Department: Information Technology

Curriculum Structure & Syllabus
(Effective from 2018-19 admission batch)

Under Autonomy (**GR A:** ECE, EE, EIE, BME; **GR B:** CSE, IT, ME, CE, FT)

1st Semester								
Sl No	**Course Type**	**Course Code**	**Theory**	**Contact Hours**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	BS	M 101	Mathematics -I	3	1	0	4	4
2	BS	CH 101/ PH 101	Chemistry (Gr. A) / Physics- I (Gr. B)	3	0	0	3	3
3	ES	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) / Basic Electronics	3	0	0	3	3
4	HS	HU 101	English	2	0	0	2	2
Total of Theory							**12**	**12**
B. PRACTICAL								
5	BS	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics- I Lab (Gr. B)	0	0	3	3	1.5
6	ES	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) / Basic Electronics	0	0	3	3	1.5
7	ES	ME 191/ ME 192	Engineering Graphics & Design (Gr A) / Workshop/Manufacturing	0	0	3	3	1.5
8	PROJ	PR 191	PROJECT-IA	0	0	1	1	0.5
9	PROJ	PR 192	PROJECT-IB	0	0	1	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 181	Induction Program	0	0	0	0	
Total of Theory, Practical & Mandatory Activities/Courses							**22**	**17.5**

Syllabus- 1st Semester

Course Name: Mathematics-I
Course Code: M 101
Contact: 3:1:0
Total Contact Hours: 48
Credits: 4

Prerequisites:

The students to whom this course will be offered must have the concept of (10+2) standard matrix algebra and calculus.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with techniques in matrix algebra and calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

COs	DESCRIPTIONS
CO1	Recall the distinctive characteristics of matrix algebra and calculus.
CO2	Understand the theoretical working of matrix algebra and calculus.
CO3	Apply the principles of matrix algebra and calculus to address problems in their disciplines.
CO4	Examine the nature of system using the concept of matrix algebra and calculus.

Course Content:

Module I: Matrix Algebra (11)

Echelon form and Normal (Canonical) form of a matrix; Inverse and rank of a matrix; Consistency and inconsistency of system of linear equations, Solution of system of linear equations; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton theorem.

Module II: Differential Calculus and Infinite Series (10)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Concept of sequence and series, Tests for convergence of infinite series: Comparison test, D'Alembert's ratio test, Raabe's test, Cauchy's root test, Power series; Taylor's series, Series for exponential, trigonometric and logarithm functions.

Module III: Multivariable Calculus (Differentiation) - I (9)

Function of several variables, Concept of limit, continuity and differentiability; Partial derivatives, Total derivative and its application; Chain rules, Derivatives of implicit functions Euler's theorem on homogeneous function, Jacobian.

Module IV: Multivariable Calculus (Differentiation) - II (7)

Maxima and minima of functions of two variables, Method of Lagrange multipliers; Directional derivatives, Gradient, Divergence, Curl.

Module V: Integral Calculus (11)

Evolutes and involutes; Evaluation of definite integrals and its applications to evaluate surface areas and volumes of revolutions; Improper integrals; Beta and Gamma functions and their properties.

Text Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
5. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Reference Books:

1. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Apostol, M., Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
3. Kumaresan, S., Linear Algebra - A Geometric approach, Prentice Hall of India, 2000.
4. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. Bronson, R., Schaum's Outline of Matrix Operations. 1988.
6. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969

CO-PO Mapping:

PO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	-	-	-	-	-	-	-	-	1

Course Name: Physics –I
Course Code: PH 101
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Pre requisites: Knowledge of Physics up to 12th standard.

Course Objective:
The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcomes:

CO1: Describe various types mechanical resonance and its electrical equivalence
CO2: Explain basic principles of Laser, Optical fibers and various types of semiconductors
CO3: Apply superposition to explain interference and diffraction as well as apply wave mechanics to attainment of Heisenberg's uncertainty principle
CO4: Analyze importance of light as a carrier of information and examine different crystallographic structures according to their co-ordination number and packing factors
CO5: Justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

Course Content:

Module 1 (6L):
Waves & Oscillations:
Simple Harmonic Motion (only preliminary idea), damped harmonic motion-over damped, critically damped and under damped motion, energy decay, logarithmic decrement, force vibration and resonance (amplitude, velocity resonance), sharpness of resonance, quality factor, related numerical problems.

Module 2 (8L):
Classical Optics:
2.01- Interference of light: Huygens's principle, superposition of waves, conditions of sustained interference, Newton's ring (qualitative descriptions of working principles and procedures-no deduction required). Engineering applications, Numerical Problems.

2.02- Diffraction of light: Fresnel and Fraunhofer class, Fraunhoffer diffraction of a single slit, multiple slits, intensity distributions, missing order, Rayleigh criterion (no deduction) and resolving power of grating and microscope (no deduction), related numerical problems.

Module 3 (8L):
Quantum Mechanics-I:
3.01 Quantum Theory: Inadequacy of classical physics and its modifications by Planck's quantum hypothesis-qualitative (no deductions), particle concept of electromagnetic wave (example: photoelectric and Compton Effect; no derivation required, origin of modified and unmodified lines), wave particle duality; phase velocity and group velocity; de Broglie hypothesis; Davisson and Germer experiment.

3.02 Quantum Mechanics 1: Concept of wave function, physical significance of wave function, probability interpretation; normalization of wave functions; uncertainty principle, relevant numerical problems.

Module 4 (7L):
Solid State Physics-I:
4.01 Crystal Structure: Structure of solids, amorphous and crystalline solids (definition and examples), lattice, basis, unit cell, Fundamental types of lattices –Bravais lattice, simple cubic, fcc and bcc lattices, Miller indices and miller planes, co-ordination number and atomic packing factor, Bragg's equation, applications, numerical problems.

4.02 Semiconductor: Physics of semiconductors, electrons and holes, metal, insulator and semiconductor, intrinsic and extrinsic semiconductor, p-n junction.

Module 5 (7L):
Modern Optics-I:
5.01- Laser: Concepts of various emission and absorption process, Einstein A and B coefficients and equations, working principle of laser, metastable state, population inversion, condition necessary for active laser action, optical resonator, illustrations of Ruby laser, He-Ne laser, Semiconductor laser, applications of laser.

5.02-Fibre optics: Principle and propagation of light in optical fibres- Numerical aperture and Acceptance angle, Numerical problems.

Text Books:

Waves & Oscillations:
1. Sound-N. K. Bajaj (TMH)
2. Advanced Acoustics-D. P. Roy Chowdhury (Chayan Publisher)
3. Principles of Acoustics-B.Ghosh (Sridhar Publisher)
4. A text book of sound-M. Ghosh (S. Chand publishers)
5. A text book of Light- K.G. Mazumder & B.Ghoshs, (Book & Allied Publisher)
6. Physics of Oscillations and Waves- R.P. Singh
7. College Physics Vol. II - A.B. Gupta
8. Vibration, Waves and Acoustics- Chattopadhyay and Rakshit

Classical & Modern Optics:
1. A text book of Light- K.G. Mazumder & B.Ghoshs (Book & Allied Publisher)
2. A text book of Light-Brijlal & Subhramanium, (S. Chand publishers)

3. Modern Optics-A. B. Gupta (Book & Allied Publisher)
4. Optics-Ajay Ghatak (TMH)
5. Optics-Hecht
6. Optics-R. Kar, Books Applied Publishers
7. Physical Optics Möler
8. Optics -F.A. Jenkins and H.E White

Quantum Mechanics-I

1. Introduction to Quantum Mechanics-S. N. Ghoshal (Calcutta Book House)
2. Quantum Mechanics-Bagde and Singh (S. Chand Publishers)
3. Perspective of Quantum Mechanics-S. P. Kuilla (New Central Book Agency)
4. Quantum Mechanics-Binayak Datta Roy (S. Chand Publishers)
5. Quantum Mechanics-Bransden (Pearson Education Ltd.)
6. Perspective of Modern Physics-A. Beiser (TMH)
7. Quantum mechanics -A.K. Ghatak and S Lokenathan
8. Modern Physics -E.E. Anderson
9. Physics Volume 2 -Haliday, Resnick & Krane, Published by Wiley India

Solid State Physics-I:

1. Solid state physics-Puri & Babbar (S. Chand publishers)
2. Materials Science & Engineering-Kakani Kakani
3. Solid state physics- S. O. Pillai
4. Introduction to solid state physics-Kittel (TMH)
5. Solid State Physics and Electronics-A. B. Gupta and Nurul Islam (Book & Allied Publisher)
6. Problem in Solid state physics -S.O. Pillai (a. b.)

Reference Books:

1. Refresher courses in physics (Vol. 1, Vol. 2 & Vol. 3)-C. L. Arora (S. Chand Publishers)
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
3. Perspective & Concept of Modern Physics -Arthur Baiser
4. Principles of engineering physics – Md. N Khan and S Panigrahi.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	-	-	-	-	-	-	-	-	-	-	2
CO2	**3**	-	-	-	-	-	-	-	-	-	-	2
CO3	**3**	2	-	-	-	-	-	-	-	-	-	1
CO4	2	**3**	-	-	-	-	-	-	-	-	-	1
CO5	1	**3**	-	-	-	-	-	-	-	-	-	**1**

Course Name: Basic Electronics Engineering
Course Code: EC101
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites:
Electric current and voltage-D.C and A.C., Complex impedance, conductivity, resistivity, transformer charging and discharging of capacitor, active and passive elements.

Course Objective:

1. To understand the behavior of Conductors, Insulators, and Semiconductors based on energy-band theory and relevant problems.
2. To instill the knowledge of working principles of P-N Junction Diode, Zener diode and analyze their applications in the rectifier, clipper, clamper, regulator etc.
3. To familiarize with the characteristics of Bipolar junction transistor(BJT) under CE, CE, CC mode of operation and its biasing mechanisms.
4. To understand working principles of JFET, MOSFET and perform operations under CG, CS, CD configurations for parametric observation.
5. To determine the parameters due to the effect of feedback in amplifier to ,adder circuit , integrator and differentiator circuit using Operational Amplifier

Course Outcomes:

CO1	Students able to describe the fundamentals of Semiconductors
CO2	Students able to explain V-I characteristics of P-N Junction Diode, zener diode , working of diode rectifier, clipper, clamper, and regulator circuit
CO3	Students able to analyze characteristics of Bipolar junction transistor(BJT) under CE, CB, CC mode of operation and its biasing therein
CO4	Students able to illustrate the operations of JFET, MOSFET and the CS,CD , CG configuration using JFET
CO5	Students able to determine parameters due to effect of feedback in amplifier
CO6	Students able to construct inverting amplifier circuit , non-inverting amplifier circuit ,adder circuit , integrator and differentiator circuit using Operational Amplifier IC

Course Content:

Module-I: Basics of semiconductor (6L)
Conductors, Insulators, and Semiconductors- crystal structure, Fermi Dirac function, Fermi level, Energy band diagrams, valence band, conduction band, and band gap; intrinsic, and extrinsic (p-type and n-type) semiconductors, position of Fermi level in intrinsic and extrinsic semiconductor, drift and diffusion current – expression only (no derivation) , mass action law , charge neutrality in semiconductor, Einstein relationship in semiconductor , Numerical problems.

Module-II: P-N Junction Diode and its applications (8L)
p-n junction formation and depletion region, energy band diagram of p-n junction at equilibrium and barrier energy, built in potential at p-n junction, energy band diagram and current through p-n junction at

forward and reverse bias, Static and Dynamic resistance of Diode, Transition capacitance and diffusion capacitance, V-I characteristics and current expression of diode, temperature dependencies of V-I characteristics of diode, p-n junction breakdown – conditions, avalanche and Zener breakdown, Concept of Junction capacitance, Zener diode and characteristics.

Diode half wave and full wave rectifiers (centre tapped and bridge) circuits and operation ($I_{DC,}$ I_{rms}, $V_{Dc,}$ $V_{rms)}$, ripple factor without filter, efficiency, PIV, TUF; Reduction of ac ripples using filter circuit (Qualitative analysis); Design of diode clipper and clamper circuit - explanation with example, application of Zener diode in regulator circuit. Numerical problems.

Module-III: Bipolar junction transistor (6L)
Concept of "Transistor", Formation of PNP/NPN Transistors, energy band diagram, current conduction mechanism, CE, CB, CC configurations, transistor static characteristics in CE, CB and CC mode, junction biasing condition for active, saturation and cut-off modes, current gain α, β and γ, early effect.
Biasing and bias stability; biasing circuits - fixed bias; voltage divider bias; collector to base bias, D.C. load line and Quiescent point, calculation of stability factors for different biasing circuits.
BJT as an amplifier and as a switch – Graphical analysis; Numerical Problems.

Module-IV: Field effect transistor (6L)
Concept of "field effect", Classification of FETs-JFET, MOSFET, operating principle of JFET. Drain and transfer characteristics of JFET (n-channel and p-channel), CS, CG, CD configurations, Relation between JFET parameters. FET as an amplifier and as a switch– graphical analysis. E-MOSFET (n-channel and p-channel), D-MOSFET (n-channel and p-channel), Numerical Problems.

Module-V: Feedback and Operational Amplifier (8L)
Concept of feedback with block diagram, positive and negative feedback, gain with feedback. Feedback topologies, effect of feedback on input and output impedance, distortion, concept of oscillation and Barkhausen criterion.
Operational amplifier – electrical equivalent circuit, ideal characteristics, non-ideal characteristics of op-amp – offset voltages; bias current; offset current; Slew rate; CMRR and bandwidth, Configuration of inverting and non-inverting amplifier using Op-amp, closed loop voltage gain of inverting and non-inverting amplifier, Concept of virtual ground, Applications op-amp – summing amplifier; differential amplifier; voltage follower; basic differentiator and integrator, Numerical Problems.

Module-VI: Cathode Ray Oscilloscope (2L)
Operating principle of CRO with block diagram, measurement of voltage, frequency and phase.

Text Books :
1.D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
2.Millman & Halkias, Integrated Electronics, Tata McGraw Hill.
3.Sedra & Smith, Microelectronics Engineering

Reference Books :
1.John D. Ryder, Electronic Fundamentals and Applications, PHI
2.J.B.Gupta, Basic Electronics, S.K. Kataria.
3.Malvino: Electronic Principle.
4.Boyelstad & Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	2	-	1
CO2	3	3	3	1	-	-	-	-	1	1	1	2
CO3	3	1	1	1	-	-	-	-	1	1	1	1
CO4	3	2	1	1	-	-	-	-	1	1	2	2
CO5	3	2	3	1	-	-	-	-	1	1	1	2
CO6	3	3	3	1	-	-	-	-	2	1	2	3

Course Name: English
Course Code: HU101
Contact: 2:0:0
Total Contact Hours: 24
Credits: 2

Prerequisites: The course presupposes a high school level knowledge of English grammar, punctuation, and elementary to intermediate reading and writing skills.

Course Objectives: The basic objectives of this course are to impart professional communication skills in the globalized workplace context, to enable functional competence in reading and writing so as to create industry-ready personnel.

Course Outcomes:

CO1: Know about and employ communication in a globalized workplace scenario.
CO2: Understand and apply functional grammar, reading skills and sub-skills.
CO3: Acquire a working knowledge of writing strategies, formats and templates of professional writing.
CO4: Apply and make use of the modalities of intercultural communication.

Course Content:

Module 1: Communication in a Globalized World **4L**
1.1 Definition, Process, Types of Communication
1.2 Verbal and Non-Verbal Communication
1.3 Barriers to Communication
1.4 Workplace Communication

Module 2: Functional Grammar **4L**
2.1Articles, Prepositions and Verbs
2.2 Verb-Subject Agreement
2.3 Voice, Modality and Modifiers
2.4 Direct and Indirect Speech
2.5 Common Errors in English

Module 3: Vocabulary and Reading **6L**
3.1 Word Roots, Prefixes and Suffixes
3.2 Antonyms, Synonyms and one word Substitution
3.3 Reading—Purposes and Skills (Skimming, Scanning & Intensive Reading)
3.4 Reading Comprehension (Fictional and Non-fictional prose)

Module 4: Professional Writing **10L**
4.1Writing Functions: Describing, Defining, Classifying
4.2 Structuring—coherence and clarity
4.3 Business Writing—Letters (Enquiry, Order, Sales, Complaint, Adjustment, Job Application letters), Memos, Notices, Circulars, Agendas and Minutes of Meetings).
4.4 E-mails—types, conventions, jargons and modalities.

4.5 Reports and Proposals
4.6 Précis writing
4.7 Essay writing
4.8 Punctuation and its importance in writing
4.9 Writing for an Audience

Text Books:

1. Ruskin Bond: The Night Train at Deoli OR Khushwant Singh: The Portrait of a Lady
2. Roald Dahl: Lamb to the Slaughter OR Somerset Maugham: The Man with the Scar
3. Anne Frank: The Diary of a Young Girl (Letters of 3rd February 1944, 12th February 1944 and 13th February 1944) OR Jawaharlal Nehru: "How Britain Ruled India" (Glimpses of World History, Chap 112)

Reference Books:

1. Raymond Murphy. English Grammar in Use. 3rd Edn. CUP, 2001.
2. A. J Thomson and A. V. Martinet. A Practical English Grammar Oxford: OUP, 1980.
3. Michael Swan. Practical English Usage. Oxford: OUP, 1980.
4. Simeon Potter. Our Language. Oxford: OUP, 1950.
5. Pickett, Laster and Staples. Technical English: Writing, Reading & Speaking. 8th ed. London: Longman, 2001.
6. Ben Heasley and Liz Hamp-Lyons. Study Writing. Cambridge: CUP, 2006.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**	**2**
CO2	**2**	**3**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**3**	**-**	**3**
CO3	**1**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**3**
CO4	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**-**	**3**

Course Name: Physics I Lab
Course Code: PH 191
Contact: 0:0:3
Credits: 1.5

Pre requisites: Knowledge of Physics upto 12^{th} standard.

Course Outcomes:

CO1 : Demonstrate experiments allied to their theoretical concepts
CO2 : Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spctrometer
CO3 : Participate as an individual, and as a member or leader in groups in laboratory sessions actively
CO4 : Analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

List of Experiments:

General idea about Measurements and Errors (One Mandatory):

i) Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
ii) Proportional error calculation using Carrey Foster Bridge.

Any 6 to be performed from the following experiments

Experiments on Waves & Oscillations:
1. Study of Torsional oscillation of Torsional pendulum & determination of time period using various load of the oscillator.
2. Determination of elastic moduli of different materials (Young's modulus /Rigidity modulus)

Experiments on Classical Optics:
3. Determination of wavelength of light by Newton's ring method.
4. Determination of wavelength of light by Laser diffraction method.

Experiments on Quantum Physics-I:
5. Determination of Planck's constant using photoelectric cell.
6. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
7. Determination of Stefan's Constant

Experiments on Solid State Physics-I:
8. Determination of Band gap of a semiconductor

In addition it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:
1. Determination of wavelength of light by Fresnel's bi-prism method (beyond the syllabus).
3. Study of dispersive power of material of a prism.

4. Study of viscosity using Poiseullie's capillary flow method/using Stoke's law.
5. Measurement of nodal and antinodal points along transmission wire and measurement of wave length.
6. Any other experiment related to the theory**.**

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	1	2	-	3	-	-	-	-	-	-	-	1
CO3	1	2	-	-	-	-	-	-	3	-	-	1
CO4	1	2	-	-	-	-	-	-	-	3	-	1

Course Name: Basic Electronics Engineering Lab
Course Code: EC 191
Contact: 0:0:3
Credit: 1.5

Prerequisites: A basic course in electronics and Communication engineering Progresses from the fundamentals of electricity, active and passive components, basic electronics laws like Ohm's law, Ampere's law.

Course Objective:
The objectives of this course are

1. To prepare the students to have a basic knowledge of active and passive components.
2. To build knowledge to distinguish pure and impure DC signals.
3. To grow measuring ability of signals through multi meter and CRO
4. To understand characteristics of proper biasing for BJT and FET.
5. To encourage in developing circuits using diodes, transistors, FETs and OPAMPs.

Course Outcomes:

CO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
CO2	Analyse the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
CO3	Determination of input-offset voltage, input bias current and Slew rate, Common- mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
CO4	Able to know the application of Diode, BJT & OPAMP.

List of Experiments:

1. Familiarization with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, millimeters etc.
2. Familiarization with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of I-V characteristics of Field Effect Transistors.
8. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
9. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
10. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.
11. Study of Logic Gates and realization of Boolean functions using Logic Gates.
12. Study of Characteristic curves for CB, CE and CC mode transistors.
13. Innovative Experiment

Text Books:

1.D. Chattopadhyay, P. C. Rakshit, Electronics Fundamentals and Applications, New Age International
2.Millman & Halkias, Integrated Electronics, Tata McGraw Hill.
3.Sedra & Smith, Microelectronics Engineering

Reference Books:

1.John D. Ryder, Electronic Fundamentals and Applications, PHI
2.J.B. Gupta, Basic Electronics, S.K. Kataria.
3.Malvino: Electronic Principle.
4.Boyelstad & Nashelsky: Electronic Devices & Circuit Theory, McGraw Hill, 1976.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2
CO3	3	3	3	2	1	-	-	-	-	-	-	3
CO4	3	3	2	3	2	-	-	-	-	-	-	3

Course Name: Workshop/Manufacturing Practices
Course Code: ME 192
Contact: 0:0:3
Credit: 1.5

Prerequisite: Higher Secondary with Mathematics, Physics and Chemistry

Course Objectives:
To understand the basic knowledge of Workshop Practice and Safety. To identify and use of different hand tools and other instruments like Hack Saw, Jack Plane, Chisels etc. and operations like Marking, Cutting etc. To expose students to different types of manufacturing/fabrication processes

Course Outcomes:
CO1: Fabricate components with their own hands.
CO2: Get practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.
CO3: Produce small devices of their interest for project or research purpose.

Course Content:
(i) Theoretical discussion & videos: (3)
Detailed contents:
1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Carpentry
4. Welding (arc welding & gas welding), brazing
5. Electrical & Electronics
6. Metal casting
7. CNC machining, Additive manufacturing
8. Plastic moulding& Glass Cutting.

(ii) Workshop Practice:
Module 1 - Machine shop (6)

Typical jobs that may be made in this practice module:
i. To make a pin from a mild steel rod in a lathe.
ii. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Module 2 - Fitting shop (6)
Typical jobs that may be made in this practice module:
i. To make a Gauge from MS plate.

Module 3 - Carpentry (6)
Typical jobs that may be made in this practice module:
i. To make wooden joints and/or a pattern or like.

Module 4 - Welding shop (Arc welding 3P + gas welding 3P) (3)

Typical jobs that may be made in this practice module:
i. ARC WELDING (3P): To join two thick (approx 5mm) MS plates by manual metal arcwelding.
ii. GAS WELDING (3P): To join two thin mild steel plates or sheets by gas welding.

Module 5 - Electrical & Electronics (3P)
House wiring, soft Soldering

Module 6 – Smithy (3P)
Typical jobs that may be made in this practice module:
i. A simple job of making a square rod from a round bar or like.

For further study (Optional)
Module 7 - Casting
Typical jobs that may be made in this practice module:
i. One/ two green sand moulds to prepare, and a casting be demonstrated.

Module 8 - Plastic moulding & Glass Cutting (3P)
Typical jobs that may be made in this practice module:
i. For plastic moulding, making at least one simple plastic component should be made.
ii. At least one sample shape on glass should be made using laser cutting machine.
Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Text Books:
1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of WorkshopTechnology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Reference Books:
1. Gowri P., Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
3. Kalpakjian S. and Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
4. Manufacturing Science by A.Ghosh and A.K.Mallick, Wiley Eastern.
5. Principles of Metal Cutting/Principles of Machine Tools by G.C.Sen and A.Bhattacharya, New Central Book Agency, Kolkata.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	1	1	-	-	-	2	1	-	2
CO2	3	3	2	2	1	-	-	-	2	1	-	2
CO3	3	2	2	2	1	1	-	1	2	2	3	2

Curriculum for B.Tech 2nd Semester

Under Autonomy (**GR A:** ECE, EE, EIE, BME; **GR B:** CSE, IT, ME, CE, FT)

2nd Semester								
Sl No	**Course Type**	**Course Code**	**Theory**	**Credit Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	BS	M 201	Mathematics -II	3	1	0	4	4
2	BS	CH 201/ PH	Chemistry - (Gr. B) / Physics – I (Gr. A)	3	0	0	3	3
3	ES	EE 201/ ECEC 201	Basic Electrical Engineering (Gr. B) / Basic Electronics Engineering (Gr. A)	3	0	0	3	3
4	ES	CS 201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME 201	Engineering Mechanics	3	0	0	3	3
Total of Theory							**16**	**16**
B. PRACTICAL								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH 291/	Chemistry Lab (Gr. B) / Physics - I Lab (Gr.	0	0	3	3	1.5
8	ES	EE 291/	Basic Electrical Engineering Lab (Gr. B) /	0	0	3	3	1.5
9	ES	ME 291/	Engineering Graphics & Design (Gr B) / Workshop/Manufacturing	0	0	3	3	1.5
10	HS	HU 291	Language Lab	0	0	2	2	1
11	PROJ	PR 291	Project-II	0	0	1	1	0.5
12	PROJ*	PR 292	Innovative activities-I	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
13	MC	MC 281	NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club	0	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							**34**	**24**

* Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/ innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/ Tinkering Lab/ Institutional workshop; Working in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc. (evaluation by Programme Head through certification)
Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Syllabus- 2nd Semester

Course Name: Mathematics - II
Course Code: M 201
Contact: 3:1:0
Total Contact Hours: 48
Credit: 4

Prerequisites: The students to whom this course will be offered must have the concept of (10+2) standard calculus.

Course Objectives: The objective of this course is to disseminate the prospective engineers with techniques in multivariable calculus, ordinary differential equations and Laplace transform. It aims to equip the students with concepts and tools at an intermediate to advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

CO1	Use mathematical tools to evaluate multiple integrals and vector integrals
CO2	Apply effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
CO3	Recall the properties of Laplace Transform to evaluate multiple integrals and their usage
CO4	Understand the concept of Laplace transform to solve ordinary differential equations.

Course Content:

Module I: Multivariable Calculus (Integration): (12 L)

Double integration, Change of order of integration in double integrals, Triple integrals, vector line integrals, scalar surface integrals, vector surface integrals, Green's theorem, Gauss divergence theorem and Stokes' theorem.

Module II: First Order Ordinary Differential Equations: (10 L)

Solution of first order and first degree ODE: Exact ODE, Rules for finding Integrating factors, Linear ODE, Bernoulli's equation, Solution of first order and higher degree ODE: solvable for p, solvable for y solvable for x and Clairaut's equation.

Module III: Second Order Ordinary Differential Equations: (12 L)

Solution of second order ODE with constant coefficients: C.F. & P.I., Method of variation of parameters, Cauchy-Euler equations, Reduction of 2nd order ODE to a pair of first order ODEs, Solution of simultaneous linear ODEs.

Module IV: Laplace Transform: (14L)

Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property, LT of $tf(t)$, LT of $\frac{f(t)}{t}$, LT of derivatives of f (t), LT of $\int f(t)dt$, Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and

its properties, Convolution theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT.

Text Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
5. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Reference Books:

1. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Boyce, W. E. and DiPrima, R. C., Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
3. Ross, S. L., Differential Equations, 3rd Ed., Wiley India, 1984.
4. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969.
5. Coddington, E. A., An Introduction to Ordinary Differential Equations, Prentice Hall, India, 1995.

CO-PO Mapping:

PO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	3	2	2	-	-	-	-	-	-	-	-	1
CO2	3	2	2	-	-	-	-	-	-	-	-	1
CO3	2	2	-	-	-	-	-	-	-	-	-	1
CO4	3	3	2	-	-	-	-	-	-	-	-	1

Course Name: Chemistry
Course Code: CH201
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Pre requisites: Knowledge of Chemistry up to 12th standard.

Course Objective:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Course Outcomes:

CO1: Able to describe the fundamental properties of atoms & molecules, atomic structure and the periodicity of elements in the periodic table

CO2: Able to apply fundamental concepts of thermodynamics in different engineering applications.

CO3: Able to apply the knowledge of water quality parameters, corrosion control & polymers to different industries.

CO4: Able to determine the structure of organic molecules using different spectroscopic techniques.

CO5: Capable to evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

Course Content:

Module I: Inorganic Chemistry (9 L)

(i) Atomic structure (5 L)

Bohr's theory to hydrogen-like atoms and ions; spectrum of hydrogen atom. Quantum numbers, Introduction to the concept of atomic orbitals, diagrams of s, p and d orbitals, Pauli's exclusion principle, Hund's rule, exchange energy, Aufbau principle and its limitation, introduction to Schrodinger equation.

(ii) Periodic properties (4 L)

Modern Periodic table, group trends and periodic trends in physical properties: electron affinity, electronegativity, polarizability, oxidation states, effective nuclear charges, penetration of orbitals, variations of s, p and d orbital energies of atoms.

Module II: Physical Chemistry (8 L)

(i) Use of free energy in chemical equilibria (6 L)

Thermodynamic functions: internal energy, enthalpy, entropy and free energy. 2nd Law of Thermodynamics, Estimations of entropy and free energies, Free energy and emf, Cell potentials, the Nernst equation and applications.

(ii) **Real Gases (2 L)**

Reason for deviation of real gases from ideal behavior, Equations of state of real gases, Vander Waals' equation, pressure & volume correction, validity, critical state of gas.

Module III: Organic Chemistry (8 L)

(i) **Stereochemistry (4 L)**

Representations of 3 dimensional structures, Chirality, optical activity, isomerism, structural isomerism, stereoisomers, enantiomers, diastereomers, configurations (D,L & cis trans), racemisation.

(ii) **Organic reactions (4L)**

Concepts of inductive effect, resonance, hyperconjugation, introduction to reactions involving substitution, addition, elimination, oxidation (Baeyer villiger oxidation), reduction (Clemmensen reduction, Wolff-Kishner reduction)

Module IV: Industrial Chemistry 8L

(i) **Water (2 L):** Hardness, alkalinity, numerical

(ii) **Corrosion. (2 L):** Types of corrosion: wet & dry, preventive measures

(iii) **Polymers (3 L):** Classification of polymers, conducting polymers, biodegradable polymers

(iv) **Synthesis of a commonly used drug molecule. (1 L):** Paracetamol, Aspirin

Module V: Spectroscopic techniques in Chemistry (3L)

Electromagnetic radiation, Principles of spectroscopy, spectrophotometer, infrared spectroscopy, fingerprint region, functional group region, UV-VIS spectroscopy, ^{1}H Nuclear magnetic resonance spectroscopy, chemical shift

Text Books

(i) A Text Book of Organic Chemistry, Arun Bahl & Arun Bahl

(ii) General & Inorganic Chemistry, P.K. Dutt

(iii) General & Inorganic Chemistry, Vol I, R.P. Sarkar

(iv) Physical Chemistry, P.C. Rakshit

Reference Books

(v) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane (iii)Fundamentals of Molecular Spectroscopy, by C. N. Banwell

(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan

(v) Physical Chemistry, by P. W. Atkins

(vi) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	1	2	2	2
CO2	3	3	3	3	-	-	-	-	1	1	2	3
CO3	3	3	2	1	-	2	1	-	1	-	3	3
CO4	3	2	3	2	-	-	1	-	1	2	3	3
CO5	3	3	3	3	1	1	1	-	1	-	2	3

Course Name: Basic Electrical Engineering
Course Code: EE201
Contact: 3:0:0
Total Contact hours: 36
Credits: 3

Prerequisites:

- Basic 12th standard Physics and Mathematics.
- Concept of components of electric circuit.

Course Objective:
To introduce the students to basic principles of DC and AC circuits, Electrical Machines and Electrical Systems.

Course Outcomes:

CO1: To understand Basic Electrical circuits, Power distribution and Safety measures.
CO2: To analyze an apply DC network theorems.
CO3: To analyze and apply concept of AC circuits of single-phase and three-phase.
CO4: To analyze and apply concepts of AC fundamentals in solving AC network problems.
CO5: To understand basic principles of Transformers and Rotating Machines.

Course contents:

Module I: DC Circuits (9L)
Definition of electric circuit, linear circuit, non-linear circuit, bilateral circuit, unilateral circuit, Dependent source, node, branch, active and passive elements, Kirchhoff's laws, Source equivalence and conversion, Network Theorems - Superposition Theorem, Thevenin's Theorem, Norton Theorem, Maximum Power Transfer Theorem, Star-Delta Conversions.

Module II: AC Fundamentals (9L)
Sinusoidal quantities, Average and RMS values, peak factor, Form factor, Phase and Phase difference, concept of phasor diagram, V-I Relationship in R, L, C circuit, Combination R-L-C in series and parallel circuits with phasor diagrams, impedance and admittance, impedance triangle and power triangle, Power factor, concept of resonance, Power in AC circuit, simple problems (series and parallel circuit only), Three-phase balanced circuits, Concept of three-phase power measurement.

Module III: Single-Phase Transformer (5L)
Brief idea on constructional parts, classifications, working principle. Problems on EMF equation. Phasor diagram, Equivalent circuit.

Module IV: Electrical Rotating Machines (8L)
a)DC Machines (4L)
Brief idea on constructional features, classifications, working principle of both motor and generator. Simple problems on Voltage equation.

b) Three-Phase Induction Motor (4L)

Basic concept of three phase circuit and production of rotating magnetic field. Working principle of three-phase induction motor and torque-speed characteristics (concept only). No numerical problem.

Module V: General Structure of Electrical Power System (1L)
Power generation to distribution through overhead lines and underground cables with single line diagram.

Module VI: Electrical Installations (4L)
Earthing of Electrical Equipment, ideas of basic components- MCB, MCCB, ELCB, SFU, Megger.

Text books:

1. D. P. Kothari & I. J. Nagrath, Basic Electrical Engineering, TMH.
2. V. Mittle & Arvind Mittal, Basic Electrical Engineering, TMH.
3. Ashfaq Hussain, Basic Electrical Engineering, S. Chand Publication.
4. Chakrabarti,Nath & Chanda, Basic Electrical Engineering, TMH.
5. C.L. Wadhwa, Basic Electrical Engineering, Pearson Education**.**

Reference books:

1. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Printice Hall India, 1989.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	1	-	-	-	2	-	-	-	2	2	1
CO2	2	3	-	-	-	-	-	-	-	-	1	1
CO3	2	3	1	-	-	-	-	-	-	-	1	1
CO4	1	2	3	1	-	-	-	-	-	-	-	1
CO5	3	-	-	-	-	-	-	-	-	-	-	1

Course Name: Programming for Problem Solving
Course Code: CS 201
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites: Number system, Boolean Algebra

Course Outcomes:

CO1	Understand and differentiate among different programming languages for problem solving.
CO2	Describe the way of execution and debug programs in C language.
CO3	Define, select, and compare data types, loops, functions to solve mathematical and scientific problem.
CO4	Understand the dynamic behavior of memory by the use of pointers.
CO5	Design and develop modular programs using control structure, selection structure and file.

Course Content:

Fundamentals of Computer: (8 L)
History of Computer, Generation of Computer, Classification of Computers, Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. 2L

Binary and Allied number systems representation of signed & unsigned numbers, BCD, ASCII, Binary number. Arithmetic – Addition and Subtraction (using 1's complement and 2's complement). 2L

Overview of Procedural vs Structural language, compiler and assembler (basic concepts) 1L

Problem solving- Algorithm & flow chart. 2L

C Fundamentals: (28 L)
Variable and Data Types:
The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements. 2L

C Operators & Expressions:
Arithmetic operators, relational operators, logical operators, increment and decrement operators, bitwise operators, assignment operators, conditional operators, special operators - type conversion, C expressions, precedence and associativity.
Input and Output: Standard input and output, formatted output - printf, formatted input scanf, bit fields. 4L

Branching and Loop Statements:
Statement and blocks, if - else, switch, goto and labels, Loops - while, for, do while, break and continue. 4L

Fundamentals and Program Structures:
auto, external, static and register variables Functions, function types, function prototypes, functions returning values, functions not returning values, scope rules, recursion, C preprocessor and macro. 5L

Arrays, Strings and Pointers:
One dimensional arrays, Two-dimensional arrays, Multidimensional arrays. Passing an array to a

function Character array and string, array of strings, Passing a string to a function, String related functions, Pointers, Pointer and Array, Pointer and String, Pointer and functions, Dynamic memory allocation. 7L

Structures and Unions:

Basic of structures, arrays of structures, structures and pointers, structures and functions. 3L

Files handling with C:

formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function. 3L

Text book:

Kerninghan B.W. & Ritchie D.M. - The C Programming Language ,PHI, 2nd Edition
Kanetkar Y. - Let us C, BPB Publication, 15th Edition

Reference Books:

E Balagurusamy – Programming in ANSI C, TMH, 3rd Edition
K R Venugopal & S R Prasad – MASTERING C, TMH, 2nd Edition
Reema Thareja – INTRODUCTION TO C PROGRAMMING, OXFORD UNIVERSITY PRESS, 2nd Edition

CO – PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	1	-	3	3	1	1
CO2	2	2	3	3	2	2	-	-	3	3	3	3
CO3	2	2	2	2	2	1	-	-	3	3	1	3
CO4	3	2	2	2	2	3	-	-	3	3	2	3
CO5	3	3	3	3	2	3	-	-	3	3	3	3

Course Name: Engineering Mechanics
Course Code: ME 201
Contacts: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites: Basic Concept of Physics

Course Objective:

This course teaches students how to apply Newtonian physics to relatively simple real life applications. This course covers statics, dynamics and elementary part of strength of materials.

Course Outcomes:

CO1: To understand representation of force, moments for drawing free-body diagrams and analyze friction based systems in static condition
CO2: To locate the centroid of an area and calculate the moment of inertia of a section.
CO3: Apply of conservation of momentum & energy principle for particle dynamics and rigid body kinetics
CO4: Understand and apply the concept of virtual work, rigid body dynamics and systems under vibration.

Course Content:

Module 1: Introduction to Engineering Mechanics: Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. 6L

Module 2: Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack. 2L

Module 3: Basic Structural Analysis: Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines. 3L

Module 4: Centroid and Centre of Gravity: Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. 5L

Module 5: Virtual Work and Energy Method: Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium. 5L

Module 6: Review of particle dynamics: Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy.Impulse-momentum (linear, angular); Impact (Direct and oblique). 5L

Module 7: Introduction to Kinetics of Rigid Bodies: Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation. 5L

Module8: Mechanical Vibrations: Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums. 5L

Text books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R.C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education

Reference books:

1. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
2. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
3. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
4. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	1	-	-	-
CO2	3	3	2	2	-	-	-	-	1	-	-	1
CO3	3	2	3	2	1	-	-	-	1	-	-	1
CO4	3	3	3	3	-	-	-	-	1	-	1	-

Course Name: Programming for Problem Solving Lab
Course Code: CS291
Contacts: 0:0:3
Credits: 1.5

Prerequisites: Number system, Boolean Algebra.

Course Outcomes:

CO1	Learn the concept of DOS system commands and editor.
CO2	To formulate the algorithms for simple problems and to translate given algorithms to a working and correct program.
CO3	To be able to identify and correct syntax errors / logical errors as reported during compilation time and run time.
CO4	To be able to write iterative as well as recursive programs.
CO5	Learn the concept of programs with Arrays, Pointers, Structures, Union and Files.

List of Experiment:

- Some basic commands of DOS, Windows and Linux Operating System, File handling and Directory structures, file permissions, creating and editing simple C program, compilation and execution of C program.
- Writing C Programs on variable, expression, operator and type-casting.
- Writing C Programs using different structures of if-else statement and switch-case statement.
- Writing C Programs demonstrating use of loop (for loop, while loop and do-while loop) concept and use of break and continue statement.
- Writing C Programs demonstrating concept of Single & Multidimensional arrays.
- Writing C Programs demonstrating concept of Function and Recursion.
- Writing C Programs demonstrating concept of Pointers, address of operator, declaring pointers and operations on pointers.
- Writing C Programs demonstrating concept of structures, union and pointer to structure.
- Writing C Programs demonstrating concept of String and command line arguments.
- Writing C Programs demonstrating concept of dynamic memory allocation.
- Writing C Programs demonstrating concept of File Programming.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	2	2	-	1	-	1	2	3
CO2	3	3	3	-	-	-	-	-	-	-	-	2
CO3	2	2	2	2	2	-	-	-	-	-	-	3
CO4	1	2	2	2	2	-	-	-	-	-	-	2
CO5	2	3	3	3	2	2	3	1	3	3	3	3

Course Name: Chemistry Lab
Course Code: CH 291
Contact: 0:0:3
Credits: 1.5

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objective:

- Study the basic principles of pH meter and conductivity meter for different applications.
- Analysis of water for its various parameters & its significance in industries.
- Learn to synthesis Polymeric materials and drugs.
- Study the various reactions in homogeneous and heterogeneous medium.

Course Outcomes:

CO1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
CO2: Able to analyse and determine the composition of liquid and solid samples working as an individual and also as an team member
CO3: Able to analyse different parameters of water considering environmental issues
CO4: Able to synthesize drug and polymer materials.
CO5: Capable to design innovative experiments applying the fundamentals of chemistry

List of Experiment:

Choice of 10-12 experiments from the following:

- Determination of surface tension and viscosity
- Thin layer chromatography
- Determination of hardness of water
- Determination of chloride content of water
- Determination of the rate constant of a reaction
- Determination of cell constant and conductometric tritration
- pH metric titrations
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal

Innovative experiments (any one)

- Synthesis of silver nano particles
- Green synthesis

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3	1	-	2	3	-	-	-	-	1
CO2	2	2	1	1	-	1	-	-	-	1	-	1
CO3	-	-	-	-	-	-	-	-	3	3	2	2
CO4	2	1	2	2	-	-	1	-	-	-	-	2
CO5	3	3	3	3	1	1	1	1	-	-	2	2

Course Name: Basic Electrical Engineering Laboratory
Course Code: EE291
Contact: 0:0:3
Credits: 1.5

Prerequisites:

- Basic Physics and applied physics.
- Basic Mathematics.
- Basic concept of Electric Circuit

Course Objective:
To impart and apply knowledge about the Basic Electrical Components, Machineries, Instruments and Safety measures.
Course Outcomes:
CO1: Identify and use common electrical components.
CO2: To develop electrical networks by physical connection of various components and analyze the circuit behavior.
CO3: Apply and analyze the basic characteristics of transformers and electrical machines.

List of Experiments:

1. Basic safety precautions – earthing, introduction to measuring instruments – Voltmeter, Ammeter, Multimeter, Wattmeter, Real life Resistor, Capacitor, Inductor.
2. Verification of Thevenin's and Norton's Theorem.
3. Verification of Superposition and Maximum Power Transfer Theorem.
4. Characteristics of Fluorescent, Tungsten and Carbon filament lamps.
5. Study of R-L-C series circuit.
6. Three-phase Power measurement with two wattmeter method.
7. Demonstration of cut-out sections of machines: DC Machine (commutator-brush arrangement), Induction Machine (squirrel cage rotor).
8. Measurement of primary and secondary voltage and current of single-phase transformer – Open Circuit and Short Circuit Test.
9. Starting, Reversing and speed control of DC shunt motor.
10. Torque-Speed characteristics of DC Machine.
11. Torque-Speed characteristics of Three-phase Induction Motor.
12. Test on single-phase Energy Meter.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	-	-	-	-	2	-	-	-	-	-	1
CO2	2	3	-	-	-	-	-	-	-	-	1	1
CO3	3	-	-	-	-	-	-	-	-	-	-	1

Course Name: Engineering Graphics & Design
Course Code: ME 291
Contact: 0:0:3
Credits: 1.5

Prerequisites: Basic knowledge of geometry

Course Objectives:
To learn detailed drawing and modeling of a system, component, or process which meets desired needs within realistic constraints. It will help students to use the techniques, skills, and modern engineering tools and communicate effectively.

Course Outcomes:
CO1: Get introduced with Engineering Graphics and visual aspects of design.
CO2: Know and use common drafting tools with the knowledge of drafting standards.
CO3: Apply computer aided drafting techniques to represent line, surface or solid models in different Engineering viewpoints.
CO4: Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.

List of Drawing:

Traditional Engineering Graphics:
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Module 1: Introduction to Engineering Drawing
Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2: Orthographic & Isometric Projections
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projection of Solids inclined to both the Planes- Auxiliary Views; Isometric Scale, Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.

Module 3: Sections and Sectional Views of Right Angular Solids
Drawing sectional views of solids for Prism, Cylinder, Pyramid, Cone and project the true shape of the sectioned surface, Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw sectional orthographic views of objects from industry and dwellings (foundation to slab only)

Computer Graphics:
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modeling; Solid Modeling.

Module 4: Overview of Computer Graphics
Demonstration of CAD software [The Menu System, Toolbars (Standard, Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Zooming methods, Select and erase objects].

Module 5: CAD Drawing, Customization, Annotations, layering
Set up of drawing page including scale settings, ISO and ANSI standards for dimensioning and tolerancing; Using various methods to draw straight lines, circles, applying dimensions and annotations to drawings; Setting up and use of Layers, Changing line lengths (extend/lengthen); Printing documents; Drawing sectional views of solids and project the true shape of the sectioned surface; Drawing annotation, CAD modeling of parts and assemblies with animation, Parametric and non parametric solid, surface and wireframe modeling, Part editing and two dimensional documentation of models.

Module 6:
Demonstration of a simple team design project
Illustrating Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed topologies for engineering analysis and tool-path generation for component manufacture, Use of solid-modeling software for creating associative models at the component and assembly levels.

Text Books:
1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. (Corresponding set of) CAD Software Theory and User Manuals

Reference Books:

1. K. Venugopal**,** Engineering Drawing + AutoCAD, New Age International publishers
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	-	1	1	-	1	2	1	-	-
CO2	2	1	2	-	1	1	-	2	1	2	1	1
CO3	2	1	3	2	3	-	-	2	2	2	1	1
CO4	2	1	3	3	3	1	1	2	2	2	2	2

Course Name: Lang. Lab. and Seminar Presentation
Course Code: HU 291
Contact: 0:0:2
Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objective: To train the students in acquiring interpersonal communication skills by focussing on language skill acquisition techniques and error feedback.

Course Outcomes:

CO1: Able to understand advanced skills of Technical Communication in English through Language Laboratory.
CO2: Able to apply listening, speaking, reading and writing skills in societal and professional life.
CO3: Able to demonstrate the skills necessary to be a competent Interpersonal communicator.
CO4: Able to analyze communication behaviours.
CO5: Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

Course Content:

Module 1: Introduction to the Language Lab
a. The Need for a Language Laboratory
b. Tasks in the Lab
c. Writing a Laboratory Note Book

Module 2: Active Listening
a. What is Active Listening?
b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking
c. Academic Listening vs Business Listening
d. Listening in Business Telephony
e. Study of Contextualized Examples based on Lab Recordings

Module 3: Speaking
a. Speaking—Accuracy and Fluency Parameters
b. Pronunciation Guide—Basics of Sound Scripting, Stress and Intonation
c. Fluency-focussed activities—JAM, Conversational Role Plays, Speaking using Picture/Audio Visual inputs
d. Accuracy-focussed activities—Identifying Minimal Pairs, Sound Mazes, Open and Closed Pair Drilling, Student Recordings (using software)
e. Group Discussion: Principles and Practice

Module 4: Lab Project Work
a. Making a brief Animation film with voice over (5 minutes)OR
b. Making a brief Documentary film (10 minutes)

Reference Books:

1.IIT Mumbai**, Preparatory Course in English** syllabus
2. IIT Mumbai, **Introduction to Linguistics** syllabus
3. Sasikumar et al. *A Course in Listening and Speaking*. New Delhi: Foundation Books, 2005.
4. Tony Lynch, *Study Listening*. Cambridge: Cambridge UP, 2004.

CO – PO Mapping :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	2	-	-	3	-	**3**	**2**	**2**	**3**	**3**	-	**3**
CO2	2	3	3	3	-	**3**	**3**	**3**	**2**	**3**	-	3
CO3	1	3	3	3	-	**2**	**2**	**2**	**2**	**3**	-	2
CO4	1	2	3	3	-	**2**	**1**	**1**	**2**	**3**	-	2
CO5	3	3	2	3	-	**2**	**3**	**2**	**2**	**3**	-	2

Course Name: NSS/Physical Activities/ Meditation & Yoga/ Photography/Nature Club
Course Code: MC 281
Contact: 0:0:3

Course Objectives:

- To increase student awareness about the weaker and unprivileged sections of society
- To expose students to environmental issues and ecological concerns
- To make students self aware about their participatory role in sustaining society and the environment

List of Activities:

a) Creating awareness in social issues
b) Participating in mass education programmes
c) Proposal for local slum area development
d) Waste disposal
e) Environmental awareness ``
f) Production Oriented Programmes
g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women's development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children's Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
6. Gender issues- Developing an awareness, to link it with Women's Cell of college

Participating in mass education programmes: 1.Adult education 2. Children's education

Proposal for local slum area development : One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

• Resource conservation – Awareness to be developed on water, energy,soil.
• Preservation of heritage monuments- Marches, poster campaigns
• Alternative energy consciousness amongst younger school-children.
• Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
• Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices
6. Rodent control land pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;
9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;

Curriculum for B.Tech 3rd Semester

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

3rd Semester								
SL No	Course Type	Course Code	THEORY	Contact Hours/Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	IT301	Data Structure and Algorithm	3	0	0	3	3
2	PC	IT 302	Analog and Digital Electronics	3	0	0	3	3
3	BS	M (IT)301	Mathematics -III	3	1	0	4	4
4	BS	PH 301	Physics-II	3	0	0	3	3
5	ES	M(IT)302	Numerical Methods and Statistics	3	0	0	3	3
Total of Theory							16	16
B. PRACTICAL								
6	PC	IT391	Data Structure Lab	0	0	3	3	1.5
7	PC	IT 392	Analog and Digital Electronics Lab	0	0	3	3	1.5
8	BS	PH391	Physics-II Lab	0	0	3	3	1.5
9	ES	M(IT)392	Numerical Methods and Statistics Lab	0	0	3	3	1.5
10	PROJ	PR 391	Project-III	0	0	2	2	1
11	PROJ*	PR 392	Innovative activities-II	0	0	0	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC 381	Behavioural and Interpersonal Skills	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							34	23.5

j) Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;

Syllabus- 3rd Semester

Course Name: Data Structure and Algorithm
Course Code: IT 301
Contact 3:0:0
Total Contact Hours: 38
Credits: 3

Prerequisite:

Basic Mathematics, Programming language

Course Objective:

The objective of the course is to provide knowledge of various data structures and algorithms; to introduce difference techniques for analyzing the efficiency of computer algorithms and provide efficient methods for storage, retrieval and accessing data in a systematic manner and explore the world of searching, sorting, traversal and graph tree algorithm along with demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists and trees.

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

CO1	Use different kinds of data structures which are suited to different kinds of applications, and some are highly specialized to specific tasks.
CO2	Manage large amounts of data efficiently, such as large databases and internet indexing services.
CO3	Use efficient data structures which are a key to designing efficient algorithms.
CO4	Use some formal design methods and programming languages which emphasize on data structures, rather than algorithms, as the key organizing factor in software design.
CO5	Store and retrieve data stored in both main memory and in secondary memory.

Course Content:

Module I : Introduction : Concepts of data structures (7)
a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. Array : Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. Linked List : Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.

Module II: Stack and Queue (7)
Stack and its implementations (using array, using linked list), applications. Queue, circular queue,

dequeue. Implementation of queue- both linear and circular (using array, using linked list), applications. Recursion : Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.

Module III: Trees (12)

Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only). Huffman tree.

Graphs : Graph definitions and Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm

Module IV: Sorting Algorithm(10)

Internal sorting and external sorting Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap), radix sort. Tree Sort technique .Searching : Sequential search, binary search, interpolation search. Hashing : Hashing functions, collision resolution techniques

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	--	1	--	--	1	--	--	--	--	--
CO2	3	3	2	3	--	--	--	--	--	--	--	--
CO3	3	--	3	--	--	--	--	--	--	--	--	--
CO4	--	3	--	2	--	--	--	--	--	--	--	--
CO5	--	3	--	2	--	--	--	--	--	--	--	--

Course Name: Analog and Digital Electronics
Course Code: IT 302
Contact 3:0:0
Total Contact Hours:
Credits: 3

Prerequisites:
Mathematics, Physics, Basic Electronics.

Course Objective:
The objective of the course is to prepare students to perform the analysis and design of various digital and analog electronic circuits.

Course Outcome: After completion of this course student will be able to

CO1	Understand basic analog and digital electronics, including semiconductor properties, operational amplifiers, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques
CO2	Identify different symbols, working principles of basic Digital electronics circuits for data processing application
CO3	Analyze the characteristics of basic digital circuits
CO4	Design analog amplifiers, combinational logic devices and sequential logic devices like counters and registers

Course Content:

Module I : Analog Electronics (10)

Recapitulation of P-N diodes, BJT, FET , Feedback and OPAMP ;Power Amplifiers – Class A, B, AB and C - basic concepts, power, efficiency calculation; Phase Shift, Wein Bridge oscillators; Astable & Monostable Multivibrators, 555 Timer and Multivibrators ; Schimtt Trigger circuit.

Module II: Introduction to Number Systems (10)

Binary, Octal and Hexadecimal representation and their

conversions; BCD, ASCII, EBDIC, Gray codes and their conversions ; Signed binary number representation with 1's and 2's complement methods , Binary arithmetic; Boolean algebra ; Various logic gates; Representation in SOP and POS forms ; Minimization of logic expressions by algebraic method , K-MAP method and Quin Mc-Clusky Method.

Module III: Combinational Circuits (6)

Adder and Substractor; Applications and circuits of Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and Checker.

Module IV: Sequential Circuits (6)

Basic Flip-flop & Latch ; SR, JK, D, T and JK Master-slave Flip Flops Registers (SISO,SIPO,PIPO,PISO); Ring counter, Johnson counter ; Basic concept of Synchronous and Asynchronous counters ; Design of synchronous and asynchronous Mod N Counter.

Module V: A/D and D/A conversion techniques:(2)

Basic concepts of R-2R , A/D and D/A; successive approximation ADC

Module VI: Logic families (2)

TTL, ECL, MOS and CMOS - basic concept

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	--	--	--	--	--	--	--	--	--	--	1
CO2	--	--	--	--	--	--	--	--	--	--	--	--
CO3	--	2	--	3	--	--	--	--	--	--	--	--
CO4	--	2	3	2	1	1	2	--	--	--	--	--

Course Name: Mathematics - III
Course Code: M (IT) 301
Contact: 3:1:0
Total Contact Hours: 48
Credits: 4

Prerequisite:

The students to whom this course will be offered must have the concept of (10+2) standard set theory, calculus, basic probability.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with the knowledge of Graph Theory and Algebraic structure. It also aims to equip the students with concepts and tools of probability distribution as an intermediate to the advanced level of applications that they would find useful in their disciplines.

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

CO1	Recall the distinctive characteristics of probability distribution, abstract algebra, and graph theory.
CO2	Demonstrate the theoretical working of probability distribution, abstract algebra, and graph theory.
CO3	Compute the probability of real world uncertain phenomena by indentifying probability distribution that fits the phenomena.
CO4	Construct the shortest path and minimal spanning tree from a given graph using the algorithms of graph theory.

Course Content:

Module I: Probability Distributions (16)
Classical and Axiomatic definition of Probability (elementary properties), conditional probability, Baye's theorem and related problems. Random Variable: Discrete and Continuous (definition & examples); Probability Distribution (definition & examples); Probability Mass Function, Probability Density Function and Distribution Function for a single random variable only (definition, properties & related problems); Expectation, Variance and Standard Deviation for a single random variable only (definition, properties & related problems); Binomial Distribution, Poisson Distribution, Binomial Approximation to Poisson Distribution and Normal Distribution (problems only), Mean, Variance and Standard Deviation of Binomial, Poisson and Normal Distribution (problems only).

Module II: Algebraic Structures (14)
Group and related problems, order of an element and related problems, Lagrange's theorem, Subgroup,

Normal subgroup, Cyclic group, Permutation group, Symmetric group (S3).

Module III: Graph Theory (18)

Basics of Graph Theory and related theorems and problems; Digraphs; Weighted Graph; Connected and Disconnected graph; Bipartite Graph; Complement of a Graph; Regular Graph; Complete Graph; Walk, Path, Circuit, Euler Graph; Hamiltonian circuit, Cut Set and Cut Vertices; Adjacency and Incidence Matrices of a graph (digraph); Isomorphism.

Basics of Tree and related theorems, Binary Tree, Spanning Tree, Minimal Spanning Tree, Dijkstra's algorithm, Kruskal's Algorithm, Prim's Algorithm.

Planar and Dual Graphs, Kuratowski's graphs, Homeomorphic graphs Euler formula for connected planar graph.

Text Books:

1. Das, N.G. *Probability and Statistics*; The McGraw Hill Companies.
2. Gupta, S. C. and Kapoor, V. K. *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons.
3. Deo, N. *Graph Theory with Applications to Engineering and Computer Science*, Prentice Hall.
4. Mapa, S. K. *Higher algebra: Abstract and Linear*, Levant, 2011.
5. Chakraborty, S. K. and Sarkar, B. K. *Discrete Mathematics*, OXFORD University Press.

Reference Books:

1. Chandrasekaran, N. and Umaparvathi, M. *Discrete Mathematics*, PHI
2. Lipschutz, S. *Theory and Problems of Probability (Schaum's Outline Series)*, McGraw Hill Book. Co.
3. Spiegel, M. R. *Theory and Problems of Probability and Statistics (Schaum's Outline Series)*, McGraw Hill Book Co.
4. Grewal, B. S. *Higher Engineering Mathematics*, Khanna Pub.
5. Kreyzig, E. *Advanced Engineering Mathematics*, John Wiley and Sons.
6. Sharma, J.K. *Discrete Mathematics*, Macmillan.
7. Spiegel, M. R., Schiller, J.J. and Srinivasan, R.A. *Probability and Statistics* (Schaum's Outline Series), TMH.
8. Wilson: Introduction to graph theory, Pearson Education.

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	3	1	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	-	-	1

Course Name: Physics II
Course Code: PH 301
Contact: 3:0:0
Total Contact Hours:
Credits: 3

Pre-Requisites: 1st year Basic Physics knowledge

Course Objective:

The Physics-II course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome: After completion of this course student will be able to

CO1	explain electromagnetic wave propagation using fundamentals of electrostatics, magnetostatics and electromagnetic theory.
CO2	apply Schrödinger equation in variety of atomic scale problems including nanomaterials.
CO3	analyze the importance of superposition principle of quantum mechanics in conceptualization of Quantum bits.
CO4	justify the importance of Fermi energy level in turning electronic properties of various semiconductors

Course Content:
Module I: Quantum Mechanics-II, Quantum Computation and Communication (12)

Quantum Mechanics-II
Formulation of quantum mechanics and Basic postulates; Operator correspondence-Measurements in Quantum Mechanics- Eigen value, Eigen function, superposition principle, orthogonality of wave function, expectation value. Commutator.

Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Schrödinger's equation as energy eigen value equation, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only E<V0).

Quantum Computation and Communication
The idea of n- dimensional vector space, use of 'bra-ket' notation

, matrix representation of bra &kets; basis, Hilbert space; Pauli matrices.
Idea of qubit and examples of single qubit logic gates- Classical bits, qubit as a two level system; Bloch vector, Pauli gate, Hadamard gate, Phase shift gate, Quantum circuits related to Quantum gates.

Module II: Statistical Mechanics (6)

Basics of Statistical Mechanics:
Concept of energy levels and energy states, phasespace, microstates, macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level.

Applications of Statistical Mechanics:
Qualitative study: Fermi level in metals, intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type).

Module III: Storage and display devices (3)

Different storage and display devices-Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin film transistor display).

Module IV: Electricity and Magnetism (11)

Gauss's law in integral form and conversion into differential form, Equation of continuity, Extend to Poisson's & Laplace's equation, Application to parallel plate, spherical and cylindrical capacitors.

Magnetostatics:
Lorentz force (concept in Hall effect-), force on a small current element placed in a magnetic field. Biot-Savart law- non existence of magnetic monopole, Ampere's circuital law, Magnetic vector and scalar potential.
Electro-magnetism &Electromagnetic theory
Faraday's law, Concept of displacement current, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave.
Application of Electromagnetic theory in Polarization
Definition, Plane of polarization, Plane of vibration, Malus Law, Fundamental concepts of plane, circular & elliptical polarizations (only qualitative idea) with examples, Brewster's law, Double refraction : Ordinary & Extra ordinary rays, Nicol's prism, Engineering applications in E.M.Theory, Numerical problems

Module V : Physics of Nanomaterial (4)

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Application of nanomaterials (CNT, grapheme, electronic, environment, medical).

Text Books:
1. Integrated Engineering Physics by Amal Kumar Chakraborty
2. Engineering Physics by Khan and Panigrahi Publisher: Oxford.

Reference Books:
Module 1:
1. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
2. Quantum Mechanics-Schiff (Addison-Wesley)
3. Quantum Computation and Quantum Information(10th Anniversary Edition)-Nielsen & Chuang (Cambridge University Press)
4. The physics of quantum information-Dirk Bouwmeester, Artur K. Ekert, Anton Zeilinger (Springer)
5. Quantum Mechanics-Cohen Tanuje.
6. Advanced Quantum Mechanics-P.A.M. Dirac

Module 2.
Statistical Mechanics by B.B. Laud
Statistical Mechanics by Singh and Singh
Statistical Mechanics by Satyaprakash

Module 3
1 Introduction to solid state physics-Kittel (TMH)
2. Solid State Physics- Ali Omar (Pearson Eduction)
3. Solid state physics- S. O. Pillai
4. Solid State Physics-A. J. Dekker (Prentice-Hall India)
5. Materials Science-Raghavan

Module 4:
1. Electromagnetics-B.B. Laud (TMH)
2. Electricity Magnetism-B.Ghosh (Book & Allied Publisher)
3. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
4. Electricity Magnetism-Fewkes and Yardwood (Oxford University Press)
5. Optics-A. K. Ghatak (TMH)
6. Optics-B.D. Gupta (Books and Allied Publ)

Module 6
6. Nanotechnology-Rakesh Rathi (S. Chand Publishers)
7. Integrated Electronics-Millman Halkias (TMH)
8. Nanotechnology-Rakesh Rathi (S. Chand Publishers)
9. Nanoscience-H. E. Schaefer (Springer)

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	--	--	--	--	--	--	--	--	--	1
CO2	3	2	--	--	--	--	--	--	--	--	--	2
CO3	2	3	--	--	--	--	--	--	--	--	--	1
CO4	1	2	2	3	--	--	--	--	--	--	--	1

Course Name: Numerical Methods and Statistics
Course Code: M (IT) 302
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites:

The students to whom this course will be offered must have the concept of (10+2) standard number system, algebra and calculus.

Course Objectives:

The purpose of this course is to provide basic understanding of the derivation and the use of the numerical methods along with the knowledge of finite precision arithmetic.

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

CO1	Recall the distinctive principles of numerical analysis and the associated error measures.
CO2	Understand the theoretical workings of numerical techniques.
CO3	Apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as interpolation, integration, the solution of linear and nonlinear equations, and the solution of ordinary differential equations.
CO4	Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources.
CO5	Interpret complex statistical findings using the understanding of inferential statistics.

Course Content:

Module I: Error Analysis and Interpolation (8)

Approximation in Numerical Computation: Truncation and rounding errors, Propagation of errors, Fixed and floating-point arithmetic.
Interpolation: Difference Operators: Forward and Backward, Shift Operator; Newton forward interpolation, Newton backward interpolation, Lagrange's Interpolation.

Module II: Numerical Solution of Linear and Non-linear Equations (8)

Numerical Solution of a System of Linear Equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method.
Solution of Polynomial and Transcendental Equations: Bisection method, Regula-Falsi, Newton-Raphson method.

Module III: Numerical Integration and Numerical Solution of Differential Equation (6)

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Numerical solution of ordinary differential equation: Euler's method,Euler's modified method,Fourth order Runge-Kutta method.

Module IV: Statistics (14)

Basic Statistics: Basic statistics, measure of central tendency, mean, median, mode, dispersion, correlation coefficient and regression.
Sampling theory: Random sampling. Statistic and its Sampling distribution.Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems.
Estimation of parameters: Unbiased and consistent estimators. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson).Confidence intervals and related problems

Text Books:

1. Shishir Gupta &S.Dey, Numerical Methods, Mc. Grawhill Education Pvt. Ltd.
2. C.Xavier: C Language and Numerical Methods, New age International Publisher.
3. Dutta& Jana: Introductory Numerical Analysis. PHI Learning
4. J.B.Scarborough: Numerical Mathematical Analysis.Oxford and IBH Publishing
5. Jain, M. K., Iyengar, S. R. K. and Jain, R. K. *Numerical Methods (Problems and Solution)*. New age International Publisher.
6. Prasun Nayek: Numerical Analysis, Asian Books
7. N. G. Das: Statistical Methods, TMH.
8. **Sancheti** , *D. S. &* **Kapoor** ,*V.K. : Statistics Theory , Method & Application*, Sultan chand & sons , New Delhi

Reference Books:

1. Balagurusamy, E. *Numerical Methods*, Scitech. TMH.
2. Dutta, N. *Computer Programming & Numerical Analysis*, Universities Press.
3. Guha, S. and Srivastava, R. *Numerical Methods*, Oxford Universities Press.
4. Shastri, S. S. *Numerical Analysis*, PHI.
5. Mollah, S. A. *Numerical Analysis*, New Central Book Agency.
6. Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI.
7. Rao, G. S. *Numerical Analysis*, New Age International.
8. Rao, G.S, Programmed Statistics (Questions – Answers), New Age International

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	1	1	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	3	2	3	-	-	-	-	-	-	-	1
CO5	3	3	2	3	-	-	-	-	-	-	-	1

Course Name: Data Structure Lab
Course Code: IT391
Contact: 0:0:3
Credits: 1.5

Perquisites:
Basic Mathematics, Programming language

Course Objective:
To develop the conceptual understanding for solving problems using data structures such as linear lists, stacks, queues, hashing, trees and graphs and writing programs for these solutions.

Course Outcome: After completion of this course student will be able to

CO1	Understand the concept of dynamic memory management, data types, basic data structures, and complexity analysis.
CO2	Introduce the concept of data structures through ADT.
CO3	Choose the appropriate linear and non-linear data structure and algorithm design method for a specified application design.
CO4	Analyze the complexity of the problems.

List of Experiment:

1. Experiments should include but not limited to Implementation of array operations:
2. Stack and Queues: adding, deleting, elements circular Queue: Adding& deleting elements
3. Merging Problem:
4. Evaluation of expressions operations on Multiple stacks & queues:
5. Implementation of linked list: inserting, deleting, inverting a linked list
6. Implementation of stacks and queues
7. Using linked lists: Polynomial addition, Polynomial multiplication
8. Sparse Matrices: Multiplication , addition
9. Recursive and Non Recursive traversal Trees
10. Threaded binary tree traversal. AVL tree implementation
11. Application of Trees. Application of sorting and searching algorithms
12. Hash tables implementation: searching, inserting and deleting, searching and sorting techniques.
13. Innovative Experiments

Text Books:

1. Data Structures Using C, by Reema Thereja, OXFORD Publications
2. Data Structures and Algorithms Using C by Amitava Nag and Joyti Prakash Singh, VIKASH Publication
3. Data Structures by S. Lipschutz.

Reference Books:

1. Data Structures Using C, by E. Balagurusamy E. Mc graw Hill)
2. Data Structures Using C and C++, by Moshe J. Augenstein, Aaron M. Tenenbaum

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	--	--	--	--	--	--	--	--	--
CO2	2	3	1	3	--	--	--	--	--	--	--	--
CO3	3	3	3	3	2	--	--	--	2	--	--	3
CO4	3	2	1	3	2	--	--	--	--	--	--	1

Course Name: Analog and Digital Electronics Lab
Course Code: IT392
Contact: 0:0:3
Credits: 1.5

Perquisite:
Basic Mathematics, Programming language

Course Objective:
The objective of the course is to illustrate the different electronic circuit and their application in practice.

Course Outcome: At the end of the course students will be able to know to find out:

CO1	Examine the characteristics of analog electronic circuit devices such as BJTs and FETs, amplifiers
CO2	Make use of different basic logic gates and universal gates
CO3	Implement the combinational circuits in digital electronics using basic logic gates
CO4	Construct sequential circuits like registers and counters using flip-flops and basic gates

List of Experiment:

1. Design of an amplifier.
2. Design of a Phase-Shift Oscillator.
3. Design of a Schmitt Trigger using Opamp.
4. Design of a Multivibrator circuit using 555 timer.
5. Design of Half and Full adder and Half and Full Substractor
6. Construction of simple Decoder & Multiplexer circuits using logic gates
7. Realization of RS / JK / D flip flops using logic gates
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counter.
10. Design of MOD- N Counter (Synchronous and Asynchronous).
11. Study of DAC and ADC.
12. Innovative Experiments

Text Books:

1. 'Digital Circuits and Design', Salivahanan, S. Arivazhagan, Vikas Publishers
2. 'Electronics Fundamentals and Applications', D. Chattopadhyay, P. C. Rakshit, New Age International Publishers

Reference Books:

1. 'Digital Design', M. Morris Mano, Pearson Education

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	--	--	--	2	--	--	--	--	--	--	--	--
CO2	2	--	--	2	--	--	--	--	--	--	--	1
CO3	--	2	2	--	--	--	--	--	--	--	--	--
CO4	--	3	2	--	--	1	--	--	--	--	--	--

Course Name: Physics-II Lab
Course Code: PH391
Contact: 0:0:3
Credits: 1.5

Perquisites:
Knowledge of Physics upto B.Tech Physics-I lab

Course Objective:
The Physics-II Lab course will provide the exposure to the physics of materials that are applied in digital circuitry, storage devices; exposure to the physics of quantum logic gate operation and quantum computation; an insight into the science & technology of next generation; foundations of electromagnetic theory and communication systems; concept of fundamental particles and associated applications in semiconductors

Course Outcome: At the end of the course students will be able to know to find out:

CO1	demonstrate experiments allied to their theoretical concepts
CO2	conduct experiments using semiconductors , dielectric and ferroelectrics
CO3	classify various types of magnetic materials
CO4	participate as an individual, and as a member or leader in groups in laboratory sessions actively
CO5	analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

List of Experiment:

Module I : Electricity Magnetism

1. Study of dipolar magnetic field behaviour.
2. Study of hysteresis curve of a ferromagnetic material using CRO.
3. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
4. Measurement of Curie temperature of the given sample.
5. Determination of dielectric constant of given sample (frequency dependent).
6. Determination of Hall co-efficient of a semiconductor and measurement of Magneto resistance of a given semiconductor

Module II: Quantum Mechanics-II

7. Determination of Stefan's radiation constant.
8. To study current-voltage characteristics, load response, areal characteristics and spectral response of

photo voltaic solar cells & measurement of maximum workable power.
9. Measurement of specific charge of electron using CRT.
10. Determination of band gap of a semiconductor.

Module III : Experiments Beyond Syllabus

1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
2. Determination of thermal conductivity of a good conductor by Searle's mothod.
3. Study of I-V characteristics of a LED.
4. Study of I-V characteristics of a LDR
5. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.
6. Innovative Experiments

Text Books

1. 1.Electricity and Magnetism (In Si Units): Berkeley Physics Course - Vol.2,
2. Principles of Engineering Physics Vol 1 and Vol 2; by Md. N. Khan and S. Panigrahi, Pub:
3. Cambridge Univ. press
4. Introduction to Quantum MechanicsS. N. Ghoshal (Calcutta Book House)
5. Introduction to solid state physics-Kittel (TMH)
6. Nanostructure and Nanomaterials, B.K. Parthasarathy

Reference Books

1. Edward M Purcell Introduction to Electrodynamics Griffiths David J. The Feynman Lectures on Physics. 2 (2nd ed.).,
2. Feynman, Richard P Addison-Wesley. ISBN 978-0-8053- 9065-0
3. Quantum Mechanics-Bagde Singh (S. Chand Publishers)
4. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
5. Quantum Computation and Quantum Information(10th Anniversary Edition)- Nielsen &

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	--	--	--	--	--	--	--	--	--	--	1
CO2	2	1	--	3	--	--	--	--	--	--	--	--
CO3	--	--	2	--	--	--	--	--	--	--	--	1
CO4	--	--	--	--	--	--	--	--	3	--	--	--
CO5	--	--	--	--	--	--	--	--		1	--	--

Course Name: Numerical Methods and Statics Lab
Course Code: M(IT)392
Contact: 0:0:3
Credits: 1.5

Prerequisites: Any introductory course on programming language (example. C/ Matlab).

Course Objectives: The purpose of this course is to provide basic programming skills for solving the problems in numerical methods.

Course Outcome:
On successful completion of the learning sessions of the course, the learner will be able to:

CO1	Understand the theoretical workings of numerical techniques with the help of C/ Matlab
CO2	Execute basic command and scripts in a mathematical programming language
CO3	Apply the programming skills to solve the problems using multiple numerical approaches.
CO4	Analyze if the results are reasonable, and then interpret and clearly communicate the results.

List of Experiment:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule
3. Assignments on numerical solution of a system of linear equations using Gauss elimination, Gauss Jacobi and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Bisection method, Regula-Falsi method, Newton-Raphson method.
5. Assignments on ordinary differential equation: Euler's method, Euler's modified method, Runge-Kutta methods.
6. Simple problems as assignment on Measures of Central Tendency- mean, median, mode, Measures of Dispersion- variance, standard deviation. Problems related to engineering field.
7. Innovative Experiments

Implementation of numerical methods on computer through C/C++ and commercial Software Packages: Matlab / Scilab / Labview / Mathematica/NAG (Numerical Algorithms Group/Python.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	3	2	2	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	3	3	2	3	-	-	-	-	-	-	-	1

Course Name: Behavioral & Interpersonal Skills
Course Code: MC-381
Contact: 0:0:3
Total Contact Hours: 36

Course Objective: To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error rectification through feedback.

Course Outcome:

CO1	It will equip the student to handle workplace interpersonal communication in an effective manner.
CO2	To enable students with strong oral and written interpersonal communication skills.
CO3	To prepare students to critically analyze workplace situations and take appropriate decisions.
CO4	To make students campus ready through proper behavioral and interpersonal grooming.
CO5	Integration of enhanced skill set to design and frame team based Project Report and Presentation.

Course Content:
MODULE ONE – INTERPERSONAL COMMUNICATON

1. The skills of Interpersonal Communication.
2. Gender/Culture Neutrality.
3. Rate of Speech, Pausing, Pitch Variation and Tone.
4. Corporate Communication.
5. Branding and Identity.

MODULE TWO- INTERPERSONAL COMMUNICATION BASED ON WORKPLACE COMMUNICATION

6. Workplace Communication.
7. Modes of Communication (Telephone, Conference Call, Team Huddle, Public Relation etc.)
8. Communication with Clients, Customers, Suppliers etc.
9. Organizing/Participating in Business Meeting.
10. Note Taking.
11. Agenda.
12. Minutes.

MODULE THREE – BUSINESS ETIQUETTE AND CORPORATE LIFE

13. Presenting oneself in the Business Environment.
14. Corporate Dressing and Mannerism.
15. Table Etiquette (Corporate Acculturation, Office parties, Client/Customer invitations etc.)
16. E-mail Etiquette.
17. Activity based Case Study.

MODULE FOUR – MOVIE MAKING: CORPORATE BUSINESS MEETING

18. Team based Brainstorming.
19. Process Planning and Developing Plot.
20. People management.
21. Documentation and Scripting.
22. Shooting the Movie: Location and Camera.
23. Post Production and Editing.
24. Movie Review: Feedback and Analysis

Curriculum for B.Tech 4th Semester

Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)

4th								
Sl No	**Course Type**	**Course Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Tota**	
A. THEORY								
1	PC	IT401	Computer Organization & Architecture	3	0	0	3	3
2	PC	IT402	Object Oriented Programming using	3	0	0	3	3
3	PC	IT403	Formal Language and Automata	3	0	0	3	3
4	PC	IT404	Communication Engineering & Coding	3	0	0	3	3
5	HS	HU 401	Values & Ethics in Profession	2	0	0	2	2
Total of Theory							**14**	**14**
B. PRACTICAL								
6	PC	IT491	Computer Organization & Architecture	0	0	3	3	1.5
7	PC	IT492	Object Oriented Programming Lab	0	0	3	3	1.5
8	PC	IT493	Programming Skill Development Lab	0	0	3	3	1.5
9	PROJ	PR 491	Project-IV	0	0	2	2	1
10	PROJ*	PR 492	Innovative activities-III	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
11	MC	MC 401	Environmental Science	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							**28**	**20**

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Syllabus-4th Semester

Course Name: Computer Organization & Architecture
Course Code: IT 401
Contact: 3:0:0
Total Contact Hours: 42
Credits: 3

Prerequisites: Basic Programming, Basic concept of Digital Electronics.

Course Objectives:

1. To study the basic organization and architecture of digital computers (CPU, memory, I/O, software).
2. Discussions on digital logic and microprogramming.
3. Understanding and utilization of digital computers.
4. Design and application of computer systems as foundation for more advanced computer-related studies.

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

CO1:	Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit of digital computer system.
CO2:	Identify the structure and functioning of a digital computer including its overall system architecture, operating system, and digital components.
CO3:	Analyze various design techniques of CPU, Memory, pipelining, ALU, interconnecting I/O devices and microprogramming in order to achieve multiprocessing.
CO4:	Develop and Design quantitative performance evaluation of computer systems.

Course Content:

Module I (4)

Basic Computer Functions and Interconnection Structures, Discussion between computer architecture and organization, Role of Operating System, Quantitative techniques in computer design.

Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes.

Module II (8)

Memory classification, Memory Hierarchy and characteristics; Organization of RAM, Magnetic memory recording formats & methods, Disk & tape units with detailed working principles.

Memory Inclusion, Coherence and locality properties; Associative memory organization ; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Paging, mapping and management techniques, memory replacement policies.

Module III (10)

The ALU – ALU organization, Integer representation, Input/output Organization: Introduction to Bus architecture, effect of bus widths, Programmed & Interrupt I/O , DMA. Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address.

Multiplication of signed binary numbers-Booth's algorithm; Divide algorithms Restoring & Non-Restoring: Floating point - IEEE 754 standard; Floating point number arithmetic; Overflow detection, status flags. Flynn's classification –SISD, SIMD, MISD, MIMD architectures.

Module IV (10)

Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro programmed, CISC & RISC characteristics.
Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards, Exception handling, Pipeline optimization techniques;
Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, super pipelined and VLIW processor architectures. Array and vector processors.

Module V (10)

Multiprocessor architecture: taxonomy of parallel architectures; Centralized shared- memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers.
Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures

Text Books:

1. Mano, M.M., "Computer System Architecture", PHI.
2. Kai Hwang, "Advance Computer Architecture" McGraw Hill.
3. Behrooz Parhami, "Computer Architecture", Oxford University Press.
4. Nicholas P Carter, "Computer Architecture & Organization" McGraw Hill.

Reference Books:

1. Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
2. Hamacher, "Computer Organisation", McGraw Hill,
3. N. senthil Kumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers"
4. Chaudhuri P. Pal, "Computer Organisation & Design", PHI,
5. P N Basu- "Computer Organization & Architecture" , Vikas Pub

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	--	--	--	--	--	--	--	--
CO2	3	2	3	2	--	--	--	--	--	--	--	--
CO3	3	3	2	3	--	1	--	--	--	--	--	--
CO4	3	3	3	3	--	1	--	--	--	--	--	--

Course Name: Object Oriented Programming using JAVA
Course Code: IT 402
Contact: 3:0:0
Total Contact Hours: 40
Credits: 3

Prerequisites: Basic knowledge of computers, basic knowledge of programming.

Course Objectives:
1. Understand basic of Object Oriented Programming
2. Understanding the features of Java
3. Enable students to write Java program and develop projects.

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

CO1:	Understand the key concepts of object oriented programming and have an ability to design Object Oriented programs.
CO2:	alyze complex programming problems and optimize the solutions.
CO3:	luate and analyze different solution based on object oriented concepts.
CO4:	Apply the concepts of object oriented programming for implementing solution of dynamic problems in the field of Information Technology.

Course Content:

Module I: Object Oriented Design: (3)
Concepts of object oriented programming language, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation

Module II: Object Oriented Concept: (3)
Class, object, message passing, inheritance, encapsulation, polymorphism
Difference between OOP and other conventional programming – advantages and disadvantages.

Module III: Understanding Java Programming Language: (2)
History of Java Programming languages, Purpose of invention of Java. Structure of a basic Java Program, Component of Java Development Kit-API, JRE, Understanding the steps to run a complete Java Program.

Module IV: Basic Components of Java Program: (2)
Java Tokens-Literals, identifier, keywords, operator, separator, Data types, variables, constant, Type casting-defining type casting, requirement of type casting, implicit and explicit type casting. Control structure. Access specifier.

Module V: Class and Object Properties: (6)
Defining class and object, Class Members-Local variable, instance variable, class variable, Primitive and Reference variable, Constructor, this keyword, finalize and garbage collection, Array-Declaring and defining array, accessing array elements, length properties, 2D array, anonymous array, array of Objects. Understanding method- method returning object, passing objects, method passing and returning arrays, use of method overloading. Static-Static block and non static block, static variable, static method. nested & inner classes.

Module VI: Reusability Property: (6)
Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super () method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages. Serialization and deserialization.

Module VII: String Handling: (2)
Basic string handling concepts- String (discuss charAt() , compareTo(),equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() ,trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(),ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods),concept of mutable and immutable string, command line arguments

Module VIII Exception handling & Multithreading: (5)
Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Module IX: Basic IO Operation and File Handling: (3)
Understanding unformatted and formatted IO. Reading and writing files.

Module X : Collection and Generics: (4)
ArrayList class , LinkedList class, ListIterator interface, HashSet class, LinkedHashSet class, TreeSet class, PriorityQueue class, ArrayDeque class, Map interface, HashMap class, LinkedHashMap class, TreeMap class, Hashtable class, Comparable and Comparator, Properties class
Generics class, Generic interface, Generic Type, Generic Method, Generics Bounded Type parameter

Module XI: JAVA New Feature: (4)
Lambda Expression, default and static method in interface, Assertion, Annotation, Running Java Program in one command.

Text Books:
Herbert Schildt Java Complete Reference TMH

Reference Books:
Mr Kotiyana JAVA The Complete Core Reference ORACLE

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	--	--	--	--	--	--	--
CO2	3	2	2	2	3	--	--	--	--	--	--	--
CO3	3	3	3	3	3	--	--	--	--	--	--	--
CO4	3	3	3	2	3	--	--	--	--	--	--	2

Course Name: Formal Language and Automata Theory
Course Code: IT 403
Contact: 3:0:0
Total Contact Hours: 40
Credits: 3

Prerequisites: Elementary discrete mathematics including the notion of set, function, relation, product, partial order, equivalence relation, graph& tree. They should have a thorough understanding of the principle of mathematical induction and various proof techniques.

Course Objectives:

1. Being familiar with a broad overview of the theoretical foundations of computer science. Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.
2. Understand basic properties of formal languages and formal grammars.
3. Understand basic properties of deterministic and nondeterministic finite automata and Understanding the minimization of deterministic and nondeterministic finite automata.
4. Understand the relation between types of languages and types of finite automata
5. Understanding the Context free languages and grammars, and also Normalizing CFG and Understand the concept of Pushdown automata and its application.
6. Understand basic properties of Turing machines and computing with Turing machines and the concepts of tractability and decidability problem. Understand the challenges for Theoretical Computer Science and its contribution to other sciences.

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

CO1:	Analyze situations in related areas of theory in computer science.
CO2:	Model, compare and analyze different computational models using combinatorial methods.
CO3:	Apply rigorously formal mathematical methods to prove properties of languages, grammars and Automata.
CO4:	Construct algorithms for different problems and argue formally about correctness on different restricted Machine models of computation.
CO5:	Identify limitations of some computational models and possible methods of proving them.

Course Content:

Module I (14)

Fundamentals: Basic definition of sequential circuit, block diagram, mathematical representation, and concept of transition table and transition diagram (Relating of Automata concept to sequential circuit concept) Design of sequence detector, Introduction to finite state model Finite state machine: Definitions, capability & state equivalent, kth-equivalent concept, Finite memory definiteness, testing table & testing graph. Minimization of FSM-completely specified and incompletely specified(Merger graph, Merger table, Compatibility graph) Equivalence between two FSM's, Limitations of FSM Application of finite automata, Finite Automata with output- Moore & Melay machine.

Module II (10)

Deterministic finite automaton and non deterministic finite automaton. Transition diagrams and Language recognizers. Finite Automata: NFA with Î transitions - Significance, acceptance of languages.

Conversions and Equivalence: Equivalence between NFA with and without Î transitions. NFA to DFA conversion. DFA minimization. Myhill-Nerode theorem Regular Languages: Regular sets. Regular expressions, identity rules. Arden's theorem state and prove Constructing finite Automata for a given regular expressions, Regular string accepted by NFA/DFA. Pumping lemma of regular sets. Closure properties of regular sets (proofs not required). Grammar Formalism: Regular grammars-right linear and left linear grammars. Equivalence between regular linear grammar and FA.

Module III (10)
Context free grammar. Derivation trees, sentential forms. Right most and leftmost derivation of strings. Context Free Grammars, Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form and Greibach normal form. Pumping Lemma for Context Free Languages. Enumeration of properties of CFL. Closure property of CFL, Ogden's lemma & its applications. Push Down Automata: Push down automata, definition. Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. Introduction to DCFL and DPDA.

Module IV (6)
Turing Machine: Turing Machine, definition, model, Design of TM, Computable functions, Church's hypothesis, counter machine, Types of Turing machines Universal Turing Machine, Halting problem.

Text and Reference Books:

1. "Theory of Computer Science-Automata Languages and Computation", Mishra and Chandrashekaran, 2nd edition, PHI
2. "Switching & Finite Automata", ZVI Kohavi, 2nd Edn., Tata McGraw Hill
3. "An Introduction to Computing", Peter Linz, Narosa.

"Introduction to Automata Theory Language and Computation", Hopcroft H.E. and Ullman J. D.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	--	--	--	--	--	--	--	--
CO2		3	3	3	--	--	--	--	--	--	--	--
CO3	3	3	3	2	--	--	--	--	--	--	--	--
CO4		3	2	3	--	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	--

Course Name: Communication Engineering & Coding Theory
Course Code: IT 404
Contact: 3:0:0
Total Contact Hours: 34
Credits: 3

Prerequisites: Mathematics, Physics, Electronics.

Course Objectives:

1. To comprehend basics of communication system and coding techniques.
2. To apply the basic concept of PCM systems and baseband transmission schemes.
3. To analyze and evaluate band pass signalling schemes.
4. To produce spectral characteristics of band pass signalling schemes.
5. To asses noise issues.

Course Outcome: At the end of the course students will be

CO1:	Able to understand basics of communication system and coding schemes.
CO2:	Able to apply the basic concept of PCM systems and baseband transmission schemes.
CO3:	Able to analyze and evaluate band pass signalling schemes.
CO4:	Able to Create spectral characteristics of band pass signalling schemes and asses noise performance.

Course Content:

Module I: (4)

Elements of communication system, introduction to signals and modulation. Basic concept of a signal (Amplitude, frequency, wavelength, bandwidth), introduction to baseband transmission - modulation. Elements of Communication systems, origin of noise and its effect on communication system. Concept and need for modulation - types of modulation, concept of time domain and spectral representation of a signal.

Module II: (5)

Linear Modulation: Basic principles of Amplitude Modulation with Time domain representation of AM signal, modulation index calculation, transmission bandwidth, power & efficiency calculations. Basic concept of square law modulator and balanced modulator. Detection of AM by envelope detector, Synchronous detection for AM-SC. Basic principles of Sideband suppressed techniques and the need for it. Need for carrier suppression .Basic concept of SSB-SC, DSB-SC, VSB-SC. Generation of SSB: Filter method, Phase shift method. Names of SSB-SC, DSB-SC generator and detector

Module III: (4)

Non linear Modulation & Demodulation: Frequency Modulation and Phase Modulation: Time domain representations, total power calculation for a single tone message. Generation of FM & PM: basic concept and difference of wide band frequency modulation and narrow band frequency modulation. basic concept on direct and indirect method of FM generation : introductory discussion on Armstrong method. Basic block diagram representation of generation of FM & PM: basic Concept of VCO & Reactance modulator only. Demodulation of FM and PM: Only Basic Concept of frequency discriminators Phase Locked Loop Comparison of various Analog modulation techniques, inter relation between PM and FM

Module IV: (10)
Sampling and digital transmission: Sampling theorem, Sampling rate, sampling theorem, nyquist rate, Impulse sampling, Reconstruction from samples, Aliasing; Analog Pulse Modulation – basic discussion on PAM, PWM, PPM. Concept of Quantisation & Uniform Quantiser, Non-uniform Quantiser, Quantisation error, signal to quantisation noise ratio calculation, A-law & μ-law companding (after discussion on companding mention only the two types and their use) ,Encoding, Coding efficiency. Basic concept of Pulse Code Modulation, Block diagram of PCM, basic concept of DPCM, Delta modulation, basic concept of slope overload and Granular.
distortion, Adaptive delta modulation. Multiplexing - TDM, FDM, SDM. Line coding & properties, NRZ & RZ, AMI, Manchester coding. Brief discussion on: ISI, Raised cosine function, Nyquist criterion for distortion-less base-band binary transmission, Eye pattern

Module V: (5)
Digital Carrier Modulation & Démodulation Techniques: Introduction to the different digital modulation techniques-ASK, FSK, PSK, BPSK, QPSK, MSK, Introduction to QAM,. Spread Spectrum Modulation – DSSS, FHSS - concept only.

Module VI: (6)
Information Theory & Coding: Introduction to Information Theory, Entropy, Mutual information, Information rate, channel and bandwidth, Bit rate, Baud rate, Information capacity, Shanon's limit, Shanon-Fano algorithm for encoding, Huffman coding for numerical, Shannon's Theorem - Source Coding Theorem, Information Capacity Theorem. Error control Strategies: (Basic Concept of Data communication, concept of FEC, ARQ and CRC).

Text Books:
1. An Introduction to Analog and Digital Communications, Simon Haykin; Published by Wiley India.
2. Principle of Communication Systems by Herbert Taub and D.L.Schilling
3. Modern Digital and Analog Communication Systems –
4. Data Communication and Networking by Behrouz A. Forouzan, Published by Tata McGraw-Hill

Reference Books:
1. Communication Systems 4th Edition by Simon Haykin; Published by Wiley India (Student Edition)
2. Principles and Analog and Digital Communication by Jerry D Gibson, Published by MacMillan.
3. Communication Systems by A. B. Carlson, Published by McGraw-Hill.
4. Understanding Signals and Systems by Jack Golten, Published by McGraw Hill.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	--	--	--	--	--	--	--	2	--
CO2	1	2	3	--	--	--	--	--	--	--	--	--
CO3	1	2	3	--	--	--	--	--	--	--	--	--
CO4	1	3	--	--	--	1	--	--	--	--	--	--

Course Name: Values & Ethics in Profession
Course Code: HU 401
Contact: 2:0:0
Total Contact Hours: 33
Credits: 3

Prerequisites: Basic knowledge of management, communication, environment science.

Course Objectives:

To create awareness on professional ethics and Human Values

Course Outcome: At the end of the course students will be

CO1:	Able to understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.
CO2:	Able to understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.
CO3:	Able to understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO4:	Able to aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
CO5:	Able to acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

Course Content:
Module I: (3)
Introduction: Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, Social.

Module II: (5)
Psycho-social theories of moral development: View of Kohlberg; Morality and Ideology, Culture and Morality, Morality in everyday Context.

Module III: (5)
Ethical Concerns: Work Ethics and Work Values, Business Ethics, Human values in organizations: Values Crisis in contemporary society Nature of values: Value Spectrum of a good life.

Module IV: (6)
Ethics of Profession: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

Module V: (6)
Self Development: Character strengths and virtues, Emotional Intelligence, Social intelligence, Positive cognitive states and processes (Self-efficacy, Empathy, Gratitude, Compassion, and Forgiveness).

Module VI: (8)
Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of

the Club of Rome. Limits of growth: sustainable development Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology, Movement of Schumacher; Problems of man, machine, interaction.

Text Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994.
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

Reference Books:

1. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	--	--	--	--	--	1	1	1	1	2	--	--
CO2	--	--	--	--	--	1	1	3	1	2	--	--
CO3	--	--	--	--	--	3	2	3	--	1	--	--
CO4	--	--	--	--	--	3	2	1	--	--	---	--
CO5	--	--	--	--	--	3	2	2	--	1	3	--

Course Name: Computer Organization and Architecture Lab
Course Code: IT 491
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Basic concept of Digital Electronics.

Course Objectives:
1. Implementation of digital logic using XLINX tool.
2. Simulate digital circuit design using XLINX tool.

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

CO1:	Remember the basic designing principles of digital electronics circuits.
CO2:	Demonstrate Hardware Description Language (HDL) in order to implement skills in designing Architectural solutions and describing designs using VHDL.
CO3:	Apply fundamentals of digital design and extend the learning to design sequential circuits.
CO4:	Analyze & Examine the digital circuit design using Simulation tool.

List of Experiment: (30)
All laboratory assignments are based on Hardware Description Language (VHDL or Verilog) Simulation.

- HDL introduction.
- Design Implementation of Basic digital logic base programming with HDL.
- Implementation of 8-bit Addition, Multiplication, Division.
- Implementation of combinational circuit Design
- Implementation of 8-bit Register design.
- Implementation of Sequential circuit.
- Memory unit design and perform memory operations.
- Implementation of 8-bit simple ALU design.
- Implementation of 8-bit simple CPU design.

Innovation in implementation of Interfacing of CPU and Memory

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	--	1	2	--	--	--	--	--	--	--	1
CO2	1	1	1	2	3	--	--	--	--	--	--	--
CO3	2	3	3	3	2	--	--	--	--	--	--	1
CO4	3	3	3	--	2	--	--	--	--	--	--	2

Course Name: Object Oriented Programming Lab
Course Code: IT 492
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Basic knowledge of computers, basic knowledge of programming.

Course Objectives:
1. Enable students to use basic object oriented features in coding
2. Enable students to develop small projects

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

CO1:	Apply object oriented programming concepts in designing programs.
CO2:	Analyze different dimensions of a problem and provide optimal solutions.
CO3:	Evaluate and analyze different solution based on object oriented concepts.
CO4:	Implement solutions of real-life problems in the field of Information Technology.

List of Experiment:
Module I: (3)
Writing simple java program, compiling and running.
Understanding the main () method.

Module II: Basic Java Concepts : (6)
Using basic java token, control structures.
Illustrating class objects, constructor, final, finalize.
Understanding Arrays and hands on application using array.
Understanding and writing methods.
Static and non static concepts.

Module III: Reusable properties: (3)
Class Relationship.
Using inheritance
Creating abstract classes interfaces.

Module IV: (3)
String handling, Basic string handling concepts

Module V: Exception and Threading: (6)
Illustrating exception handling
Illustrating multi threading applications

Module VI: IO: (6)
Basic IO and File IO operation

Module VII : Generics and Collection: (3)

Test application using generics and collection classes.

Module VIII: Innovative Idea Development: (6)
Applying Java new features for developing innovative projects

Text Books:
Herbert Schildt Java Complete Reference TMH

Reference Books:
1. Mr Kotiyana JAVA The Complete Core Reference ORACLE
2. Kathie Seira Head Forst Java Orielley

CO-PO Mapping:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	--	1	1	--	--	--	--	--	--
CO2	2	3	2	--	3	1	--	--	--	--	--	--
CO3	3	3	2	--	3	2	--	--	--	--	--	--
CO4	3	--	--	--	3		2	--	--	--	--	2

Course Name: Programming Skill Development Lab
Course Code: IT 493
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Mathematics, basic understanding of Computer Programming.

Course Objectives:
The objective of the course is to provide basic knowledge of Python and to design and program Python applications.

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

CO1:	Understand basic of Python Programming Language.
CO2:	Analyze problems and design effective solutions of them.
CO3:	Apply the best features of Python to program real life problems.
CO4:	Implement optimal solution of a given problem.

List of Experiment:
Module I: Introduction to Python: (3)
Installation of Python, Two modes of using Python Interpreter, Variables and Data Types, Operators and their Precedence

Module II: Loops and Iterations: (2)
Iteration: while and for loops, Python Syntax, Colon & Indentation, Syntax of 'for loops', Conditional Execution: if, elif and else, Modify loops: break and continue

Module III: Strings & Lists: (2)
Python Strings, Slicing, Python Lists, Mutable and Immutable Types

Module IV: Functions and More on Strings & Lists: (2)
Functions, Optional and Named Arguments, More on Strings & Lists experiments, Split and Join Manipulating and Copying Lists

Module V: Modules and Packages: (3)
Python Modules and Packages, Different ways to import Packages, File, Input/ Output, The pickle module, Formatted Printing, Exception Handling

Module VI: Graphics, GUI and Object Oriented Programming:
Turtle Graphics, Writing GUI Programs, Object Oriented Programming in Python, Inheritance, Reusing code

Module VII: Files and Streams: (4)
File related modules in Python, File modes and permissions, Reading & Writing data from a file, Redirecting output streams to files, Working with directories, CSV files and Data Files

Module VIII: Python and Databases: (5)

ODBC and Python, Working with Databases in MySQL, Working with Tables in MySQL, Working with SQLite Database

Module IX: Innovative Projects implementation using Python (6)

Text Books:

1. 'Python for Everybody – Exploring Data in Python 3', Charles Severance, Shroff Publishers & Distributors Pvt. Ltd.
2. 'Python Training Guide', Mercury Learning & Information USA, BPB Publications, 2015.

Reference Books:

1. 'Python for Education', Ajith Kumar B. P., Inter University Accelerator Center, New Delhi, 2010.
2. 'Python Cookbook: Recipes for Mastering Python 3', 3rd Edition - David Beazley & Brian K. Jones, O'Reilly Media, Inc., 2013.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	--	--	--	--	--	--	--	--	--	--	2
CO2	--	3	3	2	--	--	--	--	--	--	--	--
CO3	--	--	--	--	3	--	--	--	--	--	--	--
CO4	--	2	3	--	3	2	--	--	2	--	--	--

Course Name: Environmental Science
Course Code: MC 401
Contact: 0:0:3

Prerequisite:
Knowledge of Basic Chemistry

Course Objectives:
1. Apply the knowledge of environmental science to design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
2. Analyze and discuss the relevance of environmental science to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
3. Function in multi/inter-disciplinary teams with a spirit of tolerance, patience and understanding so necessary for team work.
4. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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

CO1:	Describe the structure and function of environment and different types of environmental pollution.
CO2:	Identify all types of resources and learn the quality parameter to maintain proper balance.
CO3:	Demonstrate environmental problems like global warming, acid rain, natural and manmade disasters.
CO4:	Demonstrate the controlling method of environmental pollution and apply their knowledge for environment management.
CO5:	Apply the method of synthesis of green chemistry and find green solution.

List of Experiment:
Module I: General: (6)
Natural Resources: Forest Resource, water resource, mineral resource, energy resources (renewable, non-renewable, potentially renewable). Population Growth: Exponential Growth, logistic growth, Maximum sustainable yield Disaster Management: Types of disasters (Natural & Man-made), Floods, Earthquake, Tsunamis, Cyclones, landslides (cause, effect & control). Ecology & Ecosystem: Elements of ecology, definition of ecosystem- components types and function, Food chain & Food web, Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems. Environmental Management: Environmental impact assessment, Environmental laws and protection act of India, Different international environmental agreement.

Module II: Air Pollution: (6)
Sources of Pollutants: point sources, nonpoint sources and manmade sources primary & secondary pollutant. Types of air pollutants: primary & secondary pollutant ; Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN, Smog (Photochemical smog and London smog). Effects on human health & climate: Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion. Air pollution and meteorology: Ambient Lapse Rate, Adiabatic Lapse Rate, Atmospheric stability & Temperature inversion. control of air pollution (ESP, cyclone separator, bag

house, catalytic converter, scrubber (ventury)

Module III: Water Pollution: (6)
Classification of water (Ground & surface water). Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, heavy metals, pesticides, volatile organic compounds. Surface water quality parameters: pH, DO, 5 day BOD test, BOD reaction rate constants, COD. Numerical related to BO Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only),ground water pollution (Arsenic & Fluoride; sources, effects, control) , Quality of Boiler fed water: DO, hardness, alkalinity, TDS and Chloride, Layout of waste water treatment plant (scheme only).

Module IV: Land Pollution: (2)
Types of Solid Waste: Municipal, industrial, commercial, agricultural, domestic, hazardous solid wastes (bio-medical), E-waste , Solid waste disposal method: Open dumping, Land filling, incineration, composting, recycling (Advantages and disadvantages).

Module V: Noise Pollution: (2)
Definition of noise, effect of noise pollution on human health, Average Noise level of some common noise sources, Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L10 (18 hr Index) . Noise pollution control.

Text Books:

1. A Textbook of Environmental Studies, Shashi Chawla. Tata McGraw Hill Education Private Limited.
2. Environmental Studies, Dr. J P Sharma, University Science Press

Reference Books:

1. Environmental Engineering, J K Das Mohapatra, Vikas Publication

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	--	--	--	--	2	--	--	--	--	--
CO2	3	2	--	--	--	--	--	--	--	--		--
CO3	2	3	2	--	--	2	2	--	--	--	--	--
CO4	2	3	2	--	--	2	3	--	--	--	--	--
CO5	2	3	--	--	--	2	--	--	--	--	--	--

Department: Information Technology

Curriculum Structure & Syllabus

(Effective from 2018-19 admission batch)

5th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	PC	IT501	Design & Analysis of Algorithm	3	0	0	3	3
2	PC	IT502	Software Engineering	3	0	0	3	3
3	PC	IT503	Operating System	3	0	0	3	3
4	HS	HU503	Industrial & Financial Management	2	0	0	2	2
5	PE	IT504	A. Programming Practice with C++ B. Artificial Intelligence and Expert System C. Microprocessor and Microcontroller	3	0	0	3	3
Total of Theory							**14**	**14**
B. PRACTICAL								
6	PC	IT591	Algorithm Lab	0	0	3	3	1.5
7	PC	IT592	Software Engineering Lab	0	0	3	3	1.5
8	PC	IT593	Operating System Lab	0	0	3	3	1.5
9	PE	IT594	A. Programming Practice with C++ Lab B. Artificial Intelligence and Expert System Lab C. Microprocessor and Microcontroller Lab	0	0	3	3	1.5
10	PROJ	PR591	Project-V	0	0	2	2	1
11	PROJ*	PR592	Innovative Activities-IV	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC501	Constitution of India	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							**31**	**21.5**

* Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.
Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Design and Analysis of Algorithm
Course Code: IT 501
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:

Discrete Mathematics Data Structure and Basic Programming Knowledge

Course Objective:

The objective of the course is to study paradigms and approaches used to analyze and design algorithms and to appreciate the impact of algorithm design in practice, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome

After completion of this course students will be able to

- **CO1:** Understanding the time complexity of the basic algorithms for the classic problems in various domains.
- **CO2:** Apply the classic algorithms to solve different problems.
- **CO3:** Evaluate existing algorithms by calculating the time complexity.
- **CO4:** Design algorithm to solve various problems in different domains.

Course Contents:

Module I: [2L]
Introduction: Time and Space Complexity, Different Asymptotic notations and their mathematical significance

Module II : [**8L]**
Divide and Conquer: Basic method, use, Merge Sort, Quick Sort and their complexity, Heap Sort and its complexity
Dynamic Programming: Basic method, use, Matrix Chain multiplication, All pair shortest paths, single source shortest path, Strassen's matrix multiplication algorithm.

Module III: [8L]
Backtracking: Basic method, use, 8 queens problem, Graph coloring problem.
Greedy Method: Basic method, use, Knapsack problem, traveling sales man, Job sequencing with deadlines, Minimum cost spanning tree by Prim's and Kruskal's algorithm.

Module IV: [3**L]**
Branch and bound technique: integer programming, 0/1 knapsack problem

Module V: [4**L]**
Disjoint set manipulation: Set manipulation algorithm like UNION-FIND, union by rank.

String matching problem: Different techniques – Naive algorithm, Knuth, Morris, Pratt (KMP) algorithm with their complexities.

Module VI: [6L]
Amortized Analysis: Aggregate, Accounting, and Potential Method.
Network Flow: Ford Fulkerson algorithm, Max-Flow Min-Cut theorem (Statement and Illustration)

Module VII: [5L]
Notion of NP-completeness: P class, NP class, NP hard class, NP complete class – their interrelationship, Satisfiability problem, Cook's theorem (Statement only).
Approximation Algorithms: Necessity of approximation scheme, performance guarantee, polynomial time approximation schemes.

Textbooks:

1. A. Aho, J. Hopcroft and J. Ullman "The Design and Analysis of Algorithms"
2. D. E. Knuth "The Art of Computer Programming", Vol. 3
3. E. Horowitz and Shani "Fundamentals of Computer Algorithms"

Reference books:

4. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms

CO- PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	-
CO3	3	2	3	3	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2

Course Name: Software Engineering
Course Code: IT 502
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:

Mathematics, Data Structure and Basic Computations.

Course Objective:

In this course, students will gain a broad understanding of the discipline of software engineering and its application to the development of and management of software systems. Knowledge of basic software engineering methods and practices and their appropriate application.

Course Outcome

After completion of this course student will be able to

- **CO1:** Ability to analysis and design of complex systems and meet ethical standards, legal Responsibilities.
- **CO2:** Ability to apply software engineering principles, techniques and develop, maintain, Evaluate large-scale software systems.
- **CO3:** To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.
- **CO4:** Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

Course Contents:

Introduction [2L]
Definition of Software Engineering, Software crisis, Evolution of technology- Hype curve, Exploratory style of Software development vs. Software Engineering, Human cognition mechanism, Software Engineering principle- abstraction and decomposition.

Software Development Life Cycle (SDLC) models [4L]
Water fall model, V-shape Model, Prototyping Model, Spiral Model, RAD Agile Model, Verification and Validation.

Software Project Management [7L]
Responsibility of a project manager, Project planning, Metrics for project size estimation, Project estimation techniques, COCOMO model, Halstead's Software Science, Scheduling-CPM, PERT, Gantt chart, Risk management, Software configuration management, Staffing and team leader project and planning

Requirement analysis and specification [3L]
SRS, Requirement gathering and specification, Functional requirement, Traceability.

Software Design [8L]
Characteristics of a good software, Cohesion and coupling, Function oriented design- DFD, Structure chart. Design phase in life cycle, System Design Definitions, Concept and methodologies, data flow oriented Design, Program Design and the requirements. Object oriented design- class and relationship, UML diagrams.

Coding and Testing [7L]
Coding Standard, software documentation, Testing- unit testing, black box testing- equivalence class partitioning, boundary value analysis, white box testing- McCabe's Cyclometric Complexity, Mutation Testing, Debugging, Program analysis tool, Integration Testing, Grey box testing, System testing- Smoke and performance testing.

Software Reliability and Quality Management [2L]
Reliability, Hazard, MTTF, Repair and Availability, Software quality, Software reliability and fault-tolerance, six-sigma.

Computer-aided software engineering [3L]
Computer-aided software engineering (CASE)-environment and benefit. Function point methods (FSM,ISO,OMG) & Metrics. Standards: Capability Maturity Model Integration, ISO 9001.

Text Books:
1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Books:
1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Software Engineering: Iyan Somarville, 7th Edition.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	1	-	-	1	1
CO2	-	3	1	2	2	-	-	1	-	-	1	1
CO3	2	1	3	-	1	-	-	1	-	-	-	1
CO4	-	-	2	3	3	-	-	1	-	-	-	1

Course Name: Operating System
Course Code: IT 503
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites:

Computer organization and Architecture, Data Structures, Algorithms & Programming Concept

Course Objective:

The objective of the course is to present an introduction to operating systems, with an emphasis on concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization.

Course Outcome:

After completion of this course students will be able to

- **CO1:** Understand competence in recognizing and using operating system features.
- **CO2:** Apply knowledge of different operating system algorithms.
- **CO3:** Analyze theory and implementation of different operating system aspect and the structure and basic architectural components involved in operating system.
- **CO4:** Evaluate different operating system approaches.

Course Contents:

Introduction: [2L]
Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, timesharing, real-time, distributed, parallel.

System Structure: [2L]
Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls**.**

Processes: [3L]
Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication**.**

Threads: [2L]
Overview, benefits of threads, user and kernel threads.

CPU Scheduling: [3L]
Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Synchronization: [4L]
Background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlock: [4L]
System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Memory Management: [3L]
Background, logical vs. physical address space, swapping, contiguous memory allocation, Pre-paging, paging, segmentation, segmentation with paging.

Virtual Memory:[4L]
Background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing, Virtualization(VMware).

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

I/O Management:[3L]
I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: [3L]
Disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Text Books:

1. Milenkovie M., "Operating System : Concept & Design", McGraw Hill.
2. Silbersehatz A. and Peterson J. L., "Operating System Concepts", Wiley.
3. Dhamdhere: Operating System TMH

Reference Books:

1. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.
2. Stalling, William, "Operating Systems", Maxwell McMillan International Editions, 1992.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	-	-	-	-	2	-	-	-
CO2	2	3	3	3	-	-	-	-	-	-	-	-
CO3	1	3	3	3	-	-	-	-	2	-	-	-
CO4	2	3	3	3	-	-	-	-	2	1	-	2

Course Name: Programming Practice with C++
Course Code: IT 504A
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:

Basic computer programming concepts

Course Objective:

The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome

After completion of this course student will be able to

CO1: Understand the basic concept of object oriented programming

CO2: Apply the concept of object oriented programming concept using C++

CO3: Analyse the different features of object oriented programming in the context of C++

CO4: Evaluate concept of C++ to design different small to big scale project

Course Contents:

Module I: [2L]

Introduction to Object oriented design, Declaration, Expression and statements

Concepts of object oriented programming language, Language translator, Basics of OOPs, Structure of C++ program, Class and object, Abstraction and encapsulation, Polymorphism.

Module II: [8L]

Array, Function, Pointer & Data abstraction through classes and user defined data types

Array , Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function. Class, Members, Constructor and destructor, Copy constructor. Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables. Friend Function : understanding friend function and its use Pre-processor

Module III: [12L]

Class relationships: Operator Overloading, Polymorphism & Standard Library in C++

Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator. Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class, Friend,

Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators. Standard library in C++: Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes, File Handling,

Module IV: [8L]
Template , Exception Handling & UML Diagram
Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace. Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception. Object oriented design and modeling: Software architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.

Module V: [6L]
Introduction to C++11 Features
Lambda Expressions, Automatic Type Deduction and decl type, Uniform Initialization Syntax, Deleted and Defaulted Functions, null ptr, Delegating Constructors, Rvalue References, Threading Library

Text Books:
1. Schildt, H., The Complete Reference C++, McGraw – Hill.
2. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:
1. C++ object oriented programming paradigm, Debasish Jana, PHI
2. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	2	2	2	--	--	--	--	--	--	--	--

Course Name: Artificial Intelligence
Course Code: IT 504B
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:

Basic concept of computer science and automation, Knowledge of programming languages, Basic mathematical concept like calculus, probability, metrics and statistics.

Course Objectives:

Apply knowledge of computing and mathematics appropriate to the discipline. Analyze a problem and identify and define the computing requirements appropriate to its solution. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs Understand current techniques, skills, and tools necessary for computing practice.

Course Outcome

After completion of this course student will be able to

- **CO1:** Understand various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction).
- **CO2:** Apply facts, rules, and concepts of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving.
- **CO3:** Analyze working knowledge of reasoning in the presence of incomplete and/or uncertain information.
- **CO4:** Evaluate and create knowledge representation, reasoning, and machine learning techniques for the solution of real-world problems.

Course Content:

Introduction to Artificial Intelligence and Agent [3L]:
Foundations and History of Artificial Intelligence, Turing Test, Intelligent Agents – Agents and environment. Concept of Rationality, Nature of environments and Structure of agents.

Searching and Problem Solving: [12L]:
Problem solving agents - Problem formulation with suitable examples, searching for solutions, 8 puzzle problem, tower of Hanoi problem, water jugs problem, 8-queen problem, Data driven and goal driven search, Uninformed search strategies – Breadth-first search, Uniform-cost search, depth-first search, Depth-limited search, Uninformed search strategies Iterative deepening depth-first search, Bidirectional search, avoiding repeated states, Informed search strategies – Greedy best first search, A* search, Informed search strategies Memory-bounded heuristic search, Heuristic Functions, Constraint satisfaction problems.

Game Playing: [2L]:
Adversarial search, Mini-max, alpha-beta pruning.

Knowledge Representation and Reasoning: [10L]:
Building a Knowledge Base, Propositional logic, first order, script and frame, Logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning, Hierarchical Task network planning, Planning and acting in nondeterministic domains.

Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks, Inference using full joint distribution, Independence, Bayes' rule and its use, Semantics of Bayesian Networks, Exact Inference in Bayesian networks, Dempster-Shafer-theory.

Learning: [5L]:
Learning from observation – Forms of learning, Inductive learning, Learning Decision trees, Knowledge in learning - Explanation based learning, Learning Decision Trees, Neural Networks Clustering concept, Reinforcement Learning – Introduction, Passive reinforcement Learning, Active Reinforcement Learning.

Expert Systems [4L]:
Introduction to Expert system, Expert System Design, Expert System Shell, Case Studies of Typical Expert Systems, PROLOG.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	3	3	-	-	-	-	-	-	-	-
CO2	2	-	3	3	-	-	-	-	-	-	-	-
CO3	2	3	1	3	-	-	-	-	-	-	-	-
CO4	2	3	1	3	-	1	1	2	-	-	-	-

Course Name: Microprocessor & Microcontroller
Course Code: IT 504C
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisites:
Digital Electronics, Computer Programming, Computer Organisation and Architecture

Course Objective:
To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

Course Outcome:
After completion of this course student will be able to

CO1: Describe the general architecture of a microcomputer system and architecture &organization of 8085 & 8086 Microprocessor and understand the difference between 8085 and advanced microprocessor.

CO2: Understand and classify the instruction set of 8085 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.

CO3: Recognize 8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts

CO4: Understand and realize the Interfacing of memory & various I/O devices with 8085 microprocessor.

Course Contents:

Module -1: [10L]
Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages.
Architecture of 8085 Microprocessor, Pin description of 8085.
Address/data bus Demultiplexing , Status Signals and the control signals.
Instruction set of 8085 microprocessor, Addressing modes
Timing diagram of the instructions (a few examples).

Module -2: [10L]
Assembly language programming with examples, counter and Time Delays, Stack and Subroutine Interrupts of 8085 processor (software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O, Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,

Module 3: [8L]
The 8086 microprocessor- Architecture, Addressing modes, interrupts
Introduction to 8051 Microcontroller –Architecture, Pin Details
Addressing modes, Instruction set, Examples of Simple Assembly Language.

Module -4: [8L]
Memory interfacing with 8085, 8086

Support IC chips- 8255, 8251, 8237/8257, 8259
Interfacing of 8255 PPI with 8085 and Microcontroller 8051.
Brief introduction to PIC microcontroller (16F877)

Text Book:

1. Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International
2. Fundamentals of microprocessor and microcontroller- B.Ram
3. An Introduction to Microprocessor and Applications –Krishna Kant, Macmillan

Reference Book:

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, Oxford university press
2. 8086 Microprocessor –K Ayala, Cengage learning
3. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
4. The 8051 microcontrollers – Uma Rao and Andhe Pallavi, Pearson
5. The 8051 Microcontroller and Embedded System- Mazidi
6. The 8051 microcontroller - K. Ayala, Thomson

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	3	-	3	-	2	-	-	3	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	--
CO3	2	3	-	-	3	-	-	-	2	-	-	-
CO4	2	-	-	3	3	-	-	-	2	2	-	-

Course Name: Industrial & Financial Management
Course Code: HU 503
Contact: 2:0:0
Total Contact Hours: 34
Credits: 2

Prerequisite:
Mathematics, English.

Course Objective:

- ✓ Introduce students to financial management and its importance and its applications in business, their relationship with the business environment and the role and functions of chief financial officer.
- ✓ Introduce students to financial planning, and objectives, and its benefits, and the types of areas and stages of financial planning, and the factors that help the success of financial planning and the methods used in financial planning to assess the short-term financial needs.
- ✓ Introduce students to time value of money and its relationship to the objectives of financial management, rationale for using the time value of money, and simple and compound interest and how to calculate it, and also to understand the present value of the future payments.
- ✓ Introduce students to major financial statements of businesses as well as the definition of the purposes and tools of financial analysis and its importance in the financial control process. Introduce students to the basics of investing in securities through exposure to the following points: knowledge of financial markets, and their components, and functions of the financial market, and the parties worked in the financial markets, the stock traded in the money markets and capital markets, then find out the efficiency standards of the financial market, as well as valuations of Shares and bonds.
- ✓ Giving students how to apply full financial cycle and makes the necessary adjustments on service and commercial installations
- ✓ Giving student's of Application processors to finance small projects.

Course Outcome
After completion of this course student will be able to

CO1: Explain and describe various technology-based business models and the dynamics of value creation, value proposition, and value capture in industrial enterprises.

CO2: Select, interpret and use different costing techniques as a basis for decisions in various business situations.

CO3: Understand the basic principles of financial accounting and reporting.

CO4: Produce and interpret an industrial company's Annual Statement, at a basic level.

Course Content:

Introduction [10L]
Introduction to Accounting, Important Definitions, Basic concepts and conventions, Types of Accounts with Golden Rule of Accounting, Journal, Ledger and Trial Balance,

Preparation of Trading Account, Profit & Loss A/C and Balance Sheet for business organizations.

Financial Management [10L]
Introduction to Financial Management, Introduction, Definition and concept, scope, objective, functions of Finance Manager. Ratio Analysis: Definition, Objectives, Advantages & Disadvantages. Classification of Ratios: Liquidity ratios, Capital Structure ratios, Activity ratios & Profitability Ratios, Capital Budgeting: Nature of Investment Decision, Importance of Capital Budgeting, capital budgeting process, Investment criteria, payback period, Rate of return, cash flow, discounting cash flow NPV method and IRR method, Benefit cost ratio, ARR.

Cost Accounting [7L]
Introduction to cost accounting-Cost Centre Cost unit, Elements of costs, Statement of cost or cost sheet, Marginal cost & C-V-P analysis with BEC. Budget and Budgetary Control: Concepts of Budget, Budgeting and budgetary control, advantages, disadvantages, uses, Master Budget, Zero Based Budget, Cash budget, Flexible budget.

Working capital management [4L]
Introduction-working capital concept-financing working capital-importance of working capital-management of working capital-working capital cycle-management of different components of working capital-working capital forecast.

Introduction to GST [3L]
Introduction to GST-Basic concept and application.

Text Books:

4. Financial Management, Khan & Jain, S. Chand
5. Management Accounting, Khan & Jain, S. Chand
6. Modern Accountancy, Haniff & Mukherjee, TMH

Reference Books:

1. An Introduction to Accountancy, S.N.Maheswari, Vikas publication
2. Cost Accounting: Theory and Practices, B. Banerjee, PHI
3. Financial Management, IM Pandey, Vikas

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	1	2	-	2	-	-	-	-	-	-
CO2	-	-	-	-	3	1	2	-	-	-	1	-
CO3	3	-	-	-	-	2	-	-	-	-	3	-
CO4	-	2	-	-	1	-	1	-	-	-	-	-

Course Name: Constitution of India
Course Code: MC501
Contact: 3:0:0
Total Contact Hours: 32
Prerequisite: NA

Course Outcome:

After completion of this course student will be able to

CO1: Develop human values, create awareness about law ratification and significance of Constitution

CO2: Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant morality, social values and their social responsibilities.

CO3: Create understanding of their Surroundings, Society, Social problems and their suitable solutions.

CO4: Familiarize with distribution of powers and functions of Local Self Government.

CO5: Realize the National Emergency, Financial Emergency and their impact on Economy of the country.

Course content:

1. Meaning of the constitution law and constitutionalism (2L)
2. Historical perspective of the Constitution of India (2L)
3. Salient features and characteristics of the Constitution of India (1L)
4. Scheme of the fundamental rights (2L)
5. The scheme of the Fundamental Duties and its legal status (2L)
6. The Directive Principles of State Policy – Its importance and implementation (2L)
7. Federal structure and distribution of legislative and financial powers between the Union and the States (3L)
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India (2L)
9. Amendment of the Constitutional Powers and Procedure (2L)
10. The historical perspectives of the constitutional amendments in India (2L)
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency (3L)
12. Local Self Government – Constitutional Scheme in India (3L)
13. Scheme of the Fundamental Right to Equality (2L)
14. Scheme of the Fundamental Right to certain Freedom under Article 19 (2L)
15. Scope of the Right to Life and Personal Liberty under Article 21. (2L)

Text Books:

1. Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2. The Constitution of India, PM Bhakshi, Universal Law

CO-PO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	2	3	-	-	-	2
CO2	-	-	-	-	-	3	2	3	-	-	-	2
CO3	-	-	-	-	-	3	2	3	-	1	-	2
CO4	-	-	-	-	-	3	2	3	-	1	-	2
CO5	-	-	-	-	-	3	2	3	-	1	-	2

Course Name: Design Analysis of Algorithm Lab
Course Code: IT 591
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Discrete Mathematics, Data Structure, Basic Programming Knowledge

Course Objective:
The objective of the course is to analyze and design algorithms, use different computational models, order notation and various complexity measures to analyze the complexity/performance of different algorithms.

Course Outcome
After completion of this course student will be able to

CO1: Analyze a problem and design the solution for the problem.
CO2: Optimize the solution with respect to time complexity & memory usage.
CO3: Apply different algorithmic approaches for solving the problems.
CO4: Analyze the efficiency of algorithms using time and space complexity theory.

Course Content:

1. Implement Merge Sort using Divide and Conquer approach
2. Implement Quick Sort using Divide and Conquer approach
3. Find the minimum number of scalar multiplication needed for chain of matrix using dynamic programming
4. Implement all pair of Shortest path for a graph (Floyd- Warshall Algorithm) using dynamic programming
5. Implement Traveling Salesman Problem using dynamic programming
6. Implement Single Source shortest Path for a graph using Bellman Ford Algorithm
7. Implement 15 Puzzle Problem using Branch and Bound technique.
8. Implement 8 Queen Problem using Backtracking.
9. Implement any one of the following problems using Backtracking:
   - Graph Coloring Problem
   - Hamiltonian Problem
10. Implement any one of the following problem using Greedy method:
    - Knapsack Problem
    - Job sequencing with deadlines
11. Implement KMP algorithm for string matching.
12. Implement Ford Fulkerson algorithm.

Text books:

1. Aho, J. Hopcroft and J. Ullman “The Design and Analysis of Algorithms”
2. D. E. Knuth “The Art of Computer Programming”, Vol. 3
3. E. Horowitz and Shani “Fundamentals of Computer Algorithms”

Reference books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, “Introduction to Algorithms”

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	-	3	-	-	-	-	-	-	-
CO2	2	-	2	-	3	-	-	-	-	-	-	-
CO3	2	3	2	-	3	-	-	-	-	-	-	-
CO4	2	3	2	-	3	-	-	-	-	-	-	2

Course Name: Software Engineering Lab
Course Code: IT 592
Contact: 0:0:3
Credits: 1.5

Perquisite: Familiar with MS Office Package and Basic Computations.

Course Objective:

Demonstrate the UML diagrams with ATM system descriptions, Demonstrate the working of software testing tools with c language, Understanding Project Planning Tools.

Course Outcome:

After completion of this course student will be able to

- **CO1:** Ability to analysis and design of complex systems and meet ethical standards, legal responsibilities
- **CO2:** Ability to apply software engineering principles, techniques and develop, maintain, evaluate large-scale software systems.
- **CO3:** To produce efficient, reliable, robust and cost-effective software solutions and perform independent research and analysis.
- **CO4:** Ability to work as an effective member or leader of software engineering teams and manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals.

List of Experiments:

1. Identifying the Requirements from Problem Statements
2. Requirements, Characteristics of Requirements, Categorization of Requirements, Functional Requirements, Identifying Functional Requirements
3. Estimation of Project Metrics
4. Project Estimation Techniques -COCOMO, Basic COCOMO Model, Intermediate COCOMO Model, Complete COCOMO Model, Advantages of COCOMO, Drawbacks of COCOMO, Halstead's Complexity Metrics
5. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios
6. Use case diagrams, Actor, Use Case, Subject, Graphical Representation, Association between Actors and Use Cases, Use Case Relationships, Include Relationship, Extend Relationship, Generalization Relationship, Identifying Actors, Identifying Use cases, Guidelines for drawing Use Case diagrams
7. Identifying Domain Classes from the Problem Statements
8. Introduction to selenium tool for software testing.
9. JUnit, Static analysis, Junit Framework
10. Prepare a SRS document in line with the IEEE recommended standards
11. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
12. Draw the sequence diagram for any two scenarios.
13. Draw the collaboration diagram.

14. Draw the state chart diagram & component diagram.
15. Draw the deployment diagram.

Text Book

1. Rajib Mall: Software Engineering, PHI
2. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition.

Reference Book

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
Software Engineering: Iyan Somarville, 7th Edition

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	1	-	-	-	1	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-
CO4	1	2	1	-	-	-	-	1	-	-	-	2

Course Name: Operating System Lab
Course Code: IT 593
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Computer architecture, C,C++, Java

Course Objective:
The objective of the course is to have students understand and appreciate the principles in the design and implementation of operating systems software.

Course Outcome
After completion of this course student will be able to

CO1: Describe the important computer system resources and the role of operating system in their management policies and algorithms.
CO2: Understand the process management policies and scheduling of processes by CPU
CO3: Evaluate the requirement for process synchronization and coordination handled by operating system
CO4: Describe and analyze the memory management and its allocation policies

Course Contents:

1. **Managing Unix/Linux Operating System :**
Installation & Configuration of Operating Systems-Multi Booting, VMware installation, Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Super block, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.

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),message passing & shared memory(IPC version V).

Text Books:

1. Russ Cox, Frans Kaashoek, Robert Morris , xv6: a simple, Unix-like teaching operating system",Revision8.
2. Sumitabha Das , UNIX Concepts and Applications, Tata McGraw-Hill.

Reference Books:

1. Tanenbaum A.S., "Operating System Design & Implementation", Practice Hall NJ.2.
2. Stalling, William, "Operating Systems", Maxwell McMillan International Editions.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	-	-	-	-	2	-	-	-
CO2	2	3	3	3	-	-	-	-	-	-	-	-
CO3	1	3	3	3	-	-	-	-	2	-	-	-
CO4	2	3	3	3	-	-	-	-	2	1	-	2

Course Name: Programming Practice with C++ Lab
Course Code: IT 594A
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Basic Computer concepts

Course Objective:
The objective of the course is to introduce with the object oriented programming paradigm using C++ and make the students understand different concept of C++ and apply the features in application development.

Course Outcome
After completion of this course student will be able to

CO1	Apply the concept of Object oriented programming in developing program
CO2	Analyse and evaluate different feature of C++ in different laboratory experiments
CO3	Develop small to big scale project using C++

List of Experiments:

Introduction
Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU & GDB script.

Basic Programming Concepts
Introduction to C++, basic loop control, executing programs, writing functions, selection statements, review of functions and parameters, command line arguments, recursion

Stream and Structure
I/O streams, arrays and string manipulation, pointers, structures & unions Template , Exception

Object Oriented Concepts
Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. Dealing with member functions

Overloading
Operator overloading and Polymorphism (both static & dynamic).

Inheritance
Introduction to Inheritance, derived class handling, abstract class, virtual class, overriding, template class, name-space & exception handling.

Memory Management
Dynamic memory allocation, implementation of Linked Lists, using C++.

C++11 Features
Basic C++11 features

Innovative Experiments
Design innovative projects using C++

Text Books:
1. Schildt, H., The Complete Reference C++, McGraw – Hill.
2. Balaguruswamy, Object Oriented Programming C++ McGraw – Hill.

Reference Books:
1. C++ object oriented programming paradigm, Debasish Jana, PHI
2. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	--	1	1	--	--	--	--	--	--
CO2	3	3	2	--	3	2	--	--	--	--	--	--
CO3	3	--	--	--	3	--	2	--	--	--	--	2

Course Name: Artificial Intelligence Lab
Course Code: IT 594B
Contact: 0:0:3
Credits: 1.5

Perquisite:
Knowledge of programming languages.

Course Objective:
Apply knowledge of computing and mathematics appropriate to the discipline. Analyze a problem, and identify and define the computing requirements appropriate to its solution. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs Understand current techniques, skills, and tools necessary for computing practice.

Course Outcome:

After completion of this course student will be able to

- **CO1:** Understand and recognize various AI search algorithms and AI tools.
- **CO2:** Apply the fundamentals of knowledge representation, inference and theorem proving using
- **CO3:** Analyze working knowledge of reasoning in the presence of incomplete and/or uncertain information.
- **CO4:** Evaluate and create knowledge representation, reasoning, and machine learning techniques for the solutions of real-world problems.

List of Experiments:

A. Write the following programs using PROLOG

1. Study of PROLOG facts and rules.

2. Write a program to compute factorial of a number.

3. Write a program to compute GCD of two numbers.

4. Write a program to represent facts and rules.

5. Write a program to represent a family tree.

6. Write a program to diagnosis intelligently.

7. Write a program to check whether a given line segment is vertical or horizontal.

8. Write a program for list processing.

B. Write the following programs using PROLOG

1. Write a program to solve 8 queens problem

2. Solve any problem using depth first search.

3. Solve any problem using best first search.

3. Solve 8-puzzle problem using best first search

4. Solve Robot (traversal) problem using means End Analysis

6. Solve traveling salesman problem.

C. Write some programs on recent trend in AI (It may be recent real world problems)
Jupyter Notebook(iPython) :Medical diagnosis. Design an Expert System

Projects assigned by instructor to model and solve real world problems.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach,. Russell & Norvig, Prentice Hall.
2. Artificial Intelligence, Elain Rich and Kevin Knight, TMH.

REFERENCE BOOK:

3. Prolog Programming for Artificial Intelligence Paperback by Ivan Bratko
4. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	-	3	-	-	-	-	-	-	-	-	-	1
CO3	1	-	3	-	-	-	-	-	-	-	-	1
CO4	-	3	-	2	-	-	-	-	-	-	-	1

CO-PO Mapping

Course Name: Microprocessor and Microcontroller Lab
Course Code: IT 594C
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Basic Knowledge of Digital Electronics

Course Objective:
To apply Assembly Level Programming for arithmetic-logical solutions and also to interpret the interfacing programming by conducting experiments.

Course Outcome
After completion of this course student will be able to

- **CO1:** Able to solve small assignments using the 8085 basic instruction sets and memory mapping through trainer kit and simulator.
- **CO2:** Able to write 8085 assembly language programs like Addition, Subtraction, Multiplication, Square, Complement, Look up table, Copying a block of memory, Shifting, Packing and unpacking of BCD numbers, Ascending order, Descending order etc. using trainer kit.
- **CO3:** Able to validate the interfacing technique using 8255 trainer kit through subroutine calls and IN/OUT instructions like glowing LEDs accordingly, stepper motor rotation etc
- **CO4:** Able to test fundamental of 8051 programs using the trainer kit.

List of Experiments:

1. Familiarization with 8085 register level architecture, the basic instruction sets (data transfer, arithmetic, logical, branching) and the trainer kit components including the memory map.

2. Familiarization with the process of storing, executing and viewing the contents of memory as well as registers in the trainer kit 8085 and simulator through small assignments.

3. Programming using 8085 kit and simulator for: Addition, Subtraction, Multiplication by repeated addition method, Square, Complement, Look up table, Copying a block of memory, Shifting ,Packing and unpacking of BCD numbers, Addition of BCD numbers, Binary to ASCII conversion, Smallest and Largest number from an array of numbers, Ascending order, Descending Order, String Matching, Multiplication using shift and add method.

4. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly, glowing of seven segment display.

Program for serial communication between two trainer kits.

1. Interfacing of 8255: Keyboard, Stepper motor rotation.
2. Study of 8051 Micro controller kit and writing programs.

Text Book:

4. Microprocessor architecture, programming and application with 8085 – R. Gaonkar, Penram International
5. Fundamentals of microprocessor and microcontroller- B.Ram

Reference Book:

7. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, Oxford university press
8. 8086 Microprocessor –K Ayala, Cengage learning
9. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
10. The 8051 Microcontroller and Embedded System- Mazidi

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	--	--	1	--	--	--	2	--	--	2
CO2	3	3	2	--	2	2	--	--	--	--	--	--
CO3	3	--	--	--	3	--	2	--	--	--	--	2
CO4	3	2	--	--	3	--	2	--	--	--	--	2

CO-PO Mapping

Department: Information Technology

Curriculum Structure & Syllabus

(Effective from 2018-19 admission batch)

6th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	PC	IT601	Database Management System	3	0	0	3	3
2	PC	IT602	Web Technology	3	0	0	3	3
3	PC	IT603	Computer Networking	3	0	0	3	3
4	PE	IT604	A. E-Commerce and ERP B. Digital Image Processing C. Soft Computing	3	0	0	3	3
	Total of Theory						**12**	**12**
B. PRACTICAL								
5	PC	IT691	Database System Lab	0	0	3	3	1.5
6	PC	IT692	Web Technology Lab	0	0	3	3	1.5
7	PC	IT693	Computer Networking Lab	0	0	3	3	1.5
8	PE	IT694	A. E-Commerce and ERP Lab B. Digital Image Processing Lab C. Soft Computing Lab	0	0	3	3	1.5
9	PROJ	PR691	Project-VI	0	0	2	2	1
10	PROJ*	PR692	Innovative Activities-V	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
11	MC	MC681	Technical Lecture Presentation & Group Discussion-I	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							**29**	**19.5**

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Database Management System
Course Code: IT 601
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Mathematics, Data Structure, Operating System.

Course Objective:
The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcome
After completion of this course student will be able to

- **CO1:** Understand Database Management System, explain fundamental elements of a database management system, compare the basic concepts of relational data model, entity-relationship model, file organization and use appropriate index structure.
- **CO2:** Apply efficient query optimization techniques, suitable transaction management, concurrency control mechanism and recovery management techniques.
- **CO3:** Evaluate a database design and improve the design by normalization.
- **CO4:** Design entity-relationship diagrams to represent simple database application scenarios, translate entity-relationship diagrams into relational tables, populate a relational database and formulate SQL queries on the data.

Course Contents:

Module I: Introduction: [2L]
Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Module II: Entity-Relationship Model: [3L]
Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.

Module III: Relational Model: [4L]
Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

Module IV: SQL and Integrity Constraints: [8L]
Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Sub queries, Database security application development using SQL, Stored procedures and triggers.

Module V: Relational Database Design: [9L]
Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

Module VI: Internals of RDBMS: [6L]
Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols, two phase locking.

Module VII: File Organization & Index Structures: [4L]
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.

Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.Graw Hill.
2. Elmasri Ramez and Novathe Shamkant, "Fundamentals of Database Systems", Benjamin Cummings Publishing. Company.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill.
2. Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and Management (7/e), Cengage Learning.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	-	-	-	-	2	-	-	-
CO2	2	3	3	3	-	-	-	-	-	-	-	-
CO3	1	3	3	3	-	-	-	-	2	-	-	-
CO4	2	3	3	3	-	-	-	-	2	1	-	2

Course Name: Web Technology
Course Code: IT 602
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Computer Networking, Database Management System, JAVA Programming Language

Course Objective:
Describing the web application architecture and protocols, illustrating different technologies those are used to develop web applications, describing different frameworks those used to develop web applications

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

CO1: Understand and evaluate web application architecture, technologies and frameworks.

CO2: Apply the knowledge of web technology in developing web applications

CO3: Evaluate different solutions in field of web application development.

CO4: Implement small to large scale project to provide live solution in web application development fields

Course Content:

Module I: Introduction to World Wide Web: [2L]
Web Architecture, Web Applications, Web servers, Web Browsers and Agents, Internet standards, DNS, SMTP , Pull and Push mechanism: Pros and Cons. HTTP, HTTPS, XMPP

Module II: Mark-up: [2L]
HTML: Elements, Attributes, Tags, Forms, Input, Frames, Tables.

Module III: Cascading Style Sheets: [2L]
Advantages, Rules, CSS, inline and external, using template Layouts.

Module IV: Java Script and Node JS: [5L]
Basic java Script concepts, Use of Java Script, Variable, Object, function, Event Handling. Evaluation of Java Scrip. Create, Publish, Extend & Manage, Node.js HTTPs : Create Server and Get Data, Node.js Express, Node JS Mongo DB. Node.js Promise , Node.js Generators & Compare with Callbacks, Node js Streams : File stream, Pipes, Node.js Testing with Jasmine

Module V: Server-side Programming: [7L]
Servlets: HTTP Tunneling, Programmatically issuing HTTP GET, POST etc. and retrieval of content Concept of Dynamic Web pages, Web server versus Application server, Role of threading in a Server, Servlet-2.x API conforming to Web 2.0: Role of web.xml as deployment descriptor, request and response, Basic request handling, parameter retrieval, multiple parameter retrieval, inter-Servlet collaboration: Dispatching the request, Concept of state of web: Sessions , tracking session, Using Cookies and jsession Id, Parameter passing to and from session, Servlet Filters and common uses of Filters and Cookies. Migration to Servlet 3.x plus and omission of web.xml and concept of Web Socket.

Module VI: Persistence: JDBC 3.x framework: [6L]
Need and different approaches of persistence of data, Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Executing basic CRUD using JDBC: Statement, Prepared Statement, Result Set. Execution of batch SQL, Stored Procedures using Callable Statement, Transaction Failure management: Save Point and roll back concepts, Prevention of SQL injection, Concept of connection URL in details: Connecting to a remote database host (server). Concept of roles of Drivers: Java reflection in Action.

Module VII: Java Server Pages: [6L]
Benefits of JSP over Servlets, JSP scriptlets, page directives, declarations, action tags: <jsp:useBeabn/>, <jsp:include/> <jsp:forward/> , introduction to MVC and Spring MVC

Module VIII: XML Technologies: [2L]
XML, Namespace, DTD, W3C XML Schema

Module IX: Ajax: [2L]
Introduction to Asynchronous pattern and Using XML to communicate over XML Http Request object. Handling 5 states and finding response state. Migration of Ajax to AJAJ

Module X: Web Service: [2L]
Introduction to web service architecture. Simple object access protocol, Web service description language, RESTful web service.

Text Book:
1. Professional Java Server Programming Allamaraju, Apress

Reference Book:
1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions INC.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	--	3	--	--	--	--	--	--	--	2	--
CO2	--	3	--	2	--	2	--	--	--	--	--	--
CO3	--	--	--	--	3	--	2	--	--	--	--	--
CO4	--	--	--	--	3	--	--	3	2	--	--	2

Course Name: Computer Networking
Course Code: IT 603
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Basic Digital Communication, Computer Architecture and Operating System.

Course Objective:
Understanding the basic concept of different network models, explaining the network architecture, Analyzing and evaluating different network protocols.

Course Outcome
After completion of this course student will be able to

CO1: Understand the network model and architecture

CO2: Apply different networking concepts for implementing network solution.

CO3: Analyse different networking functions and features for identifying optimal solutions

CO4: Evaluate and implement routing algorithms for implanting solution for the real-life problems

Course Content:

Module I: Overview of Data Communication and Networking: [4L]
Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI and TCP/IP.

Module II: Physical Layer: **[5L]**
Overview of data, signal, transmission & transmission media; Circuit switching: time division & space division switch, TDM bus; Telephone Network.

Module III: Data link Layer: **[8L]**
Types of errors, framing, error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, GoBack- N ARQ, Selective repeat ARQ, HDLC; Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet,

Module IV: Network layer: [7L]
Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, Routing Protocols, ARP, IP, ICMP, IPV6.

Module V: Transport layer: **[6L]**
Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

Module VI: Application Layer: [6L]
DNS, SMTP, SNMP, FTP, HTTPS, Firewalls, IP Filtering

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (5th Ed.) " – TMH
2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:

1. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	3	2	-	-	-	-	-	-	-	-
CO3	2	3	2	2	-	-	-	-	-	-	-	2
CO4	2	3	2	2	-	-	-	-	-	-	-	2

Course Name: E-Commerce and ERP
Course Code: IT604A
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Concepts of Computer Networking, Operating System, Database Management System

Course Objective:
The objective of the course is to explain the characteristics and functions of electronic commerce including mobile commerce, fundamental characteristics of electronic markets, common business models used in B2C and B2B electronic commerce. To acquire an overview to ERP and the knowledge on related technologies. Skill to ERP Manufacturing Perspective and ERP modules and to examine ERP tools and understand the benefits of ERP.

Course Outcome
After completion of this course student will be able to

- **CO1:** Understand the policy issues related to privacy, intellectual property rights, and establishing identity those are germane to electronic commerce along with the Internet and related technologies.
- **CO2:** Comprehend the underlying economic mechanisms and driving forces of E-Commerce.
- **CO3:** Analyse the impact that electronic commerce is facing and outlines the different digital transaction process and basic concepts of e-commerce.
- **CO4:** Identify different technologies and IT support used in ERP and apply different tools used in ERP.

Course Contents:

Module I: Introduction to E-Commerce: [2L]
Definition, Scope of E-Commerce, Hardware requirements, E-Commerce and Trade Cycle, Electronic Markets, Electronic Data Interchange and Internet Commerce.

Module II: Business to Business E-Commerce: [4L]
Electronic Markets, Electronic Data Interchange (EDI): Technology, Standards (UN/EDIFACT), Communications, Implementations, Agreements, Security, EDI and Business, Inter-Organizational E-commerce. Business models for E-commerce, Business Process Re-Engineering.

Module III: Legal issues: [3L]
Risks: Paper Document vs. Electronic document, Authentication of Electronic document, Laws, Legal issues for Internet Commerce: Trademarks and Domain names, Copyright, Jurisdiction issues, Service provider liability, Enforceable online contract.

Module IV: Security Issues :[5L]
Security Solutions: Symmetric and Asymmetric Cryptosystems, RSA, DES, and Digital Signature, Protocols for secure messaging, Secure Electronic Transaction (SET) Protocol, Electronic cash over internet, Internet Security, Search engines, Intelligent agents in E-Commerce Electronic payment systems, E-security.

Module V: Business to Consumer E-Commerce and E-Business: [5L]
Consumer trade transaction, Web metrics, Elements of E-Commerce, Industry impacts of E-business. Integrating Intranet and internet web applications across multiple networks. Internet bookshops, Software supplies and support, Electronic Newspapers, Internet Banking, Virtual Auctions, Online Share Dealing, Gambling on the net, E-Diversity, Case studies through internet.

Module VI: Mobile Commerce: [2L]
Overview, Infrastructure, Applications, Mobile Payment, Limitations, Security in M-Commerce.

Module VII: Information Technology and ERP Systems [9L]
The evolution of ERP systems architecture: Client-Server based architecture, Multi-Tier architecture – Presentation layer, Application layer, and Database layer. Brief discussion on Extended ERP systems - Web-enabled ERP architecture, Service- Oriented Architecture and Cloud Computing. Open Source ERP. ERP and Supply Chain Management, and Customer Relationship Management, ERP and Business Intelligence, ERP and Data warehousing, ERP and E-business.

Module VIII: Emerging Trends and Future of ERP Systems: [6L]
Emerging Technologies and ERP: Service-oriented Architecture: Enterprise SOA layers – Business processes, Business services, Components and Integration services, Difference between multi-layered Client-server architecture and SOA. Enterprise Application Integration: Basic understanding of the concept, Types of EAI – User Interface, Method, Application Interface, Data.

Text Books:
1.E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH
2. Handbook on Electronic Commerce, Shaw et al., Springer publication.
3. Enterprise Resource Planning –Alexis Leon, Tata McGraw Hill

Reference Books:
1. E-Commerce-Strategy, Technologies & Applications by David Whitley, TMH.
2. Applied E-Commerce, Langer, John Wiley Publication.
3. E-Commerce- The cutting edge of business by Kamlesh K. Bajaj, TMH.
4. Enterprise Resource Planning, 2nd Edition by Alexis Leon, Tata McGraw Hill Education, 2008
5. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGraw Hill, 1997

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	--	--	--	1	2	2	3	3	--	3	3	--
CO2	--	--	--	--	--	--	--	--	--	3	3	1
CO3	--	1	--	2	2	--	--	2	--	3	3	--
CO4	--	--	--	3	3	1	--	--	--	--	2	2

Course Name: Digital Image Processing
Course Code: IT 604B
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Mathematics, Computer Programming

Course Objective:
The aim of this course is to introduce to the students the basics of digital image processing. The students will gain overview about the available techniques and possibilities of this field. They will learn basic image transformation, segmentation algorithms and problems of object measurements.

Course Outcome:
After completion of this course students will be able to

CO1: Understand the fundamental concepts of a digital image processing system.
CO2: Analyze images in the spatial as well as frequency domain using various transformation techniques for improving the image quality.
CO3: Implement various compression techniques.
CO4: Evaluate image segmentation and representation techniques

Course Contents:

Module I: Introduction to Digital Image Processing: [3L]
Elements of digital image processing systems, Elements of visual perception Brightness, contrast, hue, saturation, mach band effect, Image sampling and quantization.

Module II: Image Enhancement: [8L]
Spatial Basic grey level transformation, Histogram equalization, Histogram specification techniques, Noise Distributions, Image subtraction and Image averaging, Smoothing, sharpening filters, Frequency Domain methods: Introduction to Fourier Transform and DFT, Discrete Cosine Transform (DCT) and its properties, Smoothing in Frequency- Domain, Sharpening in Frequency- Domain, Homomorphic filtering.

Module III: Image Restoration: [5L]
Model of Image Degradation/restoration process, Noise models, Unconstrained restoration, Lagrange multiplier, Least mean square filtering, Constrained least mean square filtering, Wiener filtering.

Module IV: Color Image Processing: [3L]
Different color Models, Color Transformations, Smoothing & Sharpening Color Image, Color Segmentation, Noise.

Module V: Image Compression: [6L]
Need for data compression, Different types of compression, Variable length coding-Huffman Coding, Run Length Encoding, Arithmetic coding, Lossy Compression: Vector Quantization, Transform coding, Basics of Image compression standards: JPEG.

Module VI: Image Segmentation: [6L]
Thresholding, Region Based segmentation, Region growing, Region splitting and Merging, Edge detection, Canny edge detector.

Module VII: Image registration: [3L]
Geometric transformations: translation, rotation, scaling, homomorphic coordinate system; ground control points, affine transformation.

Module VIII: Representation & Description: [2L]
Representation of segmented image, Boundary & Regional Descriptors, Use of Principal components for description.

Text Books:
1. Digital Image Processing by Woods, Gonzalves,Pearson
2. Digital Image Processing & Analysis by Chanda & Majumder,PHI

Reference Books:
1. Digital Image Processing by Jahne by Springer India
2. Image Processing, Analysis & Machine Vision by Sonka, VIKAS
3. Fundamentals of Digital Image Processing by Jain, PHI

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	2	3	3	2	2	-	-	-	-	-	-	-
CO3	-	-	2	2	-	-	-	-	1	-	-	-
CO4	2	3	2	2	3	-	1	-	1	-	-	1

Course Name: Soft Computing
Course Code: IT 604C
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Mathematics, Set theory.

Course Objective:
To give students knowledge of soft computing theories fundamentals, that is of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets, fuzzy logic and genetic algorithms.

Course Outcome
After completion of this course student will be able to

- **CO1:** Understand importance of soft computing.
- **CO2:** Remember different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
- **CO3:** Implement algorithms based on soft computing.
- **CO4:** Apply soft computing techniques to solve engineering or real-life problems.

Course Content:

Module I: Introduction : [4L]
Soft Computing. Difference between Hard and Soft computing, Requirement of Soft Computing, Major Areas of Soft Computing, Applications of Soft Computing.

Module II: Fuzzy Systems : [9L]
Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Min-max Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

Module III: Genetic Algorithm: [8L]
History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

Module IV: Neural Networks : [8L]
Neural Network, Learning rules and various activation functions, Single layer Perceptrons , Back Propagation networks, Architecture of Back propagation(BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

Module V: Multi-objective Optimization Problem Solving : [4L]
Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA), some applications with MOEA.

Module VI: Hybrid Systems: [3L]
Introduction to Hybrid Systems, Neuro Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	-	-	2	-	1	1
CO2	3	3	2	2	-	-	--	-	1	-	-	1
CO3	3	3	2	2	1	-		-	1	-	-	2
CO4	3	3	3	2	2	-	-	-	2	-	-	2

Course Name: Database Management System Lab
Course Code: IT 691
Contact: 0:0:3
Credits: 1.5

Perquisite: Knowledge about the basics of electronics and basic concepts in logic design, basic knowledge of data structure and programming concept.

Course Objective:
To develop conceptual understanding of database management system for solving different industry level problems & to learn its applications

Course Outcome:
After completion of this course student will be able to

CO1: Design and implement a database schema for a given problem-domain

CO2: Create and maintain tables using PL/SQL Course Outcome

CO3: Populate and query a database

CO4: Application development using PL/SQL & front-end tools

List of Experiments:
1. 1.Study of Backend Tool – Oracle.
2. Data Definition Language (DDL) commands in RDBMS.
3. Data Manipulation Language (DML) and Data Control Language (DCL) commands in RDBMS.
4. High-level language extension with Cursors.
5. High level language extension with Triggers
6. Procedures and Functions.
7. Embedded SQL.
8. Database design using E-R model and Normalization.
9. Mini project (Application Development using Oracle and Visual Basic)
    i. Inventory Control System.
    ii. Material Requirement Processing
    iii. Hospital Management System
    iv. Railway Reservation System
    v. Personal Information System
    vi. Web Based User Identification System
    vii. Time-table Management System

Text Book

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition

Reference Book

1. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc- Graw Hill.
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	3	2	-	-	-	-	-	-	-
CO2	-	-	3	3	2	-	-	-	2	-	-	-
CO3	2	-	3	3	2	-	-	-	-	2	-	-
CO4	2	-	3	3	2	-	-	-	-	-	-	2

Course Name: Web Technology Lab
Course Code: IT 692
Contact: 0:0:3
Credits: 1.5

Prerequisite: Basic knowledge on Java and computer networking and database.

Course Objective:
Describing the web application architecture and protocols; Illustrating different technologies those are used to develop web applications; Describing different frameworks those used to develop web applications.

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

- **CO1:** Apply the knowledge of web technology in developing web applications
- **CO2:** Evaluate different solutions in field of web application development
- **CO3:** Implement small to large scale project to provide live solution in web application development fields.

List of Experiments:

HTML
Developing application using different HTML elements, designing forms using HTML, Apply DOM

CSS
Using different CSS Styles for designing interactive forms and interfaces.

Java Script
Using Java script variables, operators, control structure, functions and event handling, Form validation using java script, Node js server implementation, express js for implementing web application handling get, put, post, etc.

JDBC
Connecting to databases using jdbc:odbc bridge and Type-4 drivers, Batch execution, Stored Procedure

Servlet
Developing web application using servlet: get/post, Developing filter application, Session handling.

JSP
Developing web application using JSP as view, Session handling using JSP, Using JSP components, Custom tag development.

AJAX
Developing web application using AJAX: accessing XML, text files.

Web Service
Development web service as reusable components

Innovative Experiments
Develop some innovative experiments.

Text Book:
1.Professional Java Server Programming Allamaraju, aprerss

Reference Book:
1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Kogent Learning Solutions INC.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	PO1	PO1	PO12
CO1	2	3	3	3	3	--	--	--	--	--	--	--
CO2	2	3	3	3	3	--	--	--	--	--	--	--
CO3	2	3	3	3	3	--	--	--	2	3	--	3

Course Name: Computer Networking Lab
Course Code: IT 693
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Basic Computer Architecture and Operating System.

Course Objective:
Understanding the basic concept of different network models, Explaining the network architecture, Apply different computer routing algorithms in real life problems.

Course Outcome
After completion of this course student will be able to

CO1: Understand and apply different network commands.
CO2: Analyze different networking functions and features for implementing optimal solutions.
CO3: Apply different networking concepts for implementing network solution.
CO4: Implement different network protocols.

List of Experiments:

- Familiarization with: Different networking cables, Different connectors, Hubs, Switches, Routers
- NIC Installation & Configuration (Windows/Linux)
- Understanding IP address, subnet etc, Connect the computers in Local Area Network.
- Study of basic Network Configuration commands.
- Configure a Network topology using packet tracer software
- Link Layer Error Detection Mechanism (Cyclic Redundancy Check), Data Link Layer Error Control mechanism (Selective Repeat, Go Back N)
- Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window), Data
- Server Setup/Configuration: FTP, TELNET, NFS, DNS, Firewall.
- TCP/UDP Socket Programming: Simple, TCP based, UDP based Multicast & Broadcast Sockets

Text Books:
1. B. A. Forouzan – "Data Communications and Networking (5th Ed.) " – TMH
2. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:
1. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
2. Black, Data & Computer Communication, PHI
3. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	3	-	-	-	-	-	-	-
CO2	3	2	2	3	3	-	-	-	-	-	-	-
CO3	3	2	2	3	3	-	-	-	-	-	-	2
CO4	3	2	2	3	3	-	-	-	-	-	-	2

Course Name: E-Commerce and ERP Lab
Course Code: IT694A
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Object Oriented Programming, Computer Networking, Web Application Development, Database Management System.

Course Objective:
Understanding basic concept of object-oriented programming and PhP framework, Explaining the client-side components, Appling the Php web application development concept in web application development.

Course Outcome
After completion of this course student will be able to

CO1: Understand the concept of PhP framework.

CO2: Analyzing different client and server side components for developing application.

CO3: Apply and concept for developing MVC application.

CO4: Apply and implement the solution to real life problem using PHP concepts.

Course Content:
Introduction to PHP:
Evaluation of PHP, Basic syntax, Variable constant, Data Types, control structure, function, array, string.

Web Designing:
Introduction to HTML HTML Tags Creating Forms Creating tables Managing home page, Java Script, CSS.

Database Connectivity with MySQL:
Introduction to RDBMS Connection with MySql Database Performing basic database operation (DML) (Insert, Delete, Update, Select) Setting query parameter Executing query Join (Cross joins, Inner joins, Outer Joins, Self joins.)

E-Commerce/M-Commerce Applications:
Online Store, Online Banking, Credit Card Transaction Processing. Comparison Shopping in B2C, Exchanges Handling in B2B, Interaction Examples: Virtual Shopping Carts.

Text Books:
1. PhP Complete Refernce Steven Holzner

Reference Books:
1. Programming PHP Kevin Tatroe

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	3	3	--	--	--	--	--	--	--
CO2	2	3	3	3	3	--	--	--	--	--	--	--
CO3	2	3	3	3	3	--	--	--	--	--	--	--
CO4	2	3	3	3	3	--	--	--	3	--	3	3

Course Name: Digital Image Processing Lab
Course Code: IT 694B
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Knowledge on Computer Programming

Course Objective:
The aim of this course is to familiarize the students in the regular Image Processing Software with respect to basic processing required to generate thematic maps from different sources of images.

Course Outcome:
After completion of this course students will be able to

CO1: Apply enhancing operations on the image using spatial filters and frequency domain filters.

CO2: Analyse the characteristics of the image using different transformation techniques.

CO3: Estimate the efficiency of the compression techniques on the images.

CO4: Implement different segmentation operations of images.

List of Experiments:

Simulation using MATLAB

1. Image sampling and quantization
2. Analysis of spatial and intensity resolution of images.
3. Intensity transformation of images.
4. DFT analysis of images
5. Different types of Transforms
6. Histogram Processing
7. Image Enhancement-Spatial filtering
8. Image Enhancement- Filtering in frequency domain
9. Image segmentation – Edge detection, line detection and point detection.
10. Region based Segmentation
11. Analysis of images with different color models.
12. Image compression techniques
13. Image restoration
14. A mini project based on medical image processing

References:
1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2004.
2. Lab Manual

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	-	-	-	-	-	-	1
CO2	2	3	2	3	-	-	-	-	-	-	-	-
CO3	1	1	1	2	1	-	-	-	1	-	-	-
CO4	1	3	3	1	2	1	1	-	1	1	-	1

Course Name: Soft Computing Lab
Course Code: IT 694C
Contact: 0:0:3
Credits: 1.5

Prerequisite:
Mathematics, set theory and basic computation.

Course Objective:
To give students knowledge of soft computing theories fundamentals, that is of fundamentals of non-traditional technologies and approaches to solving hard real-world problems, namely of fundamentals of artificial neural networks, fuzzy sets, fuzzy logic and genetic algorithms.

Course Outcome
After completion of this course student will be able to

CO1: Understand importance of soft computing techniques and tools.
CO2: Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
CO3: Implement algorithms based on soft computing techniques.
CO4: Apply soft computing techniques to solve engineering or real life problems.

List of Experiments:

1) Overview of Matrix, Matrix Operations, Giving input to Matrix, Displaying elements of Matrix.
2) Performing Operations on Matrix like Addition, Subtraction, and Multiplication.
3) Performing Transpose Operations on Matrix.
4) Plotting of mathematical functions like log(x), sin(x), cos(x). etc
5) Write a Program in MATLAB to check whether a number is even or odd
6) Write a program in MATLAB to find out the sum of "N" natural numbers.
7) Write a Program in MATLAB to generate the fibonacci series upto N , where N is the desired value input by user
8) Write a MATLAB program to solve MATRIX based problems.
9) Write a MATLAB Program to implement LMS Learning rule.
10) Write a MATLAB program to verify McCulloch OR Function.
11) Write a MATLAB program to verify Hebb's Rule.
12) Write a MATLAB program to implement various Fuzzy Operations. (Eg Union , Intersection , Complement, XOR Operation) For two Fuzzy Set
    P = (0.3/a) + (0.9/b) + (1.0/c) + (0.7/d) + (0.5/e) + (0.4/f) + (0.6/g)
    Q = (1/a) + (1/b) + (0.5/c) + (0.2/d) + (0.2/e) + (0.1/f) + (0.4/g)
13) Write a MATLAB program to implement Max-Min Composition
    For Two Fuzzy sets
    P = [0.3 0.7 ; 0.9 0.4 ; 0.2 0.5]
    Q = [0.4 0.1 0.8;0.3 0.7 0.6]
14) Implementation of Union , Intersection , Complement , XOR Operation and Demorgan's Law
15) Write a MATLAB program to implement MAX Composition for the two set of Matrix

S = [0.3 0.7;0.9 0.4;0.2 0.5]
R = [0.4 0.1 0.8;0.3 0.7 0.6]

16) Write a MATLAB program to implement Deffuzification of α-cut method
For the following fuzzy set
F = (0.6/a) + (0.3/b) + (0.7/c) + (1.0/d).

Projects assigned by instructor to model and solve real world problems.

Text Books:

1. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
3. Genetic Algorithms: Search and Optimization, E. Goldberg

Reference Books:

1. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee PHI.
2. Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.
3. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	2	-	-	-	2	-	1	1
CO2	3	2	2	2	-	-	-	-	1	-	-	1
CO3	2	3	2	2	1	-	-	-	1	-	-	2
CO4	3	2	3	2	2	-	-	-	2	-	-	2

Department: Information Technology

Curriculum Structure & Syllabus

(Effective from 2018-19 admission batch)

7th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Tota**	
A. THEORY								
1	PE	IT701	A. Cloud Computing B. Computer Graphics and Multimedia C. Distributed System D. Machine Learning	3	0	0	3	3
2	PE	IT702	A. Cryptography and Network Security B. Data Warehousing and Data Mining C. Advanced Computer Architecture D. Compiler Design	3	0	0	3	3
3	OE	IT703	A. Sensor Network B. Pattern Recognition C. Internet Technology D. Robotics	3	0	0	3	3
4	OE	IT704	A. Modeling and Simulation B. Microelectronics and VLSI Design C. Mobile Communication D. Operations Research	3	0	0	3	3
Total of Theory							**12**	**12**
B. PRACTICAL								
5	PE	IT 791	A. Cloud Computing Lab B. Computer Graphics and Multimedia C. Distributed System Lab D. Machine Learning using R Programming Lab	0	0	3	3	1.5
6	PROJ	PR 791	Project-VII	0	0	9	9	4.5
7	PROJ*	PR 792	Innovative activities-VI	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
7	MC	MC 781	Seminar/GD/ Presentation Skill/ Foreign Language	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							**27**	**18.5**

*Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head / Event Coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Cloud Computing
Course Code: IT701A
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Networking, Operating System, Web Technology.

Course Objectives:

The objective of the course is to learn and understand Cloud computing in details and identify the usage of it.

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

CO1	Understand the basic architecture of cloud computing
CO2	Apply the knowledge of cloud computing in the evaluation of the computing model
CO3	Analyze different problems in the domain of cloud computing
CO4	Evaluate the different models and solutions provided in the field of cloud computing

Course Content:

Overview of Computing Paradigm [3L]
Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computing Business driver for adopting cloud computing.

Introduction to Cloud Computing [3L]
Cloud Computing (NIST Model) Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers Properties, Characteristics and Disadvantages Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing

Cloud Computing Architecture and Services [4L]
Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service (IaaS) Platform as a Service (PaaS) Software as a Service(SaaS) Deployment Models Public cloud Private cloud Hybrid cloud Community cloud.

Virtualization [5L]
Introduction to virtualization, Different approaches to
virtualization, Hypervisors, Machine Image, Virtual Machine (VM) Resource Virtualization Server, Basics of VMWare, advantages of VMware virtualization,-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a

physical machine, starting and stopping a virtual machine.

Cloud Storage Management [2L]
Storage as a service, Data storage in cloud computing (storage as a service)

Service Oriented Architecture [5L]
Web Services and Primitive SOA: The Web services framework- Services, Service descriptions, messaging with SOAP. Message exchange patterns- Service activity coordination-Atomic transactions- Business activities-Orchestration-Choreography, Service-Oriented Design Introduction to service-oriented design- WSDL-related XML Schema language basics- WSDL language basics- SOAP language basics- Service interface, design tools. WS-BPEL language basics WS Coordination

Service Management in Cloud Computing [5L]
Service Level Agreements (SLAs) Billing And Accounting Comparing Scaling Hardware: Traditionalvs. Cloud Economics of scaling: Benefitting enormously Managing Data Looking at Data, Scalability And Cloud Services Database And Data Stores in Cloud Large Scale Data Processing.

Cloud Security [5L]
Infrastructure Security Network level security, Host level security, Application-level security Data security, Identity And Access Management Access Control Trust, Reputation, Risk Authentication in cloud computing,

Case Study on Open Source and Commercial Clouds [4L]
Google Cloud Microsoft Azure Amazon EC2

Text Books
1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Reference Books:
1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
2. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee, Gillam, Springer, 2012
3. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	3	-		-	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-	-	-
CO4	3	3	3	4	2	-	-	-	-	-	-	-

Course Name: Computer Graphics and Multimedia
Course Code: IT701B
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Computer Programming, Mathematics

Course Objectives:
The objective of the course is to provide comprehensive introduction about computer graphics system, design algorithms and two-dimensional transformations; to make the students familiar with techniques of clipping, three-dimensional graphics and three-dimensional transformations and become familiar with various software programs used in the creation and implementation of multimedia and to gain knowledge about hardware devices and software used.

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

CO1 Understand the basic computer graphics and Identify different media representations of different multimedia data and data formats, windows, clipping and view-ports object representation.
CO2 Analyze geometric, mathematical and algorithmic concepts necessary for programming computer graphics.
CO3 Apply different coding technique for solving real world problems.
CO4 Evaluate the software utilized in constructing computer graphics and multimedia applications.

Course Content:

Overview of Computing Paradigm [3L]
Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing Evolution of cloud computing Business driver for adopting cloud computing.

TWO-DIMENSIONAL GRAPHICS [7L]
Two dimensional geometric transformations, Matrix representations and homogeneous coordinates, composite transformations, Two dimensional viewing, viewing pipeline, viewing coordinate reference frame, window-to-viewport coordinate transformation, Two dimensional viewing functions, clipping operations, point, line, and polygon clipping algorithms.

ILLUMINATION AND COLOR MODELS [7L]
Height sources, basic illumination models, halftone patterns and dithering techniques, Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model, HSV colour model, HLS colour model, colour selection. Output primitives, points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms, Pixel addressing and object geometry.

THREE-DIMENSIONAL GRAPHICS [7L]

Three dimensional concepts, Three dimensional object representations, Polygon surfaces, Polygon tables, Plane equations, Polygon meshes, Curved Lines and surfaces, Spline representations, Bezier curves and surfaces, B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations, Translation, Rotation, Scaling; Three-dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping.

MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING [6L]

Multimedia basics, Multimedia applications, Multimedia system architecture, evolving technologies for multimedia, Defining objects for multimedia systems, Multimedia data interface standards, Multimedia databases. Compression and decompression, Data and file format standards, Multimedia I/O technologies, Digital voice and audio, Video image and animation, Full motion video, Storage and retrieval technologies.

HYPERMEDIA [6L]

Multimedia authoring and user interface, Hypermedia messaging, Mobile messaging, Hypermedia message component, Creating hypermedia message, Integrated multimedia message standards, Integrated document management, Distributed multimedia systems.

Text Books

1. Hearn Baker Carithers, - "Computer Graphics with Open GL", Pearson New International Edition
2. Donald Hearn and Pauline Baker M, ―Computer Graphics", Prentice Hall, New Delhi, 2007
3. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003

Reference Books:

1. Judith Jeffcoate, ―Multimedia in practice: Technology and Applications, PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, ―Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnel, ―Computer Graphics: Theory into Practice, Jones and Bartlett Publishers, 2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan, 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, ―Fundamentals of Computer Graphics, CRC Press, 2010.
6. William M. Newman and Robert F.Sproul, ― Principles of Interactive Computer Graphics, Mc Graw Hill 1978.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	2	1	2	-	1	-	-	-	-
CO2	2	2	1	-	3	-	2	-	1	-	-	-
CO3	2	2	3	3	-	1	-	1	-	-	-	-
CO4	3	1	2	2	2	-	1	-	-	-	-	2

Course Name: Distributed System
Course Code: IT701C
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Operating System, Computer Networking

Course Objectives:
This course introduces the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.

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

CO1	Understand the knowledge of the basic elements and concepts related to distributed system technologies for identify core architectural aspects of distributed systems;
CO2	Identify the main underlying components of distributed systems (such as RPC, file systems) and use those components for building a distributed system;
CO3	Use and apply important methods in distributed systems to support scalability and fault tolerance;
CO4	Demonstrate experience in building large-scale distributed applications.

Course Content:

Introduction to distributed Systems: [2L]
Definition and goals, Hardware and Software concepts, Design issues

Communication in Distributed System: [4L]
Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC

Synchronization in Distributed Systems: [4L]
Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems

Processes and Processors in Distributed Systems: [3L]
Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues.

Distributed File Systems:[4L]
Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study

Distributed Shared Memory: [5L]
Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing.

Naming: [4L]
Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS.

Distributed Web-based Systems: [3L]
Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications

Security: [3L]
Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management

Case Study: [3L]
Oracle Network File System, Google case study

Text Books:
1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,Tim Kindberg, Pearson

Reference Books:
1. Distributed Operating Systems by Andrew S Tannebaum, Pearson

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	2
CO4	2	-	3	2	1	1	-	-	-	-	2	2

Course Name: Machine Learning
Course Code: IT701D
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Probability, Linear Algebra, Multivariable Calculus, Programming

Course Objectives:

- This introductory course gives an overview of many concepts, techniques, and algorithms in machine learning related to classification and regression problems.
- The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work.
- The underlying theme in the course is statistical inference as it provides the foundation for most of the methods covered.
- Make use of Data sets in implementing the machine learning algorithms.

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

CO1	Recognize the characteristics of machine learning that make it useful to real-world problems.
CO2	Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
CO3	Be able to use support vector machines.
CO4	Understand the learning algorithm for hidden Markov model with latent variables.

Course Content:

Basics of Linear Algebra [8L]
Introduction to Machine Learning, linear classification, perceptron update rule, Perceptron convergence, generalization, Maximum margin classification, Classification errors, regularization.

Logistic regression [9L]
Linear regression, estimator bias and variance, active learning, Active learning, non-linear predictions, Regression/Classification Basic methods: Distance-based methods, Nearest Neighbors, Decision Trees, Kernel regression, kernel optimization, Model selection criteria, Description length, feature selection, expectation maximization.

Classification [10L]
Classification problems; decision boundaries; nearest neighbor methods, Probability and classification, Naive Bayes, Bayes' Rule and Naive Bayes Model, Hidden Markov models (HMMs), Bayesian networks, Learning Bayesian networks, Logistic regression, online gradient descent, neural network, support vector machine (SVM), kernel ridge regression.

Ensemble methods [9L]
Bagging, random forests, boosting, Unsupervised learning: clustering, k-means, hierarchical agglomeration, Advanced discussion on clustering, Latent space methods; PCA, Text representations; multinomial models; clustering and latent space models.

Text Books
1. Machine Learning. Tom Mitchell. First Edition, McGraw-Hill.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.

Reference Books:

1. Simon Haykin, Neural Networks and Learning Machines Third Edition, Pearson Publisher.
2. Christopher M. Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics), Springer, 2006.
3. Pattern Classification. Richard Duda, Peter Hart and David Stock. Second Edition Wiley Inter science.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	2	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	3	-
CO3	2	-	-	2	3	-	-	-	2	-	-	-
CO4	1	3	3	-	2	-	-	-	-	-	-	-

Course Name: Cryptography and Network Security
Course Code: IT702A
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisite:
Mathematics, Computer Networking,

Course Objective:
The objective of the course is to study the about how to maintain the Confidentiality, Integrity and Availability and Authenticity of the data over insecure channel by various means and to understand various protocols for network security to protect against the threats in the networks.

Course Outcome:
After completion of this course student will be able to

CO1 Identify computer and network security threats, classify the threats, and understand different technique of cryptography and security.
CO2 Analyze existing cryptographic algorithm, authentication, and key agreement protocols, identify the strength and weaknesses of existing algorithm
CO3 Apply different algorithm and technique of encryption and decryption method over information and security techniques to the existing computer and network platforms.
CO4 Design and develop cryptography algorithm and network technique security product or code, investigate the strong and weak points of the product or code.

Course Content:

Module 1: [4L]
Attacks on Computers & Computer Security Introduction, Need for Security, Security approaches, Principles of Security, Types of attack.

Module 2: [7L]
Cryptography: Concepts & Techniques Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, and Symmetric & Asymmetric key Cryptography, Key Range & Key Size

Module 3: [8L]
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.

Module 4: [5L]
Asymmetric Key Algorithm, Digital Signature and RSA Introduction, Overview of Asymmetric key Cryptography, RSA algorithm, Digital Signature, Basic concepts of Message Digest and

Hash Function (Algorithms on Message Digest and Hash function not required).

Module 5: [5L]
Internet Security Protocols, User Authentication Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication.

Module 6: [4L]
Electronic Mail Security Basics of mail security, Pretty Good Privacy, S/MIME.

Module7: [3L]
Firewall Introduction, Types of firewall, Firewall Configurations.

Textbooks:
1. Cryptography and Network Security, William Stallings, 2nd Edition, Pearson Education Asia
2. Network Security private communication in a public world, C. Kaufman, R. Perlman and M. Speciner, Pearson
3. Cryptography & Network Security: Atul Kahate, TMH.

Reference Books:
1. Network Security Essentials: Applications and Standards by William Stallings, Pearson
2. Designing Network Security, Merike Kaeo, 2nd Edition, Pearson Books
3. Building Internet Firewalls, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition
4. Practical Unix & Internet Security, Simson Garfinkel, Gene Spafford, Alan Schwartz, 3rd Edition, Oreilly

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	-	-	-	-	-	-	-	-	-
CO2	2	3	2	2	1	1	1	-	-	-	-	-
CO3	2	2	3	1	2	-	-	-	-	-	-	-
CO4	2	3	2	2	3	1	1	-	-	-	-	3

Course Name: Data Warehousing and Data Mining
Course Code: IT702B
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Database Management System, Mathematics

Course Objectives:
The student should be made to be familiar with the concepts of data warehouse and data mining and be acquainted with the tools and techniques used for knowledge discovery in databases.

Course Outcome:
After completion of this course student will be able to
CO1 Understand the basic concepts of data warehousing and data mining.
CO2 Apply the various mining algorithms for extract knowledge from data warehouse.
CO3 Analyze different data warehousing methodologies and data mining algorithms
CO4 Design a data warehouse

Course Content:

Data Warehousing:[7L]
Data Warehousing Components, Building A Data Warehouse, Mapping The Data Warehouse To A Multiprocessor Architecture, DBMS Schemas For Decision Support, Data Extraction, Cleanup, And Transformation Tools, Metadata.

Business Analysis: [7L]
Reporting And Query Tools And Applications, Tool Categories, The Need For Applications, Cognos Impromptu, Online Analytical Processing (OLAP), Need, Multidimensional Data Model, OLAP Guidelines, Multidimensional Versus Multi-relational OLAP, Categories of Tools, OLAP Tools And The Internet.

Data Mining: [7L]
Introduction, Data Types, Data Mining Functionalities, Interestingness of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration Of A Data Mining System With A Data Warehouse, Issues, Data Pre-processing.

Association Rule Mining and Classification: [7L]
Mining Frequent Patterns, Associations And Correlations, Mining Methods, Mining Various Kinds Of Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification And Prediction, Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification By Back Propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction.

Clustering and Trends in Data Mining: [7L]

Cluster Analysis, Types Of Data, Categorization Of Major Clustering Methods, K-Means, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint, Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

Text Books:

1. Alex Berson And Stephen J.Smith, "Data Warehousing, Data Mining And OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han And Micheline Kamber, "Data Mining Concepts And Techniques", Third Edition, Elsevier, 2012.

Reference Books:

1. Data Mining, Practical Machine Learning Tools and Techniques, Third Edition; Ian H.
2. Witten, Eibe Frank, Mark A. Hall
3. Data Warehousing, Data Mining, & OLAP – Second Edition by Alex Berson and
4. Stephen J. Smith, TataMcGraw Hill Education
5. Data warehouse Toolkit by Ralph Kimball, Wiley India
6. Data Warehousing in the real world; Anahory; Pearson Education.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	-	1	-	-	-	-	-	-	-	-
CO3	2	1	2	1	3	-	-	-	-	-	-	-
CO4	2	2	3	2	2	2	-	-	-	-	-	2

Course Name: Advanced Computer Architecture
Course Code: IT702C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Mathematics**,** Computer Organization and Architecture

Course Objectives:

The objective of the course is to learn technical competence in computer architecture and performance comparisons of modern and high-performance computer systems

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

CO1	Understand the operations of modern and high-performance computer systems
CO2	Identify cache and memory related issues in multi-processors architecture
CO3	Analyze performance of different ILP techniques of computer architecture
CO4	Evaluate performance of different architectures with respect to various parameter & Design the mechanism by which the performance of the system is enhanced

Course Content:

Module 1: [7L]
Fundamentals of Computer Design: Review of Fundamentals of CPU, Memory and I/O, Trends in technology, power, energy and cost, Dependability, Performance Evaluation.

Module 2: [8L]
Instruction Level Parallelism: ILP concepts, Pipelining overview, Compiler Techniques for Exposing ILP, Dynamic Branch Prediction, Dynamic Scheduling, Multiple instruction Issue, Hardware Based Speculation, Static scheduling, Multi-threading, Limitations of ILP, Case Studies.

Module 3: [7L]
Data Level Parallelism: Vector architecture, SIMD extensions, Graphics Processing units, Loop level Parallelism.

Module 4: [7L]
Thread Level Parallelism: Symmetric and Distributed Shared Memory Architectures, Performance Issues, Synchronization, Models of Memory Consistency, Case studies: Intel i7 Processor, SMT & CMP Processors

Module 5: [7L]

Memory and I/O: Cache Performance, Reducing Cache Miss Penalty and Miss Rate, Reducing Hit Time, Main Memory and Performance, Memory Technology.Types of Storage Devices, Buses, RAID, Reliability, Availability and Dependability, I/O Performance Measures.

Text Books:

1. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", Mc Graw-Hill International Edition, 2000.
2. Sima D, Fountain T and Kacsuk P, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

Reference Books:

1. Parallel Computer Architecture: D. Culler, J.P.Singh, A.Gupta, Elsevier

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	1
CO2	2	2	1	-	-	-	-	-	-	-	-	-
CO3	3	2	2	1	2	-	-	-	-	-	-	-
CO4	2	3	3	2	2	-	-	-	-	-	-	1

Course Name: Compiler Design
Course Code: IT702D
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Mathematics, Computer Programming and Automata basic concept.

Course Objectives:

To understand the knowledge of parsing, lexical and syntax analysis.
To analyze various parsing techniques, code optimization.
To apply the knowledge about the compilers they practically use.
To learn how the parse trees are generated, errors are handled and code is optimized.

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

CO1	To understand the knowledge of parsing, lexical and syntax analysis.
CO2	To analyze various parsing techniques, code optimization.
CO3	To apply the knowledge about the compilers they practically use.
CO4	To learn how the parse trees are generated, errors are handled and code is optimized.

Course Content:

Introduction to Compilers [3L]
Compilers and translators need of translators, structure of compiler: Phases of compilation and overview, Compiler construction tools

Lexical Analysis (scanner) [5L]
Role of lexical analyzer, design of lexical analyzer, regular expressions, Specification and recognition of tokens, input buffering A language specifying lexical analyzer. Finite automata, conversion from regular expression to finite automata, and vice versa, minimizing number of states of DFA, Implementation of lexical analyzer, scanner generator (lex, flex).

Syntax Analysis (Parser) [9L]
Role of parsers, definition of parsing, Shift- reduce parsing, operator precedence parsing, predictive parsing. Context-free language and grammar, push-down automata, LL(1) grammar and top-down parsing, operator grammar, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator, Canonical LR parser.

Semantic Analysis [4L]
Attribute grammar, syntax directed definition, evaluation and flow of attribute in a syntax tree.

Symbol Table [6L]
Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Intermediate Code Generation [5L]
Translation of different language features, different types of intermediate forms. Syntax directed definition, construction of syntax trees, syntax directed translation scheme, and implementation of syntax directed translation, three address code, quadruples and triples.

Code optimization and target code generation [4L]
Code improvement local optimization, global optimization, loop optimization, peep-hole optimization.

Text Books

1. Compilers Principle, Techniques & Tools - Alfread V. AHO, Ravi Sethi& J.D. Ullman; Addison Wesley.
2. Compiler Design by O.G. Kakde, Laxmi Publ.

Reference Books

1.Theory and practice of compiler writing, Tremblay & Sorenson, Mc. Graw Hill.
2. System software by Dhamdae, MGH.
3. Keith D. Cooper and Linda Torczon, Engineering a Compiler, Elsevier.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	3	-	-	-	2	-	1	2
CO2	3	1	2	2	-	-	-	-	1	-	-	1
CO3	3	1	2	-	2	-	-	-	1	-	-	2
CO4	3	2	1	1	1	-	-	-	2	-	-	1

Course Name: Sensor Network
Course Code: IT703A
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Course Objective:

1. To deal with various types of Sensors & Transducers and their working principle.
2. To deal with Resistive, Capacitive and Inductive transducers.
3. To deal with some of the miscellaneous transducers.
4. To know the overview of different advance sensors.

Course Outcome:
After completion of this course student will be able to

CO1 Illustrate the fundamental principles of various types of sensors.
CO2 Illustrate the different types of transducers available.
CO3 Employ appropriate sensors to perform engineering tasks and scientific researches
CO4 Design of different Sensors.

Course Content:
Module I: [12L]
Introduction & Characteristics of Transducers
Introduction to sensors and transducers, Measurement system, Principles of sensing & transduction, Classification of sensors, Static characteristics, Dynamic characteristics: Zero, first order and second order measurement system, Response to impulse, step, ramp and sinusoidal inputs, sensitivity calculation, error estimation.

Resistive Sensing Element
Potentiometer: Loading effect, Strain gauge: theory, types, temperature compensation, applications: force, velocity and torque measurements.

Inductive Sensing Element
Self-inductive transducer, Mutual inductive transducers, Variable Reluctance type, Linear Variable Differential Transformer (LVDT): construction, Characteristic Curve, application: LVDT Accelerometer, LVDT displacement sensors.

Module II: [8L]
Capacitive Sensing Element
Capacitive transducer: Variable Area Type, Variable distance type, Variable Permittivity type, calculation of sensitivities, applications.

Piezoelectric & Piezoresistive Sensing Element
Piezoelectric effects, charge and voltage coefficients, crystal model, materials, natural and synthetic types – their comparison, force and stress sensing, piezoelectric accelerometer,

piezoresistive sensor. Tachometers: Stroboscopes, Encoders, seismic accelerometer, Measurement of vibration, Proximity switches, Load cells: pneumatic, piezoelectric, elastic and magneto-elastic types - their mounting.

Module III: [8L]
Optical Sensors
Light Dependent Resistor, Optocoupler, Photodiode, Phototransistor, Photomultiplier tube, solar cell.

Magnetic Sensors
Sensors based on Villari effect for assessment of force, torque, rpm meters, Hall effect and Hall drive, performance characteristics

Radioactive sensors
Gieger counter, proportional counter, Scintillation detection, Ionization chamber.

Module IV: [8L]
Miscellaneous Sensors
IC temperature Sensor, Electrochemical Gas sensors, Fibre optic sensors- Thick film technology- MEMS sensors- Nano sensors- Sensors for intelligent systems- Introduction to Smart sensors and Sensor network.

Text Books:

1. Patranabis. D, “Sensors and Transducers”, Prentice Hall of India, 1999.
2. John Brignell,”Intelligent Sensor Systems”, CRC Press; 2nd Revised edition edition,1996.

Reference Books:

1. Doebelin. E.A, “Measurement Systems – Applications and Design”, Tata McGraw Hill, New York, 2000.
2. John. P, Bentley, “Principles of Measurement Systems”, III Edition, Pearson Education, 2000.
3. Murthy.D.V.S, “Transducers and Instrumentation”, Prentice Hall of India, 2001.
4. Sawhney. A.K, “A Course in Electrical and Electronics Measurements and Instrumentation”, 18th Edition, DhanpatRai& Company Private Limited, 2007.

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	2	-	-	-	-	-	-	-	-
CO2	1	1	-	3	2	2	1	-	-	-	-	-
CO3	1	2	3	1	2	2	-	-	-	-	-	-
CO4	2	2	2	1	3	-	-	-	-	-	-	2

Course Name: Pattern Recognition
Course Code: IT703B
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Fundamentals of probability and linear algebra.

Course Objectives:
The objective of this course is to learn the fundamentals of pattern recognition and its relevance to classical and modern problems. The main objective is to be able to identify where, when and how pattern recognition can be applied.

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

CO1	Understand basic concepts in pattern recognition
CO2	Formulate and describe various applications in pattern recognition
CO3	Gain knowledge about state-of-the-art algorithms used in pattern recognition research
CO4	Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis
CO5	Demonstrate successful applications to process and analyze images, and to make automatic decisions based on extracted feature information

Course Content:

Introduction to Pattern Recognition [5L]
Importance of Pattern Recognition, Features, Feature Vectors, and Classifiers, Supervised, Unsupervised, and Semi-Supervised Learning

Classifiers Based on Bayes Decision Theory [10L]
Introduction, Bayes Decision Theory: Minimizing the Classification Error Probability, Minimizing the Average Risk, Discriminant Functions and Decision Surfaces, Bayesian Classification for Normal Distributions: The Gaussian Probability Density Function, The Bayesian Classifier for Normally Distributed Classes, Decision Hyper planes, Minimum Distance Classifiers, Estimation of Unknown Probability Density Functions: Maximum Likelihood Parameter Estimation, Maximum a Posteriori Probability Estimation, Bayesian Inference, Maximum Entropy Estimation, Mixture Models, T he Expectation Maximization (EM) Algorithm, Application to the Mixture Modelling Problem, Nonparametric Estimation, The Naive-Bayes Classifier, The Nearest Neighbour Rule, Bayesian Networks, Problems.

Linear Classifiers [10L]
Introduction, Linear Discriminant Functions and Decision Hyperplanes, The Perceptron Algorithm: Proof of the Perceptron Algorithm Convergence, Variants of the Perceptron Algorithm, The Perceptron, The Pocket Algorithm, Kesler's Construction, Least Squares Methods: Mean Square Error Estimation, Multiclass Generalization, Stochastic Approximation

and the LMS Algorithm, Sum of Error Squares Estimation, Mean Square Estimation Revisited: Mean Square Error Regression, MSE Estimates Posterior Class Probabilities, The Bias–Variance Dilemma, Logistic Discrimination, Support Vector Machines: Separable Classes, Nonseparable Classes, The Multiclass Case, *v*-SVM, Support Vector Machines: A Geometric Viewpoint, Reduced Convex Hulls, Problems

Feature Selection [10L]

Introduction, Preprocessing: Outlier Removal, Data Normalization, Missing Data, The Peaking Phenomenon, Feature Selection Based on Statistical Hypothesis Testing: Hypothesis Testing Basics- The Known Variance Case, The Unknown Variance Case, Application of the *t*-Test in Feature Selection. The Receiver Operating Characteristics (ROC) Curve, Class Separability Measures, Divergence, Chernoff Bound and Bhattacharyya Distance, Scatter Matrices, Feature Subset Selection: Scalar Feature Selection, Feature Vector Selection, Suboptimal Searching Techniques, Optimal Feature Generation, Neural Networks and Feature Generation/Selection, Support Vector Machines: A Last Touch, The Bayesian Information Criterion

Text Books

1. Pattern Recognition, S.Theodoridis and K.Koutroumbas, 4th Ed., Academic Press, 2009

Reference Books:

1. Pattern Recognition and Machine Learning, C.M.Bishop, Springer, 2006
2. Pattern Classification, R.O.Duda, P.E.Hart and D.G.Stork, John Wiley, 2001

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	2	2	2	1	-	1	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	2	2	-	-	1	-	-	-	-	2

Course Name: Internet Technology
Course Code: IT703C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:

Networking, Web Application Development

Course Objectives:

Understanding the architecture of enterprise application and developing enterprise applications.

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

CO1	Understand advanced networking concepts and internet and web application architectures
CO2	Apply and Analyze d different advanced routing protocols being used in web application development
CO3	Evaluate and Analyze different solution available in the field of networking and web application development such as http and the World Wide Web, HTML, and Java Scripts;
CO4	Implement solution for different critical network related issues as; implementing the design using the client/server model, testing and documenting the solutions developed.

Course Content:

Module 1: An Overview on Internet [2L]
Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet.

Module 2: Internet Address: [6L]
Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing. IPV6, Conversion from IPV4 to IPV6

Module 3: Internet Protocol: [4L]
The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).

Module 4: Routing: [4L]
The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway

Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.

Module 5: Internet Servers: [4L]
DNS, DHCP Servers, FTP, TELNET, E-Mail

Module 6: Firewall & Networking [6L]
Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.

Module 7: ASP .NET: [10L]
Architecture and Component, Page life cycle, Control: Check Box, Radio Button, List, Label. Session Management, Web Form Handling, Accessing database, Hosting of Web application.

Text Books
1. Computer Networks and Internets - Douglas E. Comer; PE.

Reference Books:
1. Communication Networks - Leon-Garcia-Widjaja; TMH.
2. Internetworking with TCP / IP - Douglas E .Comer; PE.
3. TCP/IP protocol suite - Forouzan Behrouz A; TMH.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	2	-	-	-	-	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	-	1
CO4	3	3	3	3	3	-	-	-	-	-	2	3

Course Name: Robotics
Course Code: IT703D
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Mathematics, C/C++.

Course Objectives:

The student should be made to understand the basic concepts associated with the design and Functioning and applications of Robots

Course Outcome:
After completion of this course student will be able to

CO1 Understand the math and computational methods necessary to model and solve kinematic problems involving robot manipulators and mobile robots
CO2 Familiarize with the most common robot sensors and understand fundamental sensor processing algorithms and their engineering trade-offs
CO3 Analyze the computational challenges inherent in fundamental mobile robotic tasks
CO4 Develop simple robot control systems integrating perception, planning, and action

Course Content:

Module 1 [3L]
Introduction -- brief history, types, classification and usage, Science and Technology of robots, Some useful websites, textbooks and research journals.

Module 2 [6L]
Elements of robots – links, joints, actuators, and sensors
Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters, Examples of D-H parameters and link transforms, different kinds of actuators – stepper, DC servo and brushless motors, model of a DC servo motor, Types of transmissions, Purpose of sensors, internal and external sensors, common sensors – encoders, tachometers, strain gauge-based force-torque sensors, proximity and distance measuring sensors, and vision.

Module 3 [5L]
Kinematics of serial and parallel robots
Introduction, Direct and inverse kinematics problems, Examples of kinematics of common serial manipulators, workspace of a serial robot, Inverse kinematics of constrained and redundant robots, Degrees-of-freedom of parallel mechanisms and manipulators, Active and passive joints, Constraint and loop-closure equations, Direct kinematics problem, Mobility of parallel manipulators, Inverse kinematics of parallel manipulators and mechanisms, Direct kinematics of Gough-Stewart platform.

Module 8 [3L]
Velocity and static analysis of robot manipulators
Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom,

Module 9 [3L]
Dynamics of serial and parallel manipulators
Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation (direct and inverse) of dynamic equations of motion, Examples of a planar 2R and four-bar mechanism, Recursive dynamics,

Module 10 [3L]
Motion planning and control
Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non-linear model-based control schemes, Simulation and experimental case studies on serial and parallel manipulators, Control of constrained manipulators, Cartesian control, Force control and hybrid position/force control, Advanced topics in non-linear control of manipulators.

Module 11 [4L]
Control considerations, Hardware Architecture, Hardware for joint controllers, Computational Speed, Robot Language, Robot Programming.

Text Books:

1. K.S Fu R.C . CSG Lee-Robotics Control, Sensing, Vision &Intelligence,McGraw-Hill.

Reference Books:

2. M.P. Groover, M.Weins,R.N. Nagel,N.C. Odrey –Industrial Robotics, McGraw Hill
3. S.Sitharama Iyengar, Alberto Elefes -Autonomous Mobile Robots Control, Planning&
4. Achitecture, IEEE Computer Society Press

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	-	1	-	-	-	-	-	-	-	-
CO3	2	1	2	1	3	-	-	-	-	-	-	-
CO4	2	2	3	2	2	2	-	-	-	-	-	2

Course Name: Modeling and Simulation
Course Code: IT704A
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisite:
Programming and Data Structures, Discrete Mathematics and Probability, Numerical Analysis, Basic Electronics

Course Objective:
The objective of the course is to conceptualize basics of simulation and modeling for applying dynamic and probability concept of simulation and discrete simulation system; to enable students to analyze Continuous Uniformly Distributed Random Numbers and to assess the strengths and weaknesses of various methods and to analyze their behavior.

Course Outcome
After completion of this course student will be able to

CO1: Summarize the issues in Modeling and Simulation
CO2: Explain the System Dynamics & Probability concepts in Simulation.
CO3: Solve the Simulation of Queuing Systems
CO4: Analyze the Simulation output
CO5: Identify the application area of Modeling and Simulation and apply in the corresponding fields

Course Content:

Module 1: Introduction to Modeling and Simulation: [10L]
Nature of Simulation. Systems, Models and Simulation, Continuous and Discrete Systems, system modeling, Components of a simulation study, Introduction to Static and Dynamic System simulation , Application areas, Advantages, Disadvantages and pitfalls of Simulation.

Module 2: System Dynamics & Probability concepts in Simulation: [10L]
Exponential growth and decay models, Generalization of growth models, Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

Module 3: Simulation of Queuing Systems and Discrete System Simulation: [10L]
Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events, Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization, Recording Distributions and Transit

times.

Module 4: Analysis of Simulation output: [5L]

Sensitivity Analysis, Validation of Model Results

Text Books:

1. Geoffrey Gordon, "System Simulation", PHI.
2. Jerry Banks, John Carson, B.L.Nelson and D.M.Nicol " Discrete Event System Simulation", Fifth Edition, Pearson
3. Narsingh Deo, 1979, System Simulation with Digital Computers, PHI.

Reference Books:

1. Averill M. Law and W.David Kelton, "Simulation Modelling and Analysis", Third Edition, McGraw Hill
2. J. N. Kapoor.. Mathematical Modelling, Wiley eastern Limited.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	3	-	-	-	-	-	-	2
CO3	3	3	2	2	3	-	-	-	-	-	-	2
CO4	3	3	2	2	3	-	-	-	-	-	-	2
CO5	2	3	2	2	3	-	-	-	-	-	-	2

Course Name: Microelectronics and VLSI Design
Course Code: IT704B
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Digital Electronics, Microprocessor, Computer Architecture.

Course Objectives:
The course is designed to give the student an understanding of the different design steps required to carry out a complete digital VLSI design in silicon.

Course Outcome:

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

CO1 Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect
CO2 Create models of moderately sized CMOS circuits that realize specified digital functions
CO3 Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects
CO4 Understand of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes
CO5 Complete a significant VLSI design project having a set of objective criteria and design constraints

Course Content:

Introduction to VLSI Design: [10L]

VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only), Types of VLSI Chips (Analog & Digital VLSI chips, General purpose, ASIC, PLA, FPGA), Design principles (Digital VLSI – Concept of Regularity, Granularity etc), Design Domains (Behavioral, Structural, Physical), YChart, Digital VLSI Design Steps. MOS structure: E-MOS & D-MOS, Charge inversion in E-MOS, Threshold voltage, Flat-band voltage, Potential balance & Charge balance, Inversion, MOS capacitances.

Micro-electronic Processes for VLSI Fabrication:[10L]

Silicon Semiconductor Technology- An Overview, Wafer processing, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion, Cleaning, Etching, Photo-lithography – Positive & Negative photo-resist Basic CMOS Technology (Steps in fabricating CMOS), Basic n-well CMOS process, p-well CMOS process, Twin tub process, Silicon on insulator Layout Design

Rule: Stick diagram with examples, Layout rules.

Three Terminal MOS Structure: [10L]

Body effect. Four Terminal MOS Transistor: Drain current, I-V Characteristics. Current-voltage equations (simple derivation). Scaling in MOSFET: Short Channel Effects, General scaling, Constant Voltage & Field scaling. CMOS: CMOS inverter, Simple Combinational Gates - NAND gate and NOR Gate using CMOS.

Hardware Description Language: [5L]

VHDL or Verilog Combinational & Sequential Logic circuit Design.

Text Books:

1. CMOS Digital Integrated Circuit, S.M.Kang & Y.Leblebici, TMH.
2. Modern VLSI Design, Wayne Wolf, Pearson Education.

Reference Books:

1. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.
2. Advance Digital Design Using Verilog , Michel D. Celliti, PHI
3. VHDL, Bhaskar, PHI.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	2	-	-	-	-	-	-	-	-
CO2	2	-	3	2	1	-	-	-	-	-	-	-
CO3	2	3	-	2	1	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	2	-	-	-	2	-	-	2	2	2	-	2

Course Name: Mobile Communication
Course Code: IT704C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Computer Networking, Operating System, Mathematics.
Course Objectives:

The objective of the course is to presents the basic principles of mobile communication systems, analysis the operation of mobile communications system with wireless media and Ad-Hoc network.

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

CO1	Understand the basic of Mobile Communication system & its generation in wireless network
CO2	Analyze the network infrastructure requirements to support mobile devices and users.
CO3	Apply the knowledge to determine the functionalities, techniques, protocols and architecture employed in wireless local area networks, cellular networks, and performs basic requirements analysis.
CO4	Evaluate the techniques and technologies to design and communicate a simple mobile application for smaller devices.

Course Content:

Overview: [5L]

Introduction to Mobile Communication – Applications of Mobile Communication - Generations of Mobile Communication Technologies-MAC Protocols – SDMA- TDMA- FDMA- CDMA Transmission Medium, Need, Advantages, Disadvantages. Transmission Media, Advantages & Disadvantages.

Global System for Mobile Communication & General Packet Radio Services: [4L]

Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling. GPRS Architecture, GPRS Network Nodes.

Wireless LANs [6L]
Characteristics, IEEE 802.11: Architecture, Physical Layer, MAC Layer, And MAC Management, 802.11a and 802.11b. HIPERLAN: History, WATM, BRAN and HiperLAN2.Bluetooth: Architecture, Radio Layer, Baseband Layer, Link Management Protocol, L2CAP and Security.

Network Layer: [10L]
Introduction, Traditional TCP: Congestion Control, Slow Start, Fast Retransmit and Implications of Mobility. Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP and Fast Retransmit. Mobile IP: Introduction, IP Packet Delivery, Agent Discovery, Registration, Tunneling and Encapsulation, Optimizations and Reverse Tunneling. Mobile Ad-hoc Networks: Routing, Destination Sequence Distance Vector, Dynamic Source Routing and Alternative Metrics.

Cellular Networks: [8]
Cellular Concept, Frequency Reuse, Channel Allocation Management, Call Setup, Location Management, Cell Handoffs, Interference: Co-channel and Adjacent Interference. System Capacity, Improving Cell Capacity and Coverage: Cell Splitting, Sectoring, Repeaters and Microcell Zone Concept

Wireless Application Protocol [3L]
The Mobile Internet standard, WAP Gateway and Protocols,

Text Books:
J. Schiller, Mobile Communications, Addison –Wesley, 2003

Reference Books:
1. T. S. Rapport, Wireless Communications, Principle and Practices
2. Forouzan, Data Communications and Networking, TMH

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	3	-	-	2	2	-	-	-	-	-	-	-
CO2	1	2	-	2	3	-	-	-	-	-	-	-
CO3	1	-	3	3	2	-	-	-	-	-	-	-
CO4	3	2	2	-	3	-	-	-	-	-	-	2

Course Name: Operations Research
Course Code: IT704D
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Basic Knowledge of Function, plotting of Equation and inequations, Formulation of Mathematical Problem.

Course Objectives:

The objective of the course is to develop models and analyze the model using different techniques, decision making under uncertainty and risk.

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

CO1 Design knowledge-base representation models
CO2 Analyze the performance of rule-based-systems
CO3 Develop rule-based expert systems and planning tools
CO4 Implement heuristic search algorithms for real life problem solving

Course Content:

Linear Programming Problem [7L]:
Basics of Linear Programming Problem(LPP) and its Applications. General Mathematical Formulation of LPP; Definitions: Convex set, Solution, Feasible Solution, Basic and Non-Basic Variables, Basic Feasible Solution, Degenerate and Non-Degenerate solution, Optimum/Optimal Solution; Solution of LPP by Graphical Analysis/Method, Simplex Method, Charnes' Big M-Method; Duality Theory.

Module II [5L]:
Transportation Problem, Assignment Problem.

Network Optimization Models [6L]:
CPM / PERT (Arrow network, Time estimates, earliest expected time, latest allowable occurrence time, latest allowable occurrence time and stack. Critical path, Probability of meeting scheduled date of completion of project. Calculation of CPM network. Various floats for activities.

Game Theory [6L]:
Introduction, Two 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.

Sequencing [4L]:
Two men two machines, Three Men Two Machines.

Queuing Theory [7L]:
Introduction and Basic Structure of Queuing Theory; Basic Definitions and Notations. Birth-and-Death Model (Poisson / Exponential distribution); Poisson Queue Models: (M/M/1):(∞/FIFO) and (M/M/1):(N/FIFO) and Problems. Introduction to Stochastic Processes, Markov Process with Discrete State Space: Poisson Process, Applications in Stochastic Models (Queuing System and Models).

Text Books

1. Operations Research by Kanti Swaroop and P.K. Man Mohan, Sultan Chand and Sons
2. Linear Programming and Theory of Games by P.M.Karak, ABS Publishing House
3. Operations Research, Kalavati,VIKAS
4. Operations Research, Humdy A Taha,PHI / Pearson
5. Stochastic Processes by J. Medhi, New Age International Publishers.

Reference Books:

1. Operations Research by P.K. Gupta & Hira, S.Chand
2. Operations Research by V.K. Kapoor

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	2	-	-	-	-	-	-	-	-	-
CO2	-	3	-	2	-	-	-	-	-	-	-	-
CO3	-	-	3	-	1	-	-	-	-	-	-	-
CO4	-	1	-	-	-	1	2	2	-	-	-	-

Course Name: Cloud Computing Lab
Course Code: IT791A
Contact: 0:0:3
Credit: 1.5

Prerequisites:
Networking, Operating System, Web Technology.

Course Objectives:

The objective of the course is to learn and apply the concept of cloud computing in real world application

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

CO1	Apply the concept to solve practical application
CO2	Analyzing different service in cloud computing
CO3	Evaluate different available service with Amazon and Azure
CO4	Design Cloud based application

Course Content:

Module 1: Virtual Machine :
Creation of vpc, vnet, virtual machine, Private and Public IP configuration

Module 2: Application Development:
Implementation of SOAP Web services in JAVA Applications.
Use Azure to launch the web applications. Test Simple Application

Module 3: Security:
Identity and access management , Multifactor Authentication.

Module 4 : Bot and AI service:
Test AWS and AZURE Bot and AI services

Text Books
1. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

Reference Books:
1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
2. https://aws.amazon.com/
3. https://azure.microsoft.com/en-us/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	3	-		-	-	-	-	-	-	-	-
CO2	3	3	3	2	**2**	-	-	-	-	-	-	-
CO3	**3**	3	3	2	**3**	-	-	-	-	-	-	-
CO4	**3**	3	3	4	2	-	-	-	-	-	-	-

Course Name: Computer Graphics and MULTIMEDIA Lab
Course Code: IT791B
Contact: 0:0:3
Credit: 1.5

Prerequisites:
Computer Programming, Mathematics

Course Objectives:
The objective of the course is to become familiar with graphics programming and expertise in text, image, audio, video enhancement and manipulation using different software/tools through projects.

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

CO1	Analyze the effects of scale and use on both presentation and lower level requirements
CO2	Apply 3D graphical scenes using open graphics library suits
CO3	Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.
CO4	Implement image manipulation, enhancement, and basic transformations on objects and clipping algorithm on lines.

Course Content:

Module 1: Computer Graphics

- Implementation of Algorithms for drawing 2D Primitives – Line (DDA, Bresenham) – all slopes, Circle (Midpoint)
- 2D Geometric transformations – Translation, Rotation Scaling , Reflection Shear, Window-Viewport
- Composite 2D Transformations
- Line Clipping
- 3D Transformations - Translation, Rotation, Scaling.
- 3D Projections – Parallel, Perspective.
- Creating 3D Scenes.

Module 2: Multimedia Application

- Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.
- 2D Animation – To create Interactive animation using any authoring tool.
- VLC and Video Streaming
- HTML 5 and media publishing with Projects based learning.

- Web document creation using Dreamweaver.
- Creating Animation using Flash.

Text Books

1. Hearn Baker Carithers, - "Computer Graphics with Open GL", Pearson New International Edition

Reference Books:

1. Donald Hearn and Pauline Baker M, ―Computer Graphics", Prentice Hall, New Delhi, 2007
2. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003.

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	3	2	3	1	2	-	-	-	-	-	-
CO2	1	2	3	2	2	-	-	-	-	-	-	-
CO3	2	3	2	1	1	-	-	-	-	-	-	1
CO4	1	1	1	1	1	-	-	-	-	-	-	2

Course Name: Distributed System
Course Code: IT791C
Contact: 0:0:3
Credit: 1.5

Prerequisites:
Operating System, Computer Networking
Course Objectives:
This course introduces the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.

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

CO1	Understand the knowledge of the basic elements and concepts related to distributed system technologies for identify core architectural aspects of distributed systems;
CO2	Identify the main underlying components of distributed systems (such as RPC, file systems) and use those components for building a distributed system;
CO3	Use and apply important methods in distributed systems to support scalability and fault tolerance;
CO4	Demonstrate experience in building large-scale distributed applications.

Course Content:

The following programs may be developed preferably on 'UNIX' platform:-
1. Simulate the functioning of Lamport's Logical Clock in 'C'.
2. Simulate the Distributed Mutual Exclusion in 'C'.
3. Implement a Distributed Chat Server using TCP Sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'
5. Implement 'Java RMI' mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in 'C'.
7. Implement CORBA mechanism by using 'C++' program at one end and 'Java program on the other.

Text Books:

1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,TimKindberg, Pearson

Reference Books:
1. Distributed Operating Systems by Andrew S Tannebaum, Pearson

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	3	-		-	-	-	-	-	-	-	-
CO2	3	3	3	2	**2**	-	-	-	-	-	-	-
CO3	**3**	3	3	2	**3**	-	-	-	-	-	-	-
CO4	**3**	3	3	4	2	-	-	-	-	-	-	-

Course Name: Machine Learning using R Programming Lab
Course Code: IT791D
Contact: 0:0:3
Credit: 1.5

Prerequisites:
Probability, Linear Algebra, Calculus, R Programming.

Course Objectives:

This course provides the knowledge to Install and use R for simple programming tasks, extended R libraries and packages. Which helps to Develop R Programs using Looping Constructs and R mathematical functions that can be used for data exploration in R.

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

CO1	Master the use of the R interactive environment
CO2	Develop Loop constructs in R
CO3	Use R for descriptive statistics
CO4	Use R for inferential statistics

Course Content:

Experiments in R and Machine Learning

1. Write R program to calculate the square root of 2345, and perform a log2 transformation on the result.

2. Print the 1 to10 numbers in reverse order in R programming language.

3. Find 10 random numbers between 0 and100 in R programming language.

4. Compute the truth table for logical AND in R Programming language.

5. Use R to find all the numbers between 1 and n which are multiples of some m.

6. Write a program in R to check the leap year or not.

7. Find the Factorial of a given Number in R.

8. Program to check whether the given number is Prime or not in R.

9. Check whether the given number is Arm strong number or not.

10. Program to display multiplication table in R.

11. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

12. Write a program to implement the Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

13. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

14. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

Text Books

1. The Art of R Programming, Norman Matloff, Cengage Learning.
2. R for Everyone, Lander, Pearson.

Reference Books:

1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action, Rob Kabacoff, Manning.

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	-	-	-	-	-	-	-
CO2	-	2	2	1	2	-	-	-	-	-	-	-
CO3	-	3	1	2	1	-	-	1	-	-	-	-
CO4	1	1	3	-	2	-	-	-	-	1	-	-

Department: Information Technology

Curriculum Structure & Syllabus

(Effective from 2018-19 admission batch)

8th Semester								
Sl No	**Course Code**	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
				L	**T**	**P**	**Total**	
A. THEORY								
1	HS	HU804	Principles of Management	2	0	0	2	2
2	OE	IT 801	A. Block Chain B. Big Data Analytics C. Virtual Reality D. Natural Language Processing	3	0	0	3	3
3	OE	IT 802	A. Bio-Informatics B. Embedded System C. Internet of Things (IoT) D. Deep Learning	3	0	0	3	3
4	OE	IT 803	A. Data Sciences B. Cyber Law and IPR C. Cluster and Grid Computing D. Entrepreneurship Development	3	0	0	3	3
Total of Theory							**11**	**11**
B. PRACTICAL								
5	PROJ	PR 891	Project-VIII	0	0	9	9	4.5
C. MANDATORY ACTIVITIES / COURSES								
6	MC	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							**23**	**15.5**

Course Name: Principles of Management
Course Code: HU804
Contact: 2:0:0
Total Contact Hours: 24
Credit: 2

Prerequisites:
Nil

Course Objectives:

To understand and apply management principles in to manufacturing organization.
To understand concepts of work study, method study, and Quality control method to improve performance of any organization.
.

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

CO1	Recall and identify the relevance of management concepts
CO2	Apply management techniques for meeting current and future management challenges faced by the organization
CO3	Compare the management theories and models critically to solve real life problems in an organization
CO4	Apply principles of management in order to execute the role as a manager in an organization.

Course Content:

Management Concepts [4L]
Definition, roles, functions and importance of Management, Evolution of Management thought-contribution made by Taylor, Fayol, Gilbreth, Elton Mayo, McGregor, Maslow

Planning and Control [4L]
Planning: Nature and importance of planning, -types of planning, Levels of planning - The Planning Process. – MBO, SWOT analysis,McKinsey's7S Approach.
Organising for decision making: Nature of organizing, span of control, Organisational structure –line and staff authority.
Control: Basic control process, control as a feedback system, Feed
Forward Control, Requirements for effective control

Group dynamics & Leadership [4L]
Group dynamics: Types of groups, characteristics, objectives of Group Dynamics.
Leadership: Definition, styles & functions of leadership, qualities for good leadership,

Theories of leadership

Work Study and work measurement [4L]:
Definition of work study, Method Study Steps, Tools and Techniques used in the Method Study and Work Measurement Time Study: Aim & Objectives,, Use of stopwatch procedure in making Time Study. Performance rating, allowances and its types. Calculation of Standard Time. Work sampling

Marketing Management [2L]:
Functions of Marketing, Product Planning and development, Promotional Strategy

Quality management [6L]:
Quality definition, Statistical quality control, acceptance sampling Control Charts –Mean chart, range chart c chart,p chart,np chart, Zero Defects, Quality circles, , Kaizen & Six Sigma ,ISO -9000 Implementation steps,Total quality management

Text Books

1. Essentials of Management, by Harold Kooritz & Heinz Weihrich Tata McGraw
2. Production and Operations Management-K.Aswathapa,K .Shridhara Bhat,Himalayan Publishing House

Reference Books:

1. Organizational Behavior, by Stephen Robbins Pearson Education, New Delhi
2. New era Management, Daft, 11th Edition, Cengage Learning
3. Principles of Marketing, Kotlar Philip and Armstrong Gary, Pearson publication

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	-	3	-
CO2	-	-	-	-	-	2	-	3	3	-	3	3
CO3	-	-	-	-	-	-	-	-	2	-	3	3
CO4	-	-	-	-	-	2	-	-	3	-	3	-

Course Name: Blockchain
Course Code: IT801A
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:

Distributed Systems, Computer Networks, Cryptography, Python Programming Language, and Cloud computing.

Course Objectives:

The objective of the course is to learn and understand **Blockchain** technology in detail, and identifies the application potentials of this technology.

Course Outcome:

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

CO1 Understand the basic concepts of blockchain and it's architectures.
CO2 Analyze different issues in the domain of blockchain and understand the practical applications of blockchain.
CO3 Evaluate and analyze different solutions for the real life problems related to the blockchain.
CO4 Apply the concepts of blockchain to design large scale distributed and secure data storage systems.

Course Content:

Centralized versus Distributed Systems [6L]
Client-Server Model, Distributed System, P2P NetworkModel, Distributed Database, Two General Problem in distributed database, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete.

Security, Trust and Privacy [6L]
Confidentiality; Integrity; Availability; Authentication; Authorization; Access Control; Accounting; Non Repudiation, Symmetric Key and Asymmetric Key Cryptography, Hash function, Merkle tree hash, Digital Signatures – RSA, Schnorr, and ECDSA, Memory Hard Algorithm, Zero Knowledge Proof, User privacy.

Fundamentals of Blockchain [6L]
Introduction, Benefits over traditional distributed database, BlockchainNetwork, Data structure of block, Block construction and addition, Block mining mechanisms, Merkle Pa-tricia Tree, Gas

Limit, Transactions and Fee, Anonymity, Reward, Chain policy, Real-time application of Blockchain, Soft & Hard Fork, Private, Public, and Consortium blockchain.

Consensus algorithms in Blockchain [9L]

Distributed Consensus, Nakamoto consensus, Proof ofWork (PoW), Proof of Stake (PoS), Proof of Burn (PoB), Delegated Proof of Stake (DPoS), Byzantine Fault Tolerance (BFT), Practical Byzantine Fault Tolerance (PBFT), Ripple Protocol Consensus Algorithm (RPCA), Difficulty Level, Sybil Attack, Energy utilization and alternate.

Cryptocurrency and Blockchain Applications [9L]

History, Distributed Ledger Technology (DLT),Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contracts and Distributed Applications (Apps), GHOST, Vulnerability, Attacks, Sidechain, Namecoin, Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy, Application of Blockchain in Finance and Banking, Energy trading, Internet of Things (IoV, IoD, IIoT, Smart city, Smart Home, and so on), Medical Record Management System, Real estate business, Entertainment, Future scope of Blockchain.

Text books

1. Roger Wattenhofer, Distributed Ledger Technology: The Science of the Blockchain, Second Edition, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryp-tocurrencyTechnologies: A Comprehensive Introduction, Princeton University Press, 2016.
3. Andreas M. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, O'Reilly Publication House, 2014.

Reference books

1. Melanie Swan Blockchain: Blueprint for a new Economy, O'Reilly Publication House, 2015.
2. Andreas M. Antonopoulos and Dr. Gavin Wood, Mastering Ethereum Building Smart Contracts and DApps, O'Reilly Publication House, First Edition, 2018.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	3	3

Course Name: Big Data Analytics
Course Code: IT801B
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisite:
Basic knowledge in data storage and retrieval.
Knowledge in Quantitative Aptitude and Statistics.
Proficiency in Algorithms and Computer Programming Skills.

Course Objective:

Know the fundamental concepts of big data and analytics.
Explore tools and practices for working with big data
Learn about stream computing.
Know about the research that requires the integration of large amounts of data.

Course Outcome:

After completion of this course student will be able to

CO1	Understand the fundamental concepts of big data and analytics
CO2	Understand about clustering, classification and association techniques
CO3	Summarize about stream computing.
CO4	Summarize about the research that requires the integration of large amounts of data
CO5	Summarize about tools and practices for working with big data

Course Content:

Module 1: Introduction To Big Data [6L]
Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

Module 2: Clustering And Classification [8L]

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes‘ Theorem - Naïve Bayes Classifier.

Module 3: Association And Recommendation System [7L]

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Module 4: Stream Memory [7L]

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

Module 5: Nosql Data Management For Big Data And Visualization [7L]

NoSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

Text books:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers.

Reference books:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2	2	3	-	-	-	2	-	-	-
CO 2	2	3	3	3	3	-	-	-	-	-	-	-
CO 3	2	3	3	3	3	-	-	-	2	-	-	-
CO 4	2	3	3	3	3	-	-	-	2	1	-	2
CO 5	2	3	3	3	3	-	-	-	2	1	-	2

Course Name: Virtual Reality
Course Code: IT801C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:

Computer Architecture, Networking, Operating System,

Course Objectives:

This course provides students with an opportunity to explore the research issues in Augmented Reality and Virtual Reality (AR &VR). It also makes the students know the basic concept and framework of virtual reality.

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

CO1	Understand the basic concept of Virtual Reality
CO2	Apply the knowledge of virtual reality in the evaluation of different models.
CO3	Analyze different problems in the domain of Virtual Reality
CO4	Evaluate the different solutions provided in the field of virtual reality

Course Content:

Module 1: Introduction of Virtual Reality [4L]:
Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality.

Module 2: Multiple Models of Input and Output Interface in Virtual Reality [6L]:
Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices.

Module 3: Visual Computation in Virtual Reality [4L]:
Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering.

Module 3: **Interactive Techniques in Virtual Reality [4L]:**
Body Track, Hand Gesture, 3D Manus, Object Grasp.

Module 5 : Development Tools and Frameworks in Virtual Reality [4L]:
Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc.

Module 6 : Application of VR in Digital Entertainment [6L]:
VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

Module 7: Augmented and Mixed Reality [8L]:
Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

Text Books

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

Reference Books:

1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013
2. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	3	-		-	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-	-	-
CO4	3	3	3	3	2	-	-	-	-	-	-	-

Course Name: Natural Language Processing
Course Code: IT801D
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisite:
Mathematics, Computer Programming, Formal Language and Automata Theory

Course Objective:
The objective of the course is to learn the basics of NLTK toolkit, principles of NLP through programming, to build an application using different algorithms and natural language processing techniques.

Course Outcome:

After completion of this course student will be able to

CO1	Understand the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks.
CO2	Analyze the core computer science concepts and algorithms in the processing of natural language.
CO3	Apply the methods to solve new NLP problems and the problems outside NLP.
CO4	Design a system which processes a natural language & be familiar with research field.

Course Content:

Module I: [5L]
Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art and the Near-Term Future. Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSAs.

Module II: [5L]
Word Classes and Part-of –Speech Tagging: (Mostly) English Word Classes, Tag sets for English, Part-of –Speech Tagging, Rule-Based Part-of –Speech Tagging, Stochastic Part-of –Speech Tagging, Transformation-Based Tagging, Other Issues.

Module III: [5L]
Context-Free Grammars for English: Constituency, Context-Free Rules and Trees, Sentences-Level Constructions, The Noun Phrase, Coordination, Agreement, The Verb Phrase and Sub categorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form, Finite-State and Context- Free Grammars, Grammars and Human Processing.

Module IV: [5L]
Parsing with Context-Free Grammars: Parsing as Search, A Basic Top-Down Parser, Problems with the Basic Top-Down Parser, The Early Algorithm, Finite – State Parsing Methods.

Module V: [5L]
Features and Unification: Feature Structures, Unification of Features Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance.

Module VI: [5L]
Representing Meaning: Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus, and Some Linguistically Relevant Concepts. Semantic Analysis: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Early Parser, Idioms and Composionality, Robust Semantic Analysis.

Module VII: [6L]
Discourse: Reference Resolution, Text Coherence, Discourse Structure, Psycholinguistic Studies of Reference and Coherence. Natural Language Generation: Introduction to Language Generation, An Architecture for Generation, Surface Realization, Discourse Planning, Other Issues.

Text books:
1.Steven Bird, Ewan Klein, and Edward Loper. "Natural Language Processing– Analyzing Text with the Natural Language Toolkit". 2009, O'Reilly, 1ed.
2.Robert Dale, HermaniMoisi, Harold Somers, Handbook Of Natural Language Processing, Markcel Dekker Inc.

Reference Books:
1.Ruslan Mitkov, The Oxford Handbook Of Computational Linguistics, Oxford Universitty Press, 2003.
2.Daniel Jurafsky,James Martin, Speech and Language Processing,Prentice Hall,
3.James Allen, Natural Language Processing, Pearson Education, 2003.
4.Christopher D.Manning& Henrich Schutze, Foundations Of Statistical Natural Language Processing, TheMIT Press, 2001
5.Douglas Biber, Susan Conrad, Randi Reppen, Corpus Linguistics – Investigating Language Structure AndUse, Cambridge University Press, 2000.
6.David Singleton, Language And The Lexicon: An Introduction, Arnold Publishers, 2000.

CO_PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	3	2	2	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-
CO4	2	3	2	2	3	-	-	-	-	-	-	2

Course Name: Bio-Informatics
Course Code: IT802A
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Concepts of Computer Networking, Network Security, Database Management Systems

Course Objectives:
The basic objective is to learn about different bio molecules, their structures and functions, various data sets in bioinformatics, computational techniques useful in bioinformatics.

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

CO1 Understand the knowledge of Bioinformatics technologies with the related concept of DNA, RNA and their implications.
CO2 Analyze the techniques of different types of Data Organization and Sequence Databases with different types of Tools for Sequence Data Banks.
CO3 Apply the knowledge of the DNA Sequence Analysis.
CO4 Evaluate the performance of different types of Probabilistic models used in Computational Biology.

Course Content:

Introduction to Molecular Biology [10L]
Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA: Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Translation Introduction to Metabolic Pathways.

Sequence Databases [4L]
Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank, OMIM, Taxonomy browser, PubMed

DNA Sequence Analysis [10L]
DNA Mapping and Assembly: Size of Human DNA, Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.

Introduction Probabilistic models used in Computational Biology [7L]
Probabilistic Models; Hidden Markov Model: Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics: Genefinding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model: Architecture, Principle, Application in Bioinformatics.

Biological Data Classification and Clustering [4L]
Assigning protein function and predicting splice sites: Decision Tree

Text Books:
1. Bio Informatics and Molecular Evolution by Paul G. Higgs and Teresa K. Attwood
2. Bio Informatics Computing by Bryan Bergeron

Reference books:
1. Bio Informatics and Functional Geneomics, by Jonathan Pevsner
2. Gene Cloning DNA Analysis, by T.A. Brown

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	1
CO4	2	2	2	2	-	-	-	-	-	-	-	1

Course Name: Embedded System
Course Code: IT802B
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisite: Knowledge of basic microprocessor and microcontroller.

Course Objective:

1. An ability to design a system, component, or process to meet desired needs within realistic constraints.
2. Ability to understand microcontroller, microcomputer, embedded system.
3. Understand different components of a micro-controller and their interactions.
4. To become familiar with the programming environment used to develop embedded systems.
5. Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices
6. Learn debugging techniques for an embedded system

Course Outcome:

After completion of the course, the students will be able to

CO1	Understand the architecture and classifications of different embedded systems and the related programming knowledge.
CO2	Understand the concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices.
CO3	Choose case-specific debugging technique for an embedded system.
CO4	Design various real time systems using embedded systems.

Module I: [4L]

Introduction to the Embedded System: Embedded system Vs General computing systems, Purpose of Embedded systems, classifications of embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC.

Module II: [8L]

Serial and parallel communication: devices and protocols, wireless communication: devices and protocols, parallel communication network using ISA, PCI, PCT-X, Internet embedded system network protocols, USB, Bluetooth.

Module III: [7L]

Program Modeling Concepts; Fundamental issues in Hardware software co-design, Unified Modeling Language (UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.

Module IV: [6L]
Real Time Operating Systems: Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS.

Module V: [10L]
PIC microcontroller: introduction, architecture, comparison of PIC with other CISC and RISC based systems and microprocessors, assembly language programming, addressing modes, instruction set, Interfacing with various sensors and actuators using PIC microcontroller. Programming concepts and embedded programming.

Text Books:

1. Introduction to Embedded Systems: Shibu K. V. (TMH)
2. Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)

Reference book:

1. Embedded Systems: Rajkamal (TMH)
2. Embedded Systems: L. B. Das (Pearson)
3. Embedded System design: S. Heath (Elsevier)
4. Embedded microcontroller and processor design: G. Osborn (Pearson)

CO-PO matrices of the course IT802B:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO11**	**PO12**
CO1	3	-	2	1	2	-	-	-	-	-	1	1
CO2	2	1	3	1	-	-	-	-	-	-	2	-
CO3	2	2	3	1	-	-	-	-	-	-	1	2
CO4	3	2	2	-	-	-	-	-	-	-	1	2

Course Name: Internet of Things
Course Code: IT802C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:

Operating System, Wireless Sensor Networks, Computer Networks, Cryptography, Communication Technology, Python Programming Language, and Cloud computing.

Course Objectives:

The objective of the course is to learn and understand **Internet of Things (IoT)** in detail and identifies the application potentials of this technology.

Course Outcome:

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

CO1	Understand the basic concepts of IoT and it's architectures.
CO2	Analyze different issues in the domain of IoT and understand the practical applications of IoT.
CO3	Evaluate and analyze different solution for the real life problems of IoT.
CO4	Apply the concepts of IoT to design different smart tools.

Course Content:

Wireless Sensor Network [4L]:
Network and Communication aspects, Wireless medium access issues, MAC protocol, Routing protocols, Sensor deployment and Node discovery, Data aggregation and dissemination, Topology, Connectivity, Single-hop and Multi-hop communications.

Fundamental of IoT [4L]:

The Internet of Things, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Design challenges, Development challenges, Security challenges, Other challenges.

IoT and M2M [5L]:

Main design principles and needed capabilities, IoT architecture outline, standards , M2M and IoT Technology Fundamentals, Devices and gateways, Local and wide area networking, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT Architectural

Overview, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

IoT Architecture [6L]:

Introduction, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

IoT Privacy, Security and Governance [7L]:

Introduction, Overview of Governance, Privacy and Security Issues, Access Control, Authentication and Authorization, Distributed trust in IoT, Secure Platform design, Smart Approach. Data Aggregation for the IoT in smart cities, Intrusion detection and prevention, Security attacks and functional threats.

IoT Layers Architecture [6L]:

PHY/MAC Layer - 3GPP MTC, IEEE 802.11, IEEE 802.15, Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7; Network Layer - IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP ; Transport Layer - TCP, MPTCP, UDP, DCCP, SCTP TLS, DTLS; Session Layer - HTTP, CoAP, XMPP, AMQP, MQTT; Service Layer - oneM2M, ETSI M2M, OMA, BBF.

IoT Applications for Value Creations [4L]:

Introduction, IoT applications for industry: Future Factory Concepts, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Big Data and Serialization, IoT for Retailing Industry, Oil and Gas Industry, Real-time monitoring and control of processes - Deploying smart machines, smart sensors, and smart controllers with proprietary communication and Internet technologies, Remote control operation of energy consuming devices.

Text Books:

1. Internet of Things : Architecture and Design Principles, Raj Kamal, McGraw Hill Education; First edition.
2. Internet of Things fundamentals, David, Pearson Education.
3. Internet of Things by Tripathy and Anuradha, CRC Press.

Reference Books:

1. Getting Started With The Internet Of Things: Connecting Sensors and Microcontrollers to the Cloud, Cuno Pfister O'Reilly
2. Internet of Things (A Hands-on-Approach), Vijay Madisetti and ArshdeepBahga, Orient Blackswan Private Limited - New Delhi; First edition.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-	-
CO4	3	3	3	2	3	2	3	-	3	-	3	3

Course Name: Deep Learning
Course Code: IT802D
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite:
Linear Algebra, Machine Learning

Course Objective:

The objective of the course is to present an introduction to deep learning systems, with an emphasis on introducing major deep learning algorithms, the problem settings, and their applications to solve real world problems.

Course Outcome:

After completion of this course student will be able to

CO1 Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO2 Implement deep learning algorithms and solve real-world problems.

CO3 Understand the working knowledge of neural networks and deep learning, and data needs of deep learning

CO4 Design and explore the parameters for neural networks

Course Content:

Module I: Introduction [6L]:
Feed forward Neural networks. Gradient descent and the back propagation algorithm. Unit saturation, aka the vanishing gradient problem, and ways to mitigate it. RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Regularization. Dropout.

Module II: Convolution Neural Networks [4L]:
Architectures, convolution / pooling layers.

Module III: Recurrent Neural Networks [4L]:
LSTM, GRU, Encoder Decoder architectures

Module IV: Deep Unsupervised Learning [6L]:
Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM

Module V: Models [3L]:

Attention and memory models, Dynamic memory networks

Module VI: Computer Vision [6L]:

Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks.

Module VII: Applications of Deep Learning to NLP [7L] :

Introduction to NLP and Vector Space Model of Semantics
Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of- Words model (CBOW)**,** Glove, Evaluations and Applications in word similarity, analogy reasoning

Text Books:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation. (2015).
2. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education,

Reference Books:

3. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-		-	-	-	-	-	-	-	-
CO2	2	3	3	2	3	-	-	-	-	-	-	-
CO3	2	2	2	3	2	-	-	-	-	-	-	-
CO4	3	3	3	3	2	-	-	-	-	-	-	-

Course Name: Data Science
Course Code: IT803A
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisite:
Basic knowledge in data storage and retrieval.
Knowledge in Quantitative Aptitude and Statistics.
Proficiency in Algorithms and Computer Programming Skills.

Course Objective:

Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
Apply principles of Data Science to the analysis of business problems.
Use data mining software to solve real-world problems.

Course Outcome

After completion of this course student will be able to

CO1: Demonstrate proficiency with statistical analysis of data.

CO2: Develop the ability to build and assess data-based models.

CO3: Execute statistical analyses with professional statistical software.

CO4: Demonstrate skill in data management.

Course Content:

Module 1: Introduction [4L]:
Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

Module 2: Data Collection and Data Pre-Processing [8L]:
Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Module 3: Exploratory Data Analytics [8L]:
Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

Module 4: Model Development [8L]:
Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot –

Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

Module 5: Model Evaluation [7L]:
Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

Text Books:

1. Jojo Moolayil, “Smarter Decisions : The Intersection of IoT and Data Science”, PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013

Reference Books:

1. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	3	2	3	-	-	-	-	-	-	2
CO3	3	3	2	2	3	-	-	-	-	-	-	2
CO4	3	3	2	2	3	-	-	-	-	-	-	2

Course Name: Cyber Law and IPR
Course Code: IT803B
Contact: 3:0:0
Total Contact Hours: 35
Credit: 3

Prerequisites:
Concepts of Computer Networking, Network Security

Course Objectives:

The objective of the course is to explain critical information infrastructure related to cyber security, explain the legal and regulatory framework to enable a safe and vibrant cyberspace, analyze cyber security that promotes safe and appropriate use of cyberspace, describe national/international cyber security capabilities.

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

CO1	Understand the policy issues related to electronic filing of documents with the Government agencies and further to amend the Indian Penal Code, the Indian Evidence Act, 1872, the Bankers' Books Evidence Act, 1891 and the Reserve Bank of India Act, 1934 and for matters connected therewith or incidental thereto.
CO2	Analyze the effectiveness of the prevailing information security law practices.
CO3	Identify the importance of lawful recognition for transactions through electronic data interchange and other means of electronic communication, commonly referred to as electronic commerce or E-Commerce.
CO4	Comprehend the architecture that can cater to the needs of the social information security.

Course Content:

Introduction of Cybercrime [6L]:

Definition cybercrime, Forgery, Hacking, Software Piracy, Computer Network intrusion, Category of Cybercrime, how criminals plan attacks, passive attack, Active attacks, cyber stalking. Overview of Indian Legal System, Introduction to IT Act 2000, Amendments in IT Act, Cyber Laws of EU, USA, Australia, Britain.

Computer Ethics, Privacy and Legislation [6L]:

Computer ethics, moral and legal issues, descriptive and normative claims, Professional Ethics, code of ethics and professional conduct. Privacy, Computers and privacy issue, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT, Legal Policies, legislative background.

Cybercrime Mobile & Wireless Devices [3L]:

Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cell phones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop.

Cybercrime Mobile & Wireless Devices [6L]:

Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/ cell phones, Theft, Virus, Hacking. Bluetooth, Different viruses on laptop.

Tools and Methods used in Cybercrime [6L]:

Proxy servers, password checking, Random checking, Trojan Horses and Backdoors; DOS & DDOS attacks; SQL injection, buffer over flow.

Intellectual Property Rights Issues [8L]:

Copyrights, Jurisdiction Issues and Copyright Infringement, Multimedia and Copyright issues, WIPO, Intellectual Property Rights, Understanding Patents, Understanding Trademarks, Trademarks in Internet, Domain name registration, Software Piracy, Legal Issues in Cyber Contracts, Authorship, Document Forgery.

Text Books:

1.Cyber security by Nina Gobole&SunitBelapune; Pub: Wiley India.
2. Textbook On Cyber Law by Pavan Duggal, Pub:Univarsal

Reference books:

1. Cyber Law and Cyber Crime simplified by Prashant Mali

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	2	-	2	-	-	-	2
CO2	2	2	1	1	-	1	-	3	-	-	-	1
CO3	2	2	2	2	-	2	-	1	-	-	-	-
CO4	3	2	2	2	1	3	-	3	-	-	-	2

Course Name Cluster and Grid Computing
Course Code: IT803C
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:
Networking, Operating System, Computer Architecture

Course Objectives:

The objective of the course is to learn and understand Cluster and Grid computing in details and identify the usage of it.

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

CO1	Understand the basic architecture of Cluster and Grid computing
CO2	Apply the knowledge of Cluster and Cluster computing in the evaluation of the computing model
CO3	Analyze different problems in the domain of Cluster and Grid computing
CO4	Evaluate the different models and solutions provided in the field of Cluster and Grid computing

Course Content:

Cluster Computing [3L]
Approaches to Parallel Computing, How to Achieve Low Cost Parallel Computing through Clusters, Definition and Architecture of a Cluster, What is the Functionality a Cluster can Offer? Categories of Clusters

Cluster Middleware [3L]
Levels and Layers of Single System Image (SSI), Cluster Middleware Design Objectives, Resource Management and Scheduling, Cluster Programming Environment and Tools

Cluster Architecture [4L]
Early Cluster Architectures, High Throughput Computing Clusters, Condor.

Network Protocols and IO [5L]
Networks and Inter-connection/Switching Devices, Design Issues in Interconnection Networking/Switching, Design Architecture-General Principles and Trade-offs, HiPPI, ATM (Asynchronous Transmission Mode), Myrinet, Memory Channel (MC), Gigabit Ethernet

Introduction to Grid Computing [4L]
The Data Centre, the Grid and the Distributed / High Performance Computing, Cluster Computing and Grid Computing, Metacomputing – the Precursor of Grid Computing, Scientific,

Business and e-Governance Grids, Web Services and Grid Computing, Business Computing and the Grid – a Potential Win – win Situation, e-Governance and the Grid.

Technologies and Architecture [2L]

Clustering and Grid Computing, Issues in Data Grids, Key Functional Requirements in Grid Computing, Standards for Grid Computing, Recent Technological Trends in Large Data Grids

Grid Monitoring [4L]

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- R-GMA - GridICE – MDS- Service Level Agreements (SLAs) - Other Monitoring Systems- Ganglia, GridMon, Hawkeye and Network Weather Service.

Grid Security and Resource Management [3L]

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management, Gridway and Gridbus Broker-principles of Local SchedulersOverview of Condor, SGE, PBS, LSF-Grid Scheduling with QoS

Data Management and Grid Protocol [4L]

Data Management-Categories and Origins of Structured Data-Data Management ChallengesArchitectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-Generations of Grid Portals.

Grid Middleware [4L]

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features. Features of Next generation grid.

Text Books

1. C.S.R.Prabhu – "Grid and Cluster Computing"-PHI(2008)

Reference Books:

1. Fran Berman , Geoffrey Fox, Anthony J.G. Hey, Grid Computing: Making The Global Infrastructure a Reality,Wiley, 2003
2. MaozhenLi , Mark Baker , The Grid: Core Technologies, Wiley, 2005
3. JoshyJoseph , Craig Fellenstein Grid Computing, IBM Press, 2004

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	2	3	-		-	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-
CO3	3	3	3	2	3	-	-	-	-	-	-	-
CO4	3	3	3	4	2	-	-	-	-	-	-	-

Course Name: Entrepreneurship Development
Course Code: IT803D
Contact: 3:0:0
Total Contact Hours: 36
Credit: 3

Prerequisites:

Business Management

Course Objectives:

Understanding the evolution of Entrepreneurship development.

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

CO1	Understand the Meaning and Importance Evolution of term 'Entrepreneurship
CO2	Apply the knowledge in the evaluation of different models.
CO3	Analyze different problems in the domain entrepreneurship skill development
CO4	Evaluate the different solutions, rules and regulation provided in the field of developing enterprises

Course Content:

Module: 1 Introduction [8L]:

Meaning and Importance Evolution of term 'Entrepreneurship' ,Factors influencing entrepreneurship' Psychological factors , Social factors , Economic factor , Environmental factors , Characteristics of an entrepreneur , Entrepreneur and Entrepreneur , Types of entrepreneur , According to Type of Business , According to Use of Technology , According to Motivation , According to Growth , According to Stages , New generations of entrepreneurship viz. social entrepreneurship, Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc. , Barriers to entrepreneurship

Module 2 Entrepreneurial Motivation [4L]:

Motivation , Maslow's theory , Herjburg's theory , McGragor's Theory , McClelland's Need – Achievement Theory , Culture & Society , Values / Ethics , Risk taking behavior

Module 3 Creativity [6L] :

Creativity and entrepreneurship, Steps in Creativity , Innovation and inventions ,. Using left brain skills to harvest right brain ideas , Legal Protection of innovation , Skills of an entrepreneur Decision making and Problem Solving (steps indecision making)

Module 4: Organization Assistance [8L]:

, Assistance to an entrepreneur , New Ventures , Industrial Park (Meaning, features, & examples) , Special Economic Zone (Meaning, features & examples) , Financial assistance by different agencies , MSME Act Small Scale Industries , Carry on Business (COB) license , Environmental Clearance , National Small Industries Corporation (NSIC)

Module 5: Rules And Legislation [6L] :

Applicability of Legislation, Industries Development (Regulations) Act, 1951. , Factories Act, 1948. , The Industrial Employment (Standing Orders) Act, 1946 , Suspension 5.4.2 Stoppage of work , Termination of employment 5.5 West Bengal Shops and Establishment Act, 1963 5.6 Environment (Protection) Act, 1986 , The sale of Goods Ac, 1950 , Industrial Dispute Act 1947

Module: 6 Project Report [4L] :

Introduction , Idea Selection , Selection of the Product / Service , Aspects of a Project , Phases of a Project , Project Report , Contents of a Project Report

Text Books

1. Entrepreneurship Development and Business Ethics 2019 Edition By Abhik Mukherjee

Oxford

Reference Books:

1. Entrepreneurial Development Khanka S.S, Pub: S. Chand

CO_PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	1	2	3	-	2	2	2	2	2	1
CO3	1	1	1	2	3	3	2	2	2	2	-	1
CO4	1	1	1	3	3	3	3	3	3	3	3	3