LNCT University

School of Computer Science and Technology

B.Tech. CSE and B.Tech AIML

Syllabus

Year 2022

B.Tech CSE& AIML LNCT University

I Semester Syllabus

Engineering Chemistry (CS-101)/(AL-101)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Solve analytical problem of hard water
CO2	Use lubricants in relevant fields
CO3	Apply polymer science in daily life
CO4	Analyse phases of heterogeneous systems
CO5	Interpret atomic and molecular structure of substances

COURSE CONTENTS:

UNIT I WATER –ANALYSIS, TREATMENTS AND DISINFECTION METHODS:

Sources, Impurities, Hardness and its units, Determination of hardness by EDTA method, Alkalinity and its determination and related numerical problems. Boiler troubles- Sludge and Scale, Priming and foaming, Boiler Corrosion, Caustic embrittlement,
Softening methods - Lime- Soda process, Zeolite process, Ion Exchange process and related numerical problems.
Disinfection methods- Bleaching powder, Chlorination,Break point Chlorination, Chloroamine, UV rays, Ozone.

UNIT II FUELS AND COMBUSTION:

Fossil fuels and classification ,Calorific Value and its types ,Determination of calorific value by Bomb Calorimeter, Proximate and Ultimate analysis of coal & their significance , Calculation of calorific value by Dulong's formula, Knocking ,Relationship between knocking & structure of hydrocarbon, Octane number, Cetanenumbe, Combustion and its related numerical problems.

UNIT III LUBRICANTS AND LUBRICATION:

Introduction, Mechanism of lubrication, Classification of lubricants, Significance and determination of Viscosity, Viscosity Index, Flash and Fire point, Cloud and Pour point, Carbon residue, Aniline point, Acid number, Saponification number, SEN.
*PHASE EQUILIBRIUM AND CORROSION:*Phase diagram of single component system (Water), Phase diagram of binary eutectic system (Cu-Ag). Corrosion:-Types, Mechanism and Prevention

UNIT IV POLYMER AND POLYMERIZATION:

Introduction, Types and classification of polymerization, Mechanism of polymerization (free radical and ionic polymerization), Thermoplastic and Thermosetting polymers, Elementary idea of biodegradable polymers, Preparation , Properties and Uses of the following polymers : PVC, PMMA, Teflon, Nylon 6,Nylon 6:6, Polyester, Phenol- Formaldehyde resin, Urea Formaldehyde resin,Buna N, Buna S, Vulcanization of Rubber.

UNIT V INSTRUMENTAL TECHNIQUES AND APPLICATIONS:
Principle, Instrumentation and Applications of Electronic spectroscopy, Vibrational Spectroscopy Chromatography techniques (Principle, Instrumentation and Applications)- Gas Chromatography and HPLC

Reference Books: -

1. Chemistry for Environmental Engineering &Science,Sawyer, McCarty and Parkin McGraw Hill, Education Pvt. Ltd., New Delhi.
2. Engineering Chemistry.B.K. Sharma.KrishnaPrakashan Media (P.) Ltd., Meerut.
3. Basics Engineering Chemistry.S.S Dara& A.K Singh.S.Chand& Company Ltd. Delhi.
4. Applied Chemistry.Theory and Practice, O.P. Viramani, A.K. Narula.New Age International Pvt. Ltd. Publishers, New Delhi.
5. Polymer Science.Ghosh.Tata McGraw Hill
6. Engineering Chemistry.ShashiChawla,Dhanpat Rai& Company Pvt. Ltd. New Delhi.
7. Engineering Chemistry. Jain &Jain,Dhanpat,Rai& Company Pvt. Ltd. New Delhi.
8. A text book of Engineering Chemistry,Agrawal, C.V. Murthy, C.P. Naidu ABS publication, Hyderabad.

List of suggestive core experiments: -

1. **Water Testing**

i. Determination of total hardness by complexometric titration.
ii. Determination of mixed alkalinity : OH^- & $CO3^{2-}$ and $CO3^{2-}$ & $HCO3^-$
iii. Chloride ion estimation by Argentometric titration.

2. Determine the strength of unknown ferrous ammonium sulphate (FAS) using K2Cr2O7 as an intermediate and diphenyl amine as an internal indicator and as an external indicator.
3. Fuels and Lubricant Testing

1. Flash and Fire Point determination by-
   Abel's Apparatus, Cleveland Apparatus ,Pensky Marten's Apparatus
2. Viscosity& Viscosity index determination by –

i. Redwood viscometer-I
ii. Redwood viscometer-II

3. Determination of Cloud and Pour point of the given lubricating oil.
4. Determination of Aniline point of the given lubricating oil.
5. Determination of Carbon residue of given oil sample by Conredson's method.
6. Determination of percentage of moisture in the given sample of coal/solid lubricant by proximate analysis.
7. Determination of Calorific Value by Bomb Calorimeter.

Mathematics-I (CS-102)/(AL-102)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Introduce the fallout of the role's theorem that is fundamental to application of analysis to engineering problem.
CO2	To introduce the idea of applying differential and integral calculus of curvature and to improve integral apart from some application it gives a basic introduction on beta and gamma function.
CO3	To develop the tool of power series and Fourier series for learning advance engineering mathematics.
CO4	To familiarize the student with linear algebra that is essential in most branches of engineering.
CO5	To create the essential tool of matrices in a comprehensive manners.

Course Contents:

Module 1: Calculus: (10 hours): Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagranges Multipliers.

Module 2: Calculus: (8 hours): Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration, applications of multiple integral for calculating area and volumes of the curves.

Module 3: Sequences and series: (6 hours): Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4: Vector Spaces (8hours): Vector Space, Vector Sub Space, Linear Combination of Vectors,Linearly Dependent, Linearly Independent, Basis of a Vector Space,LinearTransformations.

