Business Etiquettes, Email Etiquettes, Resume Writing

Suggested Books:

1. E. Suresh Kumar:"Communication Skills and Soft Skills", Pearson.
2. John Sonmez:"Soft Skills: The software developer's life manual", Manning Publications.
3. Prof. M.S. Rao: "Soft Skills for Young Managers", Dreamtech Press.
4. Emma-Sue Prince:"The Advantage: The 7 soft skills you need to stay one step ahead", Pearson.

Project – I

Code: CSEUGPC24
Contacts: 8P
Credits: 4

Summer Internship ***

Code: CSEUGPC24
Contacts: 0
Credits: 2

Semester VIII:

Cryptography and Network Security

Code: CSEUGPC26
Contacts: 3L
Credits: 3

Module 1: [14 Hrs]
Introduction and Mathematical Foundations: Introduction, Overview on Modern Cryptography, Number Theory Probability and Information Theory, Attacks on Computers & Computer Security Introduction, Need for Security, Security approaches, Principles of Security, Types of attack.
Cryptography: Concepts & Techniques. Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size

Module 2 [14 hrs]
Symmetric Key Algorithm: Introduction, Algorithm types & Modes, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, IDEA(International Data Encryption Algorithm) algorithm, RC5 (Rivest Cipher 5) algorithm.
Asymmetric Key Algorithm: Digital Signature and RSA: Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Digital Signature, Basic concepts of Message Digest and Hash Function (Algorithms on Message Digest and Hash function not required).

Module 3 [10 hrs]
Internet Security Protocols, User Authentication: Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication, Electronic Mail Security: Basics of mail security, Pretty Good Privacy, S/MIME, Firewall: Introduction, Types of firewall, Firewall Configurations, DMZ Network

Suggested Books:

1. William Stallings: "Cryptography and Network Security",6th Edition, Pearson Education, 2013.
2. MerikeKaeo: "Designing Network Security", 2nd Edition, Pearson Books.
3. Wade Trappe, Lawrence C Washington: "Introduction to Cryptography with coding theory", 2nd Ed, Pearson, 2007.
4. William Stallings: "Network Security Essentials: Applications and Standards", Pearson Education.
5. Behrouz A. Ferouzan: "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
6. Man Young Rhee: "Internet Security: Cryptographic Principles, Algorithms and Protocols", Wiley Publications, 2003.
7. Douglas R Simson: "Cryptography – Theory and practice", First Edition, CRC Press, 1995.

Professional Values and Ethics

Code: MBAUGHU02
Contacts: 2L
Credits: 2

Unit 1 – Human Values [5 Hrs]
Objectives , Morals ,Values , Ethics , Integrity, Work ethics, Service learning , Virtues, Respect for others , Living peacefully, Caring , Sharing, Honesty, Courage, Valuing time , Cooperation , Commitment , Empathy, Self-confidence, Challenges in the work place ,Spirituality.

Unit 2 – Engineering Ethics [5 Hrs]
Overview, Senses of engineering ethics , Variety of moral issues , Types of inquiries , Moral dilemma , Moral autonomy , Moral development (theories) , Profession , Models of professional roles ,Theories about right action (Ethical theories)

Unit 3 – Engineering as Social Experimentation [4 Hrs]
Engineering as experimentation, Engineers as responsible experimenters, Codes of ethics, Industrial standards.

Unit 4 – Safety, Responsibilities and Rights [5 Hrs]
Safety definition, Safety and risk, Risk analysis, Assessment of safety and risk, Conflict of interests, Occupational crime, Human rights, Employee rights, Whistle blowing, Intellectual property rights.

Unit 5 – Global Issues [5 Hrs]
Globalization, Multinational corporations, Environmental ethics, Computer ethics, Engineers as managers, Engineers as advisors in planning and policy making, Moral leadership, Codes of ethics.

Suggested Books:

1. R.S. Naagarazan:“A Textbook of Professional Ethics and Human Values”, New Age International Publishers.
2. Dr.Subir Chowdhury:“Blending the best of the East & West”, EXCEL.
3. Ghosh, VIKAS: “Ethics & Mgmt. & Indian Ethos”,
4. Pherwani:“Business Ethics”,EPH.
5. Balachandran, Raja, Nair:“Ethics, Indian Ethos & Mgmt.”, Shroff Publishers.
6. Velasquez:“Business Ethics: concept and cases”, Pearson.

PROFESSIONAL ELECTIVE – IV

CAD for VLSI

Code: CSEUGPE20
Contacts: 3L
Credits: 3

Module - I
Introduction [5L]
VLSI technology, MOS Transistor & Switches, Layout of basic devices- Inverter, NAND, NOR, Compound gates, Multiplexer, Memory-Latches & Register.

Module - II
Overview of VLSI Design cycle [4L]
System specification; Design- Functional, Logic, Circuit, Physical; Fabrication, Design methodologies, Packaging; Design styles- Full custom, Standard cell, Gate arrays FPGA;
Partitioning [4L]
Problem formulation, Approximation of hyper graphs with graphs, Kerninghan-Lin & Fiduccia- Mattheyses heuristic algorithm, Ratio cut.
Placement [4L]
Cost function, Force directed methods, Partitioning placement, Resistive network, Regular & linear placement.
Floorplanning [4L]
Problem formulation, Hierarchical approach, Rectangular dualization, Floorplan sizing.

Module - III
Routing [8L]
Global- Problem formulation; Fundamentals- Maze running, Line searching, Steiner trees; Lee & line probe algorithm, Hierarchical approach,Randomized routing; Detailed- Problem formulation, Channel routing & Switchbox routing, Hierarchical approach, Greedy algorithm; Single layer-General river routing algorithm; Two layer- Left edge algorithm (Basic & Dogleg); Constraint graph- Yoshimura &Kuh algorithm.

Module-IV
Testing [7L]
Need for testing- Functionality & Manufacturing test; Manufacturing test principles- Stuck At, short & open circuit, Observability, controllability, Fault coverage; Automatic test pattern generation, Design strategies for test- Scan based, Self test.

Suggested Books:

1. Naved A. Sherwani: “Algorithms ForVLSI Physical Design Automation”, Kulwer Academic.
2. M Sarafzadeh&C.K.Wong: “An Introduction to VLSI Physical Design”,TMH.
3. Sujata Pandey& Manoj Pandey:“VLSI Design”, DhanpatiRai& Co.
4. Bhasker: “A VHDL Primer”, PE.Publisher.
5. Douglas L. Pery: “VHDL Programming by Example”, TMH.
6. B. Abrhamkhi: “Digital Testing”.

Distributed Systems

Code: CSEUGPE21
Contacts: 3L
Credits: 3

Module 1 [12 hrs]
Introduction to Distributed System : Introduction, Examples of distributed system, Resource sharing, Challenges
Operating System Structures: Review of structures: monolithic kernel, layered systems, virtual machines. Process based models and client server architecture; The micro-kernel based client-server approach.
Communication: Inter-process communication, Remote Procedure Call, Remote Object Invocation, Tasks and Threads. Examples from LINUX, Solaris 2 and Windows NT
Theoretical Foundations: Introduction. Inherent Limitations of distributed Systems. Lamport's Logical clock, Global State

Module 2 [12 Hrs]
Distributed Mutual Exclusion: Classification of distributed mutual exclusion algorithm. Non Token based Algorithm: Lamport's algorithm, Ricart-Agrawala algorithm. Token based Algorithm: Suzuki-Kasami's broadcast algorithm.
Distributed Deadlock Detection: Deadlock handling strategies in distributed systems. Control organizations for distributed deadlock detection. Centralized and Distributed deadlock detection algorithms: Completely Centralized algorithms, path pushing, and edge chasing, global state detection algorithm.
Protection and Security: Requirements for protection and security regimes. The access matrix model of protection. System and user modes, rings of protection, access lists, capabilities. User authentication, passwords and signatures. Use of single key and public key encryption.

Module 3 [12 Hrs]
Distributed file systems: Issues in the design of distributed file systems: naming, transparency, update semantics and fault resilience. Use of the Virtual File System layer. Examples of distributed systems including Sun NFS, the Andrew file store, CODA file system and OSF DCE
Distributed Shared Memory: Architecture and motivations. Algorithms for implementing DSM. Memory Coherence
CORBA: The Common Object Request Broker Architecture model and software and its relationship to Operating Systems

Suggested Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg: "Distributed Systems: Concepts and Design", 4th Edition, Pearson Education.
2. A.S. Tanenbaum and M. V. Steen: "Distributed Systems: Principles and Paradigms", Second Edition, Prentice Hall.
3. M.L. Liu: “Distributed Computing Principles and Applications”, Pearson Addison Wesley.

4. Mukesh Singhal: “Advanced Concepts In Operating Systems”, McGrawHill Series in Computer Science.
5. Nancy A. Lynch: "Distributed Algorithms", The Morgan Kaufmann Series in Data Management System, Morgan Kaufmann Publishers.

Operations Research

Code: CSEUGPE22
Contacts: 3L
Credits: 3

Unit-I: [2 Hrs]
Linear Programming Problems (LPP): Basic LPP and Applications; Various Components of LP Problem Formulation.

Unit-II: [10 Hrs]
Solution of Linear Programming Problems: Solution of LPP: Using Simultaneous Equations and Graphical Method; Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples. Solution of LPP by Simplex Method; Charnes’ Big-M Method; Duality Theory. Transportation Problems and Assignment Problems.

Unit-III: [6 Hrs]
Game Theory: Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.

Unit-IV: [8 Hrs]
Network Analysis: Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded).

Unit-V: [8 Hrs]
Inventory Control: Introduction to EOQ Models of Deterministic and Probabilistic; Safety Stock; Buffer Stock.

UNIT-VI: [8 Hrs]
Queuing Theory: Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.

Suggested Books:

1. H. A. Taha: “Operations Research”, Pearson.
2. P. M. Karak: “Linear Programming and Theory of Games”, ABS Publishing House.
3. Ghosh and Chakraborty: “Linear Programming and Theory of Games”, Central Book Agency.
4. Ravindran, Philips and Solberg: “Operations Research”, WILEY INDIA.

High Performance Computer Architecture

Code: CSEUGPE23
Contacts: 3L
Credits: 3

Unit-I: [5 Hrs]
Introduction: Review of basic computer architecture, quantitative techniques in computer design, measuring and reporting performance, CISC and RISC processors

Unit-II [10 Hrs]
Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques, Compiler techniques for improving performance. Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses

Unit-III [5 Hrs]
Virtual memory organization: mapping and management techniques, memory replacement policies.

Unit-IV [11 Hrs]
Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super-pipelined and VLIW processor architectures. Array and vector processors, Multiprocessor architecture: taxonomy of parallel architectures. Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks.

Unit-V [5 Hrs]
Distributed shared-memory architecture: Cluster computers. Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures.

Suggested Books:

1. John L. Hennessy and David A. Patterson:"Computer Architecture: A Quantitative Approach", Morgan Kaufmann.
2. John Paul Shen and Mikko H. Lipasti:"Modern Processor Design: Fundamentals of Superscalar Processors", Tata McGraw-Hill.
3. M. J. Flynn:"Computer Architecture: Pipelined and Parallel Processor Design", Narosa Publishing House.
4. Kai Hwang:"Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw-Hill.
5. John Hennessy and David Patterson: "Computer Architecture: A Quantitative Approach", 4th Edition,Morgan Kaufmann.

Real Time Systems

Code: CSEUGPE24
Contacts: 3L
Credits: 3

Module-1 [8 Hrs]
Introduction: Introduction - Issues in Real Time Computing, Structure of a Real Time System. Task Classes, Performance Measures for Real Time Systems, Estimating Program Run times. Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms, UniProcessor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and Fault Tolerant Scheduling.

Module-2 [7 Hrs]
Programming languages and tools: Programming Language and Tools – Desired Language characteristics, Data Typing, Control structures, Facilitating Hierarchical Decomposition, Packages, Run-time (Exception) Error handling, Overloading and Generics, Multitasking, Low Level programming, Task scheduling, Timing Specifications, Programming Environments, Run-time Support.

Module-3 [7 Hrs]
Real time databases: Real time Databases - Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Databases for Hard Real Time systems.

Module-4 [7 Hrs]
Communication: Real-Time Communication - Communications Media, Network Topologies Protocols, Fault Tolerant Routing. Fault Tolerance Techniques - Fault Types, Fault Detection. Fault Error containment Redundancy, Data Diversity, Reversal Checks, Integrated Failure handling.

Module-5 [7 Hrs]
Evaluation techniques: Reliability Evaluation Techniques - Obtaining Parameter Values, Reliability Models for Hardware Redundancy, Software Error models. Clock Synchronization - Clock, A Nonfault-Tolerant Synchronization Algorithm, Impact of Faults, Fault Tolerant Synchronization in Hardware, Fault Tolerant Synchronization in Software

Suggested Books:

1. C.M. Krishna, Kang G. Shin: “Real-Time Systems”, McGraw-Hill International Editions, 1997.
2. Stuart Bennett: “Real Time Computer Control-An Introduction”,Second edition Perntice Hall PTR, 1994.
3. Peter D. Lawrence: “Real time Micro Computer System Design – An Introduction”, McGraw Hill, 1988.

4. S.T. Allworth and R.N. Zobel: “Introduction to real time software design”, Macmillan, II Edition, 1987.
5. R.J.A Buhur, D.L. Bailey: “An Introduction to Real-Time Systems”, Prentice-Hall International, 1999.
6. Philip.A.Laplante: “Real Time System Design and Analysis”, PHI, III Edition, April 2004.

Digital Topology

Code: CSEUGPE25
Contacts: 3L
Credits: 3

Module I (8 Hours)
Introduction, basic ingredients, concept of 2D/3D digital space, continuity, contour tracing, chain code, topology preserving operations – skeletonization and adjacency tree, Euler characteristics, connected component labelling, adjacency graph construction

Module II (6 Hours)
Metric space, neighborhood concepts in 2D/3D, digital path, fuzzy path-definition and notations, path lengths, digital straightness concepts, polygonal approximation

Module III (8 Hours)
Distance Transform, Medial Axis Transform, Shrinking binary images, Skeletonization Algorithm, Skeletons of planar patterns, Boundaries in digital space, Connected, oriented, closed boundaries in digital space, Computation of normal at boundary points, Computation of cross-sections of 3D objects

Module IV (8 Hours)
Homotopic tree, Voronoi neighborhood, Surface voxelization, Topological transformation and topological equivalence, simple point, characteristics of simple points in 3D, local topological numbers

Module V (6 Hours)
Topological Approaches to Image Segmentation: Region Growing, Watershed, and Minimal Path; Dam construction, Watershed transform

Suggested Books and References:

1. Topological algorithms for digital image processing by T. Y. Kong and A. Rosenfeld, Elsevier
2. Topology of Digital Images by J. F. Peters, Springer
3. Digital Geometry in Image Processing by J. Mukhopadhyay, P. P. Das, S. Chattopadhyay, P. Bhowmick, B. N. Chatterji, CRC Press

PROFESSIONAL ELECTIVE – V

Adhoc& Sensor Networks

Code: CSEUGPE26
Contacts: 3L
Credits: 3

Module-1: Introduction and Overview: [12 Hrs]
Overview of wireless networks, types, infrastructure-based and infrastructure-less, introduction to MANETs (Mobile Ad-hocNetworks), characteristics, reactive and proactive routing protocols with examples, introduction to sensor networks, commonalities and differences with MANETs, constraints and challenges, advantages, applications, enabling technologies for WSNs.

Module-2: Architectures & Communication Protocols [12 Hrs]
Single-node architecture - hardware components, design constraints, energy consumption of sensor nodes, operating systems and execution environments, examples of sensor nodes, sensor network scenarios, types of sources and sinks – single hop vs. multi hop networks, multiple sources and sinks – mobility, optimization goals and figures of merit, gateway concepts, design principles forWSNs, service interfaces for WSNs, Physical layer and transceiver design considerations, MAC protocols for wireless sensor networks, routing protocols- classification, gossiping, flooding, energy-efficient routing, unicast protocols, multi-path routing,data-centric routing, data aggregation, SPIN, LEACH, Directed-Diffusion, geographic routing.

Module-3: Infrastructure Establishment & Sensor Network Platforms and Tools [12 Hrs]
Topology control, flat network topologies, hierarchical networks by clustering, time synchronization, properties, protocols based on sender-receiver and receiver-receiver synchronization, LTS, TPSN, RBS, HRTS, localization and positioning, properties and approaches, single-hop localization, positioning in multi-hop environment, range based localization algorithms – location services, sensor tasking and control, Sensor node hardware, Berkeley motes, programming challenges, node-level software platforms, node-level simulators, state-centric programming, Tiny OS, nesC components, NS2 simulator, TOSSIM.

Suggested Books:

1. Holger Karl & Andreas Willig: “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas: “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. KazemSohraby, Daniel Minoli, &TaiebZnati: “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
4. Anna Hac: “Wireless Sensor Network Designs”, John Wiley, 2003.

5. Thomas Haenselmann: "Sensor Networks", available online for free, 2008.
6. Edgar Callaway: "Wireless Sensor Networks: Architectures and Protocols", Auerbach, 2003.

Cloud Computing

Code: CSEUGPE27
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]

Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public, Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model, Characteristics of Cloud Computing – Benefits and advantages of Cloud Computing

Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients

Services and Applications by Type: IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations; PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)

Module-2: [12 Hrs]

Concepts of Abstraction and Virtualization: Virtualization technologies: Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D); Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Mention of The Google Cloud as an example of use of load balancing; Hypervisors: Virtual machine technology and types

Use of Google Web Services: Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service.

Use of Amazon Web Services: Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service

Module-3: [12 Hrs]

Use of Microsoft Cloud Services: Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs

Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service, attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs
Cloud-based Storage: Cloud storage definition – Manned and Unmanned
Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services

Suggested Books:

1. Barrie Sosinsky: "Cloud Computing Bible", Wiley India Pvt. Ltd, 2013.
2. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi: "Mastering Cloud Computing", McGraw Hill Education (India) Private Limited, 2013.
3. Anthony T. Velte: "Cloud computing: A practical approach", Tata Mcgraw-Hill.
4. Miller: "Cloud Computing", Pearson.
5. Moyer: "Building applications in cloud: Concept, Patterns and Projects", Pearson.
6. Dr. Kumar Saurabh:"Cloud Computing – Second Edition", Wiley India.

Data Warehousing and Data Mining

Code: CSEUGPE28
Contacts: 3L
Credits: 3

Module-1 [12 Hrs]
Introduction to Data Mining
Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities,
Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data,(Binning,Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integrationand Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction
Association Rule Mining:
Mining Association Rules in Large Databases, Association rule mining,mining Single-Dimensional Boolean Association rules from Transactional Databases– AprioriAlgorithm, Mining Multilevel Association rules from Transaction Databases and Mining MultiDimensionalAssociation rules from Relational Databases.

Module-2 [12 Hrs]
Classification and Predictions:
What is Classification & Prediction, Issues regarding Classification and prediction, Decisiontree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forwardNeural Network, Back propagation Algorithm, Classification methods K-nearest neighbour classifiers, Genetic Algorithm.

Dimensionality Reduction

Introduction Principal Components Analysis, Singular Value Decomposition, Multidimensional Scaling

Module-3 [12 Hrs]

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods.

Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Data Warehousing:

Overview, Definition, Delivery Process, Difference between DatabaseSystem and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes,Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers,ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, TuningData Warehouse, Testing Data Warehouse.

Suggested Books:

1. P. Tan, M. Steinbach and V. Kumar: “Introduction to Data Mining”, Addison Wesley, 2006.
2. J. Han and M. Kamber: “Data Mining: Concepts and Techniques”, 2nd Edition, Morgan Kaufmann, 2006.
3. Arun K. Pujari: “Data Mining Techniques”, Universities Press.

GIS & Remote Sensing

Code: CSEUGPE29
Contacts: 3L
Credits: 3

Module 1 [12 Hrs]

Fundamentals of remote sensing; Principles of electromagnetic radiation and EM spectrum. Sensors and platforms; remote sensing satellites, multispectral, hyper spectral and thermal sensors; RS data acquisition systems. Image processing; Image enhancement and visualization; Image interpretation and classification. Microwave thermal remote sensing; Radar & laser altimetry.

Module 2 [12 Hrs]

Applications of Remote Sensing; Integration of remote sensing and GIS. Basic concepts of GIS; cartographic principles, map projections and coordinate systems. Geographic information and spatial data types; Hardware and software; Steps of spatial data handling; Database management systems; Spatial referencing.

Module 3 [12 Hrs]
Data quality, measures of location errors on maps. Spatial data input, data preparation; Point data transformation, Analytical GIS capabilities, retrieval and classification, overlay functions, Neighbourhood operations, network analysis, error propagation; Data visualization.

Suggested Books:

1. Burrough PA:"Principles of Geographic Information System for Land Resources Assessment", Oxford Univ. Press.
2. Curran PJ:"Principles of Remote Sensing", Longman.
3. Jensen JR:"Introductory Digital Image Processing", Prentice Hall.
4. Lillesand TM & Kiefer RW:"Remote Sensing and Image", Wiley.

Parallel Computing Techniques

Code: CSEUGPE30
Contacts: 3L
Credits: 3

Module– I[4 Hrs]
Introduction: Hardware and software paradigms, Shared infrastructure

Module– II [6 Hrs]
Parallel Programming Paradigms, Parallel Architecture, Parallel Program Design

Module– III [8 Hrs]
Message-Passing Computing and Programming, Multithread Programming, Open Programming, Open MP & PRAM Model of Computation, PRAM.

Module– IV [12 Hrs]
Embarrassingly Parallel Computations, Partitioning and Divide-and-Conquer Strategies, Pipelined Computations, Synchronous Computations, Load Balancing and Termination Detection, Shared Memory & Message Passing, MPI, Algorithmic Techniques, CUDA.

Module– V [6 Hrs]
Sorting Algorithms, Numeric Algorithms, Image Processing Algorithm

Suggested Books:

1. M J Quinn: "Parallel Programming in C with MPI and OpenMP",
2. Ananth Grama, George Karypis, Vipin Kumar, and Anshul Gupta:"Introduction to Parallel Computing", Pearson.
3. D. Kirk and W. Hwu: "Programming Massively Parallel Processors",Morgan Kaufman Publisher.
4. Michael Huth, Mark Ryan: "Logic in Computer Science Modelling and Reasoning about Systems", Cambridge University Press.

Syllabus of Open Elective Courses offered by -

Department of Computer Science and Engineering,
Aliah University, Newtown

Data Structures & Algorithm Analysis

Code: CSEUGOE01
Contracts: 3L
Credits: 3

Unit I [9 Hrs]
Introduction to Data Structure: Data and Information, Program Structures, Abstract Data Type, Data Structure - Static and Dynamic Data Structures. [2L]
Array: Representation of Polynomials and Sparse Matrix, Linear List, Implementation using array, Review of Pointers and Functions. [4L]
Linked List representations: Single Linked Lists, Linked List Representation of Polynomial And Applications. [3L]

Unit II [9 Hrs]
Types of Algorithms: Divide and Conquer, Greedy, etc. [2L]
Algorithm Analysis: Performance Measurement and Analysis, Time Complexity and Space Complexity, Introduction to Order functions, Examples of Analysis. [2L]
Sorting and searching algorithms: Bubble sort, Insertion sort, Selection sort, Merge, Quick, Heap, Radix, Linear and Binary Search. [5L]

Unit III [9 Hrs]
Stack and Queue: Implementations using Arrays and Linked List, Applications, Expression Evaluation and Conversions. [3L]
Trees: Binary Trees, Binary Search Trees, Height-Balanced And Weight-Balanced Trees, 2-3 Tree, B-Trees, B+ -Trees. Applications of Trees. [6L]

Unit IV [9 Hrs]
Recursion: Basic concept, Design of recursive algorithms, Tail recursion. [2L]
Graphs: Adjacency Matrix and List, Graph Search Algorithms, Spanning Tree Algorithms [5L]
Hashing: Terminologies, Hashing Functions, Collision Resolution Techniques, Types of Hashing. [2L]

Suggested Books:

1. E. Horowitz, S. Sahni and S. Anderson-Freed: “Fundamentals of Data Structures in C”, Universal Press.
2. M. A. Weiss: “Data Structures and Algorithm Analysis in C”, Pearson Education.
3. A. V. Aho, J. E. Hopcroft and J. D. Ullman: “Data Structures and Algorithms”, Pearson Education.
4. R. K. Kruse, Bruce P. Leung: “Data Structures and Program Design”, Prentice Hall.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein: “Introduction to Algorithms”, PHI Learning Pvt. Ltd.
6. Y. Langsam, J. M. Augenstein, M. A. Tenenbaum: “Data Structures using C and C++”, Pearson Education.

Computer Organization

Code: CSEUGOE02
Contacts: 3L
Credits: 3

UNIT I
Introduction: [2 Hrs]
History of computing, von Neumann architecture, Instruction and data, fixed-point and floating point numbers, errors, IEEE standards

UNIT II
Processor design: [7 Hrs]
Instruction Set Architecture-Instruction format, opcode optimization; operand addressing; Instruction implementation-data movement, branch control, logical, Input/output and debugging instructions; arithmetic instruction implementation–addition and subtraction, multiplication-division, 2's complement multiplication; Booth's algorithm–theory and examples; bit-pair algorithm; high performance arithmetic

UNIT III
Control unit design: [8 Hrs]
Hardwired control, micro-programmed control design – micro-instruction formats, control optimization;

UNIT IV
Memory subsystem: [9 Hrs]
Memory technology, memory interfacing, Memory hierarchy–introduction to virtual memory system; Cache memory – performance, address mapping, content addressable memory (CAM), Floppy Disks,

UNIT V
Peripherals: [7 Hrs]
Basic properties, bus architectures, interfacing of I/O devices, data transfer schemes –programmed I/O, DMA, mass storage, RAID

UNIT VI
Pipelining: [3 Hrs]
Pipelining data path and instructions, speed up, efficiency, throughput, CPI, latency; linear / non-linear pipeline–reservation table, MAL; super-pipelined and super-scalar processors.

Suggested Books:
1. Mano, M.M., "Computer System Architecture", PHI.
2. BehroozParhami: "Computer Architecture", Oxford University Press
3. Hayes J. P.: "Computer Architecture & Organisation", McGraw Hill,
4. Hamacher: "Computer Organisation", McGraw Hill,
5. N. senthil Kumar, M. Saravanan, S. Jeevananthan: "Microprocessors and Microcontrollers" OUP.
6. Chaudhuri P. Pal: "Computer Organisation & Design", PHI.
7. P N Basu: "Computer Organization & Architecture", Vikas Publishing.
8. J. L. Hennessy and D. A. Patterson: "Computer Architecture: A Quantitative Approach", 3rd & 4th ed, Elsevier.
9. Kai Hwang: "Advanced Computer Architecture: Parallelism, Scalability, Programmability", TMH.

Object Oriented Programming

Code: CSEUGOE03
Contacts: 3L
Credits: 3

UNIT I: Object Oriented Thinking [3 Hrs]
Need for OOP Paradigm, Principles of Object Oriented Languages, Benefits of OOP, Applications of OOP.

UNIT II: Java Basics [5 Hrs]
History of Java, Java Buzzwords, Java Virtual Machine, Platform Independence, Data Types, Variables, Scope and Life time of variables, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program.

UNIT III: Classes and Objects [6 Hrs]
Concepts of Classes, Objects, methods, constructors, this keyword, garbage collection, Compile time polymorphism: overloading methods and constructors, parameter passing, command line arguments, Recursion, nested and inner classes, Exploring String, StringBuffer classes, Arrays.

UNIT IV: Inheritance [5 Hrs]
Hierarchical abstractions, Base class object, subclass, subtype, forms of inheritance, benefits of inheritance, Member access rules, Usage of super, static and final with inheritance, Run time polymorphism: method overriding, abstract classes, the Object class.

UNIT V: Packages and Interfaces [4 Hrs]
Defining, Creating and Accessing a Package, Understanding CLASSPATH, access control, differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

UNIT VI: Exception Handling [5 Hrs]
Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception classes: throw and throws.

UNIT VII: Multithreading [4 Hrs]
Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

UNIT VIII: Applet Programming [4 Hrs]
Applet & Application, Applet Architecture, Parameters to Applet, Embedding Applets in Web page, Applet Security Policies

Suggested Books:

1. E Balagurusamy: “Programming with Java”, McGraw Hill Education
2. Herbert Schildt: “Java: The Complete Reference”, McGraw Hill Education
3. Sachin Malhotra and Saurabh Choudhary: “Programming in Java”, Oxford University Press
4. Y. Daniel Liang: “Introduction to Java Programming, Brief Version”, Pearson Education
5. Y. Daniel Liang: “Introduction to Java Programming, Comprehensive Version”, Pearson Education
6. Cay S. Horstmann: “Core Java - Vol. I, Vol. II and Vol. II”, Pearson Education
7. E. Balagurusamy: “Object-Oriented Programming with C++”, McGraw Hill Education
8. Bjarne Stroustrup: “The C++ Programming Language”, Pearson Education

9. R. Lafore: “Object Oriented Programming in C++”, Pearson Education
10. Debasish Jana: “C++ and Object-Oriented Programming Paradigm”, PHI Learning

Data Communication & Computer Networks

Code: CSEUGOE04
Contacts: 3L
Credits: 3

Module-1: [12 Hrs]
Introduction: Data communications concepts, direction of data flow (simplex, half duplex, full duplex). Networks: physical structure (type of connection, topology), categories of network (LAN, MAN, WAN). Internet: brief history, internet today. Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

Physical level: Overview of data (analog & digital), review of signal (analog & digital), transmission (analog & digital) & transmission media (guided & non-guided). Data Line Devices: Modems, DSL, ADSL, Multiplexer and Different Multiplexing.TDM, FDM, WDM. Circuit switching and packet switching concepts

Data link layer: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC.

Module-2: [12 Hrs]
Medium access sub layer: Point to point protocol, token bus, token ring. Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD. Traditional Ethernet, Fast Ethernet.

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router. Addressing: Internet address, classful and classless addressing, subnetting.
Routing: techniques, static vs. dynamic routing, routing table for classful address.
Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing. Protocols: ARP, RARP, IP, ICMP

Module-3: [12 Hrs]
Transport layer: Process to process delivery, UDP, TCP, Congestion control algorithms. Quality of service, techniques to improve QoS.

Application layer:DNS, SMTP, *Telnet* ,SNMP, FTP, HTTP & WWW.
Wireless LAN: IEEE 802.11; Introduction to Bluetooth, VLAN’s, Cellular telephony & Satellite network.

Suggested Books:

1. B. A. Forouzan: “Data Communications and Networking (3rd Ed.)”, TMH.
2. A. S. Tanenbaum: “Computer Networks (4th Ed.)”, Pearson Education/PHI.
3. W. Stallings: “Data and Computer Communications (5th Ed.)”, PHI/ Pearson Education.
4. Zheng & Akhtar: “Network for Computer Scientists & Engineers”, OUP.
5. Black, Data & Computer Communication”, PHI.
6. Miller: “Data Communication & Network”, Vikas.
7. Miller: “Digital & Data Communication”, Jaico.
8. Shay: “Understanding Data Communication & Network”, Vikas.

Digital Image Processing

Code: CSEUGOE05
Contacts: 3L
Credits: 3

Module - 1 [6 Hrs]

Digital Imaging fundamentals: Overview of Image Processing System, Image Sensing and acquisition, Image Digitization (Sampling and Quantization), Digital Image, Fundamentals of Color image, Color Models (RGB, YCbCr, HIS), Image File Format.

Module - 2 [3 Hrs]

Spatial Domain Image Enhancement: Contrast Intensification (linear and non-linear stretching), Histogram Equalization, Spatial Domain Smoothing and Sharpening Filters, Correlation and Convolution.

Module - 3 [4 Hrs]

Frequency Domain Image Enhancement: Fourier Transform (1-D and 2-D), Frequency Domain image, Image smoothing, Image sharpening, Correlation and Convolution, Discrete Cosine Transform, Discrete Wavelet Transform.

Module - 4 [4 Hrs]

Morphological Image Processing: Dilation and Erosion, Opening and Closing, Some Basic Morphological Algorithms, Extensions to Gray-Scale Images.

Module - 5 [5 Hrs]

Image Segmentation: Point Detection, Line Detection, Edge Detection **,** Edge Linking and Edge Following by Local Processing, Hough Transform, Thresholding, Region segmentation

Module - 6 [9 Hrs]

Image Representation, Feature Extraction & Object Recognition: Boundary Representation by Chain Codes, Polygonal Approximation, Skeletons Component Labeling and Counting Geometrical, Texture Analysis, Geometric Moments Texture Descriptor, Gray-level Co Occurrence Matrix, some object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition, Texture Description, Pattern & Pattern Classes, Template Matching.

Module - 7 [5 Hrs]

Image Compression: Fundamentals, Compression Models, Error-Free compression, Lossy Compression.

Suggested Books:

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”.
2. B. Chanda and D. Dutta Majumder, “Digital Image Processing and Analysis”.
3. A K. Jain, Fundamentals of Digital Image Processing, PHI, 1989.

Data Science

Code: CSEUGOE06
Contacts: 3L
Credits: 3

Unit I. Data Definitions and Analysis Techniques [6 hrs]
Elements, Variables, and Data categorization; Levels of Measurement; Data management and indexing; Introduction to statistical learning

Unit II. Descriptive Statistics and Basic Analysis Techniques [10 Hrs]
Measures of central tendency; Measures of location of dispersions; Statistical hypothesis generation and testing; Chi-Square test; t-Test; Analysis of variance; Maximum likelihood test; Correlation analysis; Regression analysis

Unit III. Mining Association Rules in Large Databases: [5L]
Association rule mining, Frequent Itemsets Mining, Apriori Algorithm, FP-Growth Algorithm, Infrequent Patterns.

Unit IV. Classification and Predictions: [6L]
Decision tree, Bayesian Classification, K-nearest neighbour classifiers, Other Classification Methods, Prediction, Classifier Accuracy

Unit V. Cluster Analysis: [9L]
Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model-Based Clustering Methods, Outlier Analysis

Suggested Books:

1. P. Tan, M. Steinbach and V. Kumar: “Introduction to Data Mining”, Pearson Publishers.
2. J. Han, M. Kamber and J. Pei: “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers.
3. Arun K. Pujari: “Data Mining Techniques”, Universities Press.
4. J. Grus: “Data Science from Scratch”, O’Reilly Publisher.
5. H. Wickham, and G. Grolemund: “R for Data Science: Import, Tidy, Transform, Visualize, and Model Data”, O'Reilly Publishers.
6. R. Myers and R. Walpole: “Probability and Statistics for Engineers and Scientists”, Pearson.