Module 5: Matrices (8 hours): Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to findinverse.

Reference Books: - :

1. G.B. Thomas and R.L. FinneyCalculus and Analytic geometry.9th Edition 2002.Pearson
2. Erwin kreyszig ,Advanced Engineering Mathematics,9th Edition 2006, John Wiley & Sons
3. VeerarajanT.Engineering Mathematics for first year.2008.Tata McGraw-Hill, New Delhi.
4. RamanaB.V.Higher Engineering Mathematics, 11th Reprint, 2010.Tata McGraw Hill New Delhi.
5. S. L. Ross,Differential Equations,3rd Edition 1984.Wiley India
6. B.S. Grewal, Higher Engineering Mathematics.36th Edition, 2010 Khanna Publishers.
7. N.P. Bali and Manish Goyal.A text book of Engineering Mathematics, 2008.Laxmi Publications, Reprint.

Programming and Problem solving (CS-103)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Understand the basics of Computer system organization and number system.
CO2	Write and Understand algorithms to solve various computational problems.
CO3	Use of data types, operators, control statements and type conversions in C.
CO4	Write programs using arrays, functions, structures, and use of dynamic memory allocation and file handling concept in C programming language.
CO5	Understand the basic of data types, operators, functions, list, tuple and dictionaries in python programming.

Course Contents:

Unit- 1
Computer: Definition, Classification, Organization i.e. CPU, register, Buses, Memory & Storage Systems, I/O Devices, and System & Application Software. Number system: decimal, binary, octal and hexadecimal number system. Generation and classification of programming languages.
Unit-2
Algorithms: Definitions, different ways of stating algorithms (pseudo-code and flowcharts), Strategy for designing algorithms, Problem solving strategy, Structured programming concepts.Basic structure of C programs, common headerfiles.
Unit-3
C language: Introduction, Character Set, C tokens, Data types. Operators: Arithmetic, relational, logical, assignment, increment & decrement, conditional, bitwise and special operators. Precedence of operators, Type conversions and type casting in expressions. Input and output operations. Control flow statements: Decision making, Branching and looping statements**.**
Unit- 4
Arrays: one dimensional arrays, two dimensional arrays and multidimensional arrays, Strings and string handling functions. Functions, function pass by value, function pass by addresses. Structuresand Unions. Pointers, array of pointers, passing array and structure to functions.Dynamic memory allocation: malloc(), calloc(), realloc(), free().File Handling concepts**.**
Unit- 5 Basics of Python: Variables, data type, operators, print statements, control statements, functions, List, tuple, dictionaries.

Reference Books:-

1. Subhashis Banerjee, S. Arun-Kumar, D. Dubhashi. Introduction to Computer Science. Manuscript. 1st edition. Pearson/PHI.
2. Harold Abelson and Gerald, Structure and Interpretation of Computer Programs,1985,MIT Press.
3. Y Kanetkar.Let us C.,5 thedition.BPB.
4. Byron Gotfried, Schaum's outline of programming with C.1st edition Schaum's series

Basic Mechanical Engineering (CS-104)/(AL-104)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	An ability to analyze basic properties of material its applications in industry, design and conduct experiments, as well as to analyze and interpret data.
CO2	Student will be able to describe the basic concept of metro logy, its working and application knowledge on industrial machines.
CO3	An ability to formulate, analyze properties of fluids, hydraulic machines to solve engineering problem.
CO4	Student will be able to apply concept of thermodynamics in modern engineering.
CO5	An ability to understand, design and evaluate the basic concept of i.c.engine its components.

Course Contents:

Unit I: Materials: Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness , ductility, brittleness , malleability etc. of materials , Tensile test- Stress-strain diagram of ductile and brittle materials ,Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.

Unit II: Measurement: Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set. Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry, welding etc Introduction to Lathe and Drilling machines and their various operations.

Unit III: Fluids: Fluid properties pressure, density and viscosity etc. Types of fluids, Newton's law of viscosity, Pascal's law, Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps.

Unit IV: Thermodynamics: Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy. Steam Engineering: Classification and working of boilers, mountings and accessories of boilers, Efficiency and performance analysis, natural and artificial draught, steam properties, use of steam tables.

Unit V: Reciprocating Machines: Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of two stroke & four stroke Petrol & Diesel engines. Working principle of compressor.

Reference Books:

1- Kothandaraman&Rudramoorthy, Fluid Mechanics & Machinery, New Age.
2- Nakra&Chaudhary , Instrumentation and Measurements, TMH.
3- Nag P.K, Engineering Thermodynamics, TMH .
4- Ganesan , Internal Combustion Engines, TMH .
5- Agrawal C M, Basic Mechanical Engineering, Wiley Publication.
6- AchuthanM , , Engineering Thermodynamics ,PHI.

List of Suggestive Core Experiments:

Theory related Eight to Ten experiments including core experiments as follows:

1- Study of Universal Testing machines.
2- Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and Sine-bar.
3- Study of Lathe Machine.
4- Study of Drilling Machines.
5- Verification of Bernoulli's Theorem.
6- Study of various types of Boilers.
7- Study of different IC Engines.
8- Study of different types of Boilers Mountings and accessories.

Basic Electrical and Electronic Engineering (CS-105)/(AL-105)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Analyse and solve dc circuits using various electric laws.
CO2	Interpret the sinusoidal electrical quantities and parameters mathematically as well as graphically for 1- phase/3-phase ac circuits.
CO3	Explain construction, working, application and losses of transformer
CO4	Explain the working principle, construction, applications of dc and ac machines.
CO5	Apply the concepts of basic electronics to design various electronic circuits.

Course Contents:

Unit- I : D.C. Circuits: Voltage and current sources, dependent and independent sources, Units and dimensions, Source Conversion, Ohm's Law, Kirchhoff's Law, Superposition theorem, Thevenin's theorem and their application for analysis of series and parallel resistive circuits excited by independent voltage sources, Power & Energy in such circuits. Mesh & nodal analysis, Star Delta transformation & circuits.

Unit – II : 1- phase AC Circuits: Generation of sinusoidal AC voltage, definition of average value, R.M.S. value, form factor and peak factor of AC quantity , Concept of phasor, Concept of Power factor, Concept of impedance and admittance, Active, reactive and apparent power, analysis of R-L, R-C, R-L-C series & parallel circuit 3-phase AC Circuits: Necessity and advantages of three phase systems, Meaning of Phase sequence, balanced and unbalanced supply and loads. Relationship between line and phase values for balanced star and delta connections. Power in balanced & unbalanced three-phase system and their measurements

Unit – III : Magnetic Circuits: Basic definitions, magnetization characteristics of Ferro magnetic materials, self inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Single phase transformer- General construction, working principle, e.m.f. equation, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency, open circuit and short circuit test.

Unit IV: Electrical Machines: Construction, Classification & Working Principle of DC machine, induction machine and synchronous machine. Working principle &Emf equation of 3-Phase induction motor, Concept of slip in 3- Phase induction motor, Explanation of Torque-slip characteristics of 3-Phase induction motor. Types of losses occurring in electrical machines. Applications of DC machine, induction machine and synchronous machine.

Unit V : Basic Electronics: Number systems & Their conversion used in digital electronics, Demorgan's theorem, Logic Gates, half and full adder circuits, R-S flip flop, J-K flip flop. Introduction to Semiconductors, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, introduction to CC, CB & CE transistor configurations, different configurations and modes of operation of BJT

Reference Books:

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh, Basic Electrical Engineering, P.H.I., 2013
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press,2012
5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
6. B.L. Theraja& A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication
7. E. Hughes & I.M. Smith Hughes Electrical Technology Pearson 8. Vincent Del Toro Electrical Engineering Fundamentals

English for Communication (CS-106)/(AL-106)(P)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Able to understand the role of effective communication for success in professional world and develop effective communication to be employable.
CO2	Able to read actively and write and speak with grammatical correctness.
CO3	Enhance all four basic skills of language learning specially listening and understanding any kind of spoken material adored with different accent, voice modulation, tone variation and stress pattern.
CO4	Inculcate the art of effective presentation with proper body language and voice modulation.
CO5	Hone writing business correspondence like business letters and reports properly.

Course Contents

Unit-I
Identifying Common errors in writing: Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

Unit-II
Vocabulary building and Comprehension: Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

Unit-III
Communication: Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

Unit-IV
Developing Writing Skills: Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, and Progress Report.

Unit-V
Business Correspondence: Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for Writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

Topics to be covered in the Language laboratory sessions:

1. Introducing oneself, family, social roles.
2. Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate,telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. To write a book review. Standard text must be selected by the teacher.
5. Role plays: preparation and delivery topic to be selected by teacher/faculty.

Reference Books:-

1. Meenakshi Raman and SangeetaSharma,'Technical Communication : Principles and practice',2017.Oxford University Press
2. Dr Neeta Sharma, English,2017.Satya Prakashan New Delhi
3. Krizan and Merrier,Effective Business Communication,2007.Cengage learning
4. Sanjay Kumar and Pusplata, Communication Skill,2011.Oxford University Press
5. F.T. Wood, Remedial English Grammar2007.Macmillan.
6. Kul Bhushan Kumar& R S Salaria,Effective Communication Skills'2016.Khanna Publishing House, Delhi
7. CIEFL-Exercises in spoken English Parts I-III.1997.Oxford University Press.

List of Suggestive Core Experiments:

Practice work and activities are based on the contents included in course.

Introduction to AI, Data Science, ethics and Foundation of Data Analysis (AL-203)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Analyse role of data scientist and applications of data science in various domains.
CO2	Apply data preprocessing techniques to sample matrix and dataset
CO3	Perform descriptive statistics method on numerical data
CO4	Develop regression model for prediction and decision making
CO5	Evaluate and test data science models for multiple performance parameters.

Course Contents

Unit I: Introduction to Data Science: Defining Data Science and Big data, Benefits and uses of data science and Big data, Facets of Data, Structured Data, Unstructured Data, Natural Language, Machine generated data, Graph based on Network data, Audio, Image, Video, Streaming data, Data science Process, Big data ecosystem and data science, distributed file systems, distributed programming framework, data integration framework, machine learning framework, NO SQL database, scheduling tools, benchmarking tools, system deployments

Unit II: Data science Processes: Six steps of data science processes, define research goals, data retrieval, cleansing data, correct errors as early as possible, integrating- combine data from different sources, transforming data, exploratory data analysis, data modeling, model and variable selection, model execution, model diagnostic and model comparison, presentation and automation.

Unit III: Introduction to Machine Learning: What is machine learning**,** Learning from data, History of machine learning, Big data for machine learning, Leveraging machine learning**,** descriptive vs predictive analytics, machine learning and statistics, Artificial Intelligence and Machine Learning, Types of machine learning- Supervised, Unsupervised, semi supervised, reinforcement learning , Types of ML algorithms, classification vs regression problems, Bayesian , clustering, decision tree, dimensionality reduction, neural network and deep learning, training machine learning systems.

Unit IV: Introduction to AI:

What is AI, Turing Test, cognitive modeling approach, law of thoughts, the relational agent approach, the underlying assumptions about intelligence, techniques required to solve AI problems, level of details required to model human intelligence, successfully building an intelligent problem, history of AI

Unit V: Introduction to Data Analytics:

Working with Formula and Functions, Introduction to Power BI & Charts, logical functions using Excel, Analysing Data with Excel.

Reference Books:-

- Stuart J. Russell & Peter Norvig, Artificial Intelligence : A Modern Approach, 3e ed. Pearson.
- Kevin Knight &Eliane Rich, B. Nair, Artificial Intelligence. 3rd ed. McGrawHill.
- Patrick Henry Winston, Artificial Intelligence. 3rd ed. Addison –Wesley Publishing company.

B.Tech. CSE & AIML LNCT University
II Semester Syllabus

Engineering Physics (CS-201)/(AL-201)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Apply physical significance of gradient, divergence and curl on various surfaces in engineering physics
CO2	Determine various parameters related to laser, fibre optics and optics
CO3	Find position and momentum of free particle by Schrodinger wave equation
CO4	Use characteristics of diodes and binding energy of nucleus in instrumentations
CO5	Study and analyse Maxwell's equation

Course Contents

UNIT I
Quantum Physics Group and particle velocities & their relationship. Uncertainty principle with elementary proof and applications (determination of position of a particle by a microscope, non existence of electron in nucleus, diffraction of an electron beam by a single slit). Compton scattering. Wave function and its properties, energy and momentum operators, time dependent and time independent Schrödinger wave equation. Application of time independent Schrödinger wave equation to particle trapped in a one dimensional square potential well (derivation of energy eigen values and wave function)

UNIT II
Wave Optics Interference: Fresnel's biprism, Interference in thin films (due to reflected and transmitted lght), interference from a wedge shaped thin film, Newton's rings and Michelson's interferometer experiments and their applications. Diffraction at single slit, double slit and n-slits (diffraction grating). Resolving power of grating and prism. Concept of polarized light, Brewster's laws, Double refraction, Nicol prism, quarter & half wave plate.

UNIT III
Nuclear Physics Nuclear liquid drop model (semi empirical mass formula), nuclear shell model, Linear Particle acceleratos: Cyclotron, general description of Synchrotron, Synchrocyclotron, and Betatron. GeigerMuller Counter, Motion of charged particles in crossed electric and magnetic fields. Uses of Bainbridge and Auston mass Spectrographs.

UNIT IV
Solid State Physics Qualitative discussion of Kronig Penny model (no derivation), Effective mass, Fermi-Dirac statistical distribution function, Fermi level for Intrinsic and Extrinsic Semiconductors, Zener diode, tunnel diode, photodiode, solar-cells, Hall effect. Superconductivity: Meissner effect, Type I and Type II superconductors, Di-electric polarization, Complex permittivity, dielectric losses

UNIT V
Laser and Fiber Optics Laser: Stimulated and spontaneous processes, Einstein's A & B Coefficients, transition probabilities, active medium, population inversion, pumping, Optical resonators, characteristics of laser beam. Coherence, directionality and divergence. Principles and working of Ruby, Nd:YAG, He-Ne & Carbon dioxide Lasers with energy level diagram.. Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number,

propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses & various uses. Applications of lasers and optical fibers.

Reference Books: -

1. Engineering Physics- Purnima SwarupKhare, Laxmi Publication

2. A Text Book of Engg Physics – N. Gupta & S.K. Tiwary , Dhanpat Rai & Co. , Delhi

3. Concepts of Modern Physics- Beiser, TMH

4. Solid State Physics by Kittel ,Wiley India

5. Engineering Physics-Fundamentals and Modern Applications – by Purnima SwarupKhare, Infinity Press Publications

List of suggestive core experiments: -

1. Biprism, Newton's Rings, Michelsons Interferometer.

2. Resolving Powers –Telescope, Microscope, and Grating.

3. G.M. Counter, Solar Cell, Plank's constant.

4. Spectrometers-R.I., Wavelength, using prism and grating

5. Optical polarization based experiments: Brewster's angle, polarimeter etc.

6. Measurements by LASER-Directionality, Numerical aperture, Distance etc.

7. Uses of Potentiometers and Bridges (Electrical).NA of Optical Fibre.

8. Experiments connected with diodes and transistor.

9. Measurement of energy band gap of semiconductor.

10. To study Hall Effect and to find the width of s single slit by f He-Ne Laser.

Mathematics-II (CS-202)/(AL-202)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Introduce effective mathematical tools for the solution of ode.
CO2	Use of analytical method to second order differential equation in engineering problems.
CO3	Formulate the partial differential equations to solve engineering problem
CO4	Apply tools of differentiation and integration of function of complex variable that are used in various techniques dealing engineering problem.
CO5	Understand physical significance of gradient, divergence and curl in complex engineering problems.

Course Contents

Module1:Ordinary Differential Equations I:(6hours): Differential Equations of First Order and First Degree(Leibnitzlinear,Bernoulli's,Exact),Differential Equations of First Order and Higher Degree,Highe rorder differential equations with constants coefficients,Homogeneous Linear Differential equations,Simultaneous Differential Equations.

Module2:Ordinary differential Equations II:(8hours): Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions;Legend repolynomials,Bessel functions of the first kind and their properties.

Module3:PartialDifferential Equations:(8hours): Formulation of Partial Differential equations,Linear and Non-Linear Partial Differential Equations,Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Module4:Functions of Complex Variable:(8hours): Functions of Complex Variables:Analytic Functions,Harmonic Conjugate,Cauchy-RiemannEquations(without proof),Line Integral,Cauchy-Goursat theorem(without proof),Cauchy Integral formula(without proof),Singular Points,Poles&Residues,Residue Theorem, Application of Residues theorem for Evaluation of RealIntegral(Unit Circle).

Module5:Vector Calculus:(10hours): Differentiation of Vectors,Scalar and vector point function,Gradient,Geometrical meaning of gradient,Directional Derivative,Divergence and Curl,Line Integral,Surface Integral and Volume Integral,Gauss Divergence,Stokes and Green theorems.

Reference Books: - :

1. G.B. Thomas and R.L. Finney Calculus and Analytic geometry.9th Edition 2002.Pearson
2. Erwin kreyszig , Advanced Engineering Mathematics,9th Edition 2006 Edition, John Wiley & Sons
3. W. E. Boyce and R. C. DiPrima. Engineering Elementary Differential Equations and Boundary Value Problems.2009.9th ed. Wiley India.
4. RamanaB.V.Higher Engineering Mathematics, 11th Reprint, 2010.Tata McGraw Hill New Delhi.
5. S. L. Ross, Differential Equations,3rd Edition 1984.Wiley India
6. B.S. Grewal, Higher Engineering Mathematics.36th Edition, 2010 Khanna Publishers.
7. N.P. Bali and Manish Goyal. A text book of Engineering Mathematics, 2008.Laxmi Publications, Reprint.

Basic Computer Engineering (CS-203)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Student should be able to understand the architecture of a computer with its various processing units. In addition to this student can understand memory management system of computer and also application of computer in real world.
CO2	Students should be able to understand basic knowledge of programming language, and acquire knowledge about the basic concept of how to write a program in c++.
CO3	Students should be able to understand various object oriented features like polymorphism, inheritance, object, classes and also able to learn about various data structures.
CO4	Students should be able to understand fundamental underlying principles of computer networking, network security threats, security measures and ethical issues related to the misuse of computer security.
CO5	Student should be able to learn about dbms concept, different data base languages, dba and key concepts of cloud computing.

Course Contents

Unit I:Computer Fundamentals : Introduction of Computers, Classification of Computers, Anatomy of a computer, Memory Hierarchy, Introduction to OS, Operational Overview of a CPU. Functional Components and their inter-connections, concept of Booting, Use of Operating System for directory listing, hierarchical directory structure, renaming, deleting files/folders, formatting floppy, copying files, concepts of path and pathname, switching between tasks, installation/removal of applications; Software Concepts: Types of Software - System Software, Utility Software and Application Software; System Software: Operating System, Compilers, Interpreters and Assembler; Operating System: Need for operating system, Functions of Operating System (Processor Management, Memory Management, File Management and Device Management), Types of operating system – Interactive (GUI based), Time Sharing, Real Time and Distributed;

Unit II: Basics of C and C++ : Overview of C, C++, procedural oriented programming, Developing Programs in C, Parts of Simple C Program, Structure of a C Program, Comments, Program Statements, C Tokens, Keywords, Identifiers, Data Types, Variables, Constants, Operators and Expressions, Expression Evaluation–precedence and associativity, Type Conversions.**Input-Output :** Non-formatted and Formatted Input and Output Functions

Control Statements: Selection Statements – if, if-else, nested if, nested if-else, comma operator, conditional operator, switch; **Iterative Statements–**while, for, do-while; Special Control Statement– goto, break, continue, **Arrays and Strings:** One-dimensional Arrays, Character Arrays, Functions from ctype.h, string.h, Multidimensional Arrays. Functions, Pointers etc.

Unit III:Introduction to C++ : Structure of C++ program, creating the source file, compiling and linking ,Tokens, Keywords, Identifiers and Constants , Basic Data types, User defined Data types, storage classes, Derived data types, Operators in C++,Arrays, Strings. Basics of Classes and Objects. Constructors and Destructors, Operator overloading and Type Conversions, Binary Operators, Rules for Operator, Managing Console I/O operations. Object oriented concepts.

Unit IV: Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Computer Networking: Introduction, Goals, ISO-OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Introduction to Internet, World

Wide Web, E-commerce Different types of attacks like Money Laundering, Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, ,Logic bombs, Hacking Spamming, Cyber Defamation , pharming Security measures Firewall, Computer Ethics & Good Practices, Introduction of Cyber Laws about Internet Fraud, Good Computer Security Habits.

Unit V: Data base Management System: Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages. Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public, private, community and hybrid clouds), Pros and Cons of cloud computing.

Reference Books:-

1. E Balagurusamy. Fundamentals of Computers. 1st.TMH.
2. Silakari and Shukla, Basic Computer Engineering. 1st. Wiley India
3. V Rajaraman. Fundamentals of Computers. 3rd.PHI.
4. E.Balagurusamy.OOP with C++,Fifth.TMH
5. Andrew Tananbaum, Computer Networks.Third.PHI
6. Korth. Data Base Management Systems, Indian TMH.

List of suggestive core experiments: -

1. Write a program to.
    - Print the sum of digits of a given number.
    - Check whether the given number is Armstrong or not
    - Print the prime number from 2 to n where n is natural number given
2. Write a program to read the student name, roll no, marks and display the same using class and object. Also implement • Default Constructor, Parameterized Constructor, Copy Constructor.
3. Write a program to implement copy constructor, friend functions and friend class.
4. Write a program to demonstrate single inheritance, multilevel inheritance and multiple inheritances.
5. Write a program to demonstrate static and dynamic polymorphism.

Basic Civil Engineering & Mechanics (CS-204)/(AL-204)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Student should get general idea of selection of building materials for the components of building construction as per requirement of site.
CO2	Students should be able to get the concepts of surveying methods, results and surveying instruments in field.
CO3	Students should be able to do plotting of area traversed in field survey using conventional and modern techniques.
CO4	Students should be able to understand the use of principle of static and dynamics in civil engineering structures.
CO5	Students should be able to use centre of gravity and moment of inertia for finding complex cross sections.

Course Contents

Unit I : Stones, Bricks, Cement, Lime, Timber-Types, Properties, Test & uses, laboratory tests. Concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, Compaction, Curing.
Elements of Building Construction, Foundations conventional spread footings, RCC footings, Brick masonry walls, Plastering and Pointing, Floors, Roofs, Doors, Windows, Lintels, Staircases – Types and their suitability
Unit II: Introduction to surveying Instruments – Levels, Theodolites, Plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.
Unit III : Mapping details and Contouring, Profile Cross sectioning , Measurement of areas & volumes, Application of measurements in quantity computations, Survey stations, Introduction of remote sensing and its applications.
Unit IV: Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent Co- planner forces, Free Body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems.
Unit V: Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes. Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

Reference Books:

1. S. Ramamrutam&R.Narayanan. Basic Civil Engineering,3rd.Dhanpat Rai Publication.
2. Prasad I.B., Applied Mechanics,3rd.Khanna Publication
3. Shesha Prakash and Mogaveer. Elements of Civil Engg&Engg. Mechanics.1st.PHI

4. S.P,Timoshenko, Mechanics of structure.1st.East West press Pvt.Ltd.
5. Duggal, Surveying, 1st.Tata McGraw Hill New Delhi
6. S.C. Rangwala, Building Construction,3nd.Charotar publications House, Anand
7. Grucharan Singh, Building Construction,3rd.Standard Book House, New Delhi
8. Gopi, Global Positioning System Principles and application.2nd.TMH
9. R.C. Hibbler, Engineering Mechanics,2nd.Statics & Dynamics
10. Boresi&Schmidt,Engineering Machines- statics dynamics.1st.Thomson' Books
11. R.K. Rajput, Engineering Mechanics,3rd. S.Chand& Co.

List of suggestive core experiments:

Practical work will be based on surveying and field work and material of Applied Mechanics

SAMPLE FIELD WORK:

1. Linear measurements: Chain and Tape Surveying, Errors, Obstacles, Booking and Plotting, Calculation of Areas. 2. Angular Measurements: Bearing, Prismatic Compass, Local Attraction, Bowditch's Rule of correction, traverse open and closed, plotting of traverse, accuracy and precision. 3. Levelling : Types of Levels, Levelling Staff, Measurements, recording, curvature and refraction correction, reciprocal levelling, sensitivity of level. 4. Contours: Properties, uses, plotting of contours, measurement of drainage and volume of reservoir. 5. Measurement of area by planimeter.

Technical Communication (CS-205)/(AL-205)(T&P)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Analyse relevance and importance of communication in a globalized worlds.
CO2	Compare types of communication to overcome barriers to communicate
CO3	Develop writing and speaking skills with different tools
CO4	Prepare for Job interviews with the help of self assessment techniques
CO5	Apply advanced grammar to develop linguistic abilities.

Course Contents

Unit I: Identifying Common errors in writing: Parts of Speech, Sentence Structure, Tenses, Subject-Verb Agreement, Active and Passive Voice, Reported Speech: Direct and Indirect.
Unit II: Vocabulary building and Comprehension: Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, Antonyms, Reading Skills.
Unit III: Communication: Introduction, Meaning and Importance of Communication, Process of Communication, 7 C's of Communication, Verbal Communication, NonverbalCommunication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students

Unit IV: Developing Writing Skills:
Planning, Drafting and Editing, SQ3R. Precise Writing, Technical Definition and Technical Description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, and Progress Report.

Unit V: Business Correspondence:
Importance of Business Letters, Parts and Layout of letter. Application, Contents of good Resume, Guidelines for writing Resume, Calling & Sending Quotation, Order, Complaint, Tender and E-mail.

Reference Books:-

1. Meenakshi Raman and SangeetaSharma,'Technical Communication : Principles and practice',2017.Oxford University Press
2. Dr Neeta Sharma, English,2017.Satya Prakashan New Delhi
3. Krizan and Merrier,Effective Business Communication,2007.Cengage learning
4. Sanjay Kumar and Pusplata, Communication Skill,2011.Oxford University Press
5. F.T. Wood, Remedial English Grammar 2007.Macmillan.

6. Kul Bhushan Kumar& R S Salaria,Effective Communication Skills'2016.Khanna Publishing House, Delhi
7. CIEFL-Exercises in spoken English Parts I-III.1997.Oxford University Press.

List of Suggestive Core Experiments:

Practice work and activities are based on the contents included in course

Engineering Graphics (CS-206)/(AL-206) (P)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Ability to develop an understanding of construction of different types of scales and curves, their use in preparation of drawing of different elements.
CO2	Knowledge of projections, types of projection and projections of straight lines. Familiarize with the projections of 1d, 2d& 3d elements.
CO3	Ability to identify and construction of projections of planes and solids and their use in preparation and interpretation of building and machine drawings.
CO4	Familiarize with the sectioning of solids and developments of surfaces of different solids. Knowledge of sheet metal fabrication of different mechanical component.
CO5	Ability to construction of isometric projection of different solids, castings etc. Knowledge of computer aided drawing and with the help of AutoCAD software construction of machine component drawings

Course Contents

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

UNIT 2
Projection: Type of Projection, Orthographic Projections, first and third angle projection.
Projections of Points and lines: Line inclined to one plane, inclined with both the , true length, true inclination, Traces of straight line

UNIT 3
Projections of Plane and Solid: Projection of plane like circle and Polygon on different position, Auxiliary plane, projection like polyhedrons like prism, pyramid, solids of revolutions like cylinders, cones in different position

UNIT 4
Sections of solid: Prism, cylinder, pyramid, Cone- auxiliary view
Development of surfaces: Parallel line and radial line method for right solids, regular solid prism, Pyramid cylinder and cone, sectional orthographic view of sectional solids

UNIT 5:
Isometric Projections: Principles of Isometric projection, Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.
Computer Aided Drafting (CAD): Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.

Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals
6. K Venkata Reddy , Text book of Engineering Drwaing, BS Publication Hydrabad

Programming Language Python (SA_AIML_02)

COURSE OUTCOMES:
After Completing the course student should be able to:

CO1	Analyse basic features of python and compare it with other programming language.
CO2	Implement primitive and derived data structures with python.
CO3	Implement structural and functional programming concept with python.
CO4	Implement object oriented programming concept with python.
CO5	Illustrate concurrent programming with python.

Course Contents

UNIT – I
Python programming Basic: Python interpreter, IPython Basics, Tab completion, Introspection, %run command, magic commands, matplotlib integration, python programming, language semantics, scalar types. Control flow
UNIT – II
Data Structure, functions, files: tuple, list, built-in sequence function, dict, set, functions, namescape, scope, local function, returning multiple values, functions are objects, lambda functions, error and exception handling, file and operation systems
UNIT – III
NumPy: Array and vectorized computation: Multidimensional array object. Creating ndarrays, arithmetic with numpy array, basic indexing and slicing, Boolean indexing, transposing array and swapping axes, universal functions, array-oriented programming with arrays, conditional logic as arrays operations, file input and output with array
UNIT – IV
Pandas: Pandas data structure, series, DataFrame, Index Object, Reindexing, dropping entities from an axis, indexing, selection and filtering, integer indexes, arithmetic and data alignment, function application and mapping, soring and ranking, correlation and covariance, unique values, values controls and membership, reading and writing data in text format
UNIT – V
Visualization with Matplotlib: Figures and subplots, colors, markers, line style, ticks, labels, legends, annotation and drawing on sublots, matplotlib configuration
Plotting with pandas and seaborn: line plots, bar plots, histogram, density plots, scatter and point plots, facet grids and categorical data

Reference Books:

1. Timothy A. Budd: Exploring python, McGraw-Hill Education.
2. R.Nageshwar Rao ,"Python Programming" ,Wiley India
3. Allen B. Downey; Think Python, O'Reilly Media, Inc.

Suggested List of Experience

1. To write a Python program to find GCD of two numbers.
2. To write a Python Program to find the square root of a number by Newton's Method.
3. To write a Python program to find the exponentiation of a number.
4. To write a Python Program to find the maximum from a list of numbers.
5. To write a Python Program to perform Linear Search
6. To write a Python Program to perform binary search.
7. To write a Python Program to perform selection sort.
8. To write a Python Program to perform insertion sort.
9. To write a Python Program to perform Merge sort.
10. To write a Python program to find first n prime numbers.
11. To write a Python program to multiply matrices.
12. To write a Python program for command line arguments.
13. To write a Python program to find the most frequent words in a text read from a file.
14. To write a Python program to simulate elliptical orbits in Pygame.
15. To write a Python program to bouncing ball in Pygame.

B.Tech CSE& AIML LNCT University
III Semester Syllabus

Mathematics III (CS-301)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	To introduce effective mathematical tools for the numerical solution of algebraic and transcendental equations
CO2	Understand numerical differentiation and integration and use numerical techniques to find solution of linear system of equations.
CO3	Work numerically on ode and pde using different method through the theory of finite differences.
CO4	Discuss laplace transform; inverse laplace transform and Fourier transform which are used in various branches of engineering.
CO5	To acquaint the student with mathematical tools available in statistics& probability used in various fields of science and engineering.

Course Contents

Module 1: Numerical Methods – 1: (8 hours): Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods – 2: (6 hours): Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Module 3: Numerical Methods – 3: (10 hours): Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus: (8 hours): Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, ExponentialDistribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition,2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition,2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint,2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India,2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.Statistics

Discrete Structure (CS-302 / AL-302)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Apply the key concepts of set theory and also gain knowledge to computer logics.
CO2	Construct various algebraic structures.
CO3	Analyse method of representing mathematical propositional logic and its application.
CO4	Discuss graph theory concepts to solve complex problems.
CO5	Describe possets, hasse diagram and lattices with suitable example.

Course Contents

UNIT-1: Propositional Logic and Proof Techniques:
Syntax, Semantics, valid, satisfiable and unsatisfiable formula
Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers Theorem proving Techniques: Principles of Mathematical induction, Proof by contradiction, Forward proof, proof by contradiction.

UNIT-II: Basic Mathematical structures
Set Theory, Relation, Function, Theorem Proving Techniques
Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem.

UNIT-III: Function
Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole , Russels's Paradox, principle, Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, counting techniques

UNIT-IV: Abstract algebra
Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results. Applications to cryptography

UNIT-V: Graph Theory
Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian graphs paths and characterization, Hamiltonian paths and circuits, Graph coloring and its applications, chromatic number, Isomorphism and Homomorphism of graphs. Applications to Computer Science

Books Suggested:

- C L Liu, Elements of Discrete Mathematics, Second Edition, Tata McGraw-Hill.
- J P Tremblay and R Manohar, Discrete mathematical structures with applications to Computer Science, Tata McGraw-Hill.
- Kenneth H Rosen (Editor-in-chief), Handbook of Discrete and Combinatorial Mathematics, CRC Education 2002.

Object Oriented Programming Methodology with Java (CS-303/AL-303)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Implement encapsulation, abstraction of object oriented technology
CO2	Explain classes, their relationships and associativity of objects with classes.
CO3	Discuss various object oriented features like polymorphism, inheritance and abstract methods with example.
CO4	Perform operations with container classes and templates.
CO5	Perform the file operations with the help of various class library.

Course contents

UNIT-1: Introduction to Object Oriented Programming:
Object Oriented Concepts, Merits of Object Oriented Technology. Abstraction, Encapsulation, Information Hiding. Object Model: definition, State, behavior, Identity and messages. Concept of object initialization, constructors, constructor overloading. Access modifiers: Class attributes and methods. Introduction to object model of software development.

UNIT-II: Introduction to classes and Objects
Java features: Java syntax, data types, data type conversions, control statements, operators and their precedence. Introduction to Class: Instance members and member functions. String Handling, Wrapperclasses: Arrays and Vectors.

UNIT-III: Inheritance and Polymorphism
Structure, Class Relationships, Merits and Demerits Inheritance, Types of Inheritance, Polymorphism: Dynamic method dispatch, Runtime polymorphism, Abstract classes.

UNIT-IV: Exception Handling and Multithreading
Exceptions: Need for exceptions, Checked Vs Unchecked exceptions, creating custom exceptions. Multithreading:Introduction, Priorities and scheduling, Inter-thread communication, Thread Synchronization and its lifecycle.

UNIT-V: Java I/O, and C++ case study
Basic concept of streams I/O stream & reader-writer classes.File handling.in C++ and Java

Books Suggested:

- CayS. Horstmann, CoreJAVAVol-1,9/e,PearsonEducation2012.
- HerbertSchildt,The complete Reference,9/e,TataMcGrawHill2014.
- ScottW Amber,The Object Primer,3/e,Cambridge2004.
- Timothy Budd, Object Oriented Programming, 3/e, Pearson Education 2002.

Digital Electronics (CS-304)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Design and implement digital circuits of desired specifications.
CO2	Analyses digital circuits for fault detection and correction.
CO3	Configure cost effective digital circuits used in memory system and control application.
CO4	Understand the difference between analogy and digital circuits.
CO5	Know various digital ics available and their relative merits and demerits.

Course contents

UNIT-1: Foundation

Number system, Arithmetic operations using 1's,2's complement, variouscodes, Review of basicgates, universal gate application, Logic Families: - RTL, DTL, TTL &MOS, CMOS families forNOR/NAND gate, characteristics of Digital IC's - speedof operation, power dissipation, Fan-in,Fan-out,Noisemargin, Current and Voltageparameters.

UNIT-II: Combinational Circuits

Boolean laws & algebra , Sum Of Product & Product Of Sum expression, K-Map and Tabularmethodofminimization,CombinationaldeviceslikeMultiplexer,Demultiplexer,Decoders,Encoders,Tri-state Devices, Combinational circuitdesign for Adder, Subtractor, Comparator, Codeconverters.

UNIT-III: Sequential Circuits

Latches and, Flip-Flops SR,D,T,JK,Master-slave,Flip-Flop conversions, Synchronous counter, Asynchronous counter, Up-Down Counter.

UNIT-IV: Registers

ShiftRegisters,serialinparallelout,serialinserialout,parallelinserialout,parallelinparallelout,Universal Shift Register, Sequence Generators, Designing of Synchronous & Asynchronous sequential circuits.

UNITV: A/D Conversion and Microprocessor

Digital to Analog Conversion Technique as Binary Weighted DAC, R-2R Ladder, Conversions as Flashtype, Countertype, Successive Approximations typeA/D converter, Clock generation through IC555, Memory- Types ROM, RAM, Introduction to Microprocessor, Microprocessor Evaluation, Programming and hardware model of Microprocessor,8/16/32/64bitSeriesof Microprocessors.

Books Suggested

- Morris Mano,Digital Circuits &Logic Design, PHI
- Gothman,Digital Electronics, PHI
- Tocci, Digital Electronics, PHI
- Mavino & Leach, Digital Principles & Applications, PHI
- Taubandschilling,Digital Integrated electronics.
- Simon Haykin, Introduction to Analog & Digital Communication, Wiley

Data Structure (CS-305/AL-305)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Explain stack and queue data structures along with their merits and demerits
CO2	Use primitive operations on arrays, structures, stack and queue data structures.
CO3	Develop programs to perform primitive operations on linked lists.
CO4	Utilize dijkstra's algorithm to find spanning tree for a given graph.
CO5	Apply quick and merge sorting methods in problem solving.

Course contents

UNIT-I: **Arrays and List**

Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linkedlist, CircularlinkedList, Doublylinkedlist, Applications of linkedlist.

Unit-II: **Stacks**

Definition, Representations: static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Honoi problem, Implementation of recursion, Quick sort and Merge sort.

Unit-III: **Queues and Hashing**

Definition, Representations, Static and dynamic, Circular Queue, Doubleended Queue, PriorityQueue, Implementation of Priority Queue using Heap data structure, HeapSort, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

Unit-IV: **Trees**

Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree, Binary Search tree, AVL tree, Mway searchtrees,B-tree & its variations.

Unit-V: **Graphs**

Definition, Basic terminology, Graph Types, Representations: static, dynamic;Implementations, Searchingin graphs, Shortest path in graphs, Applications.

Books Suggested:

- E.Horowitz&Sahni,Fundamental Data Structure,GalgotiaBookSource,1983.
- Tannenbaum,Data Structure Using C,PearsonEducation,2003.
- Kruz,Data Structure and Programming Design,1987.
- N.Wirth, Algorithms+DataStructure=Program,PrenticeHallofIndia,1979.
- Goodrich&Tamassia,Data Structures and Algorithms in C++,2ndEdition,John

Computer Programming (CS-306/AL-306)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Explain basic architecture of java and capabilities of java language.
CO2	Illustrate basic concepts of object oriented programming and apply these concepts with the help of java language.
CO3	Update and retrieve the data from the database using jdbc connectivity.
CO4	Develop the graphical user interaction programs.
CO5	Demonstrate development of web based applications with the help of servlets and jip.

Course contents

Unit 1 HTML

What is Markup Language, Basic Structure of HTML, Head Section and Elements of Head Section, Meta Tags, CSS Tags, Script Tag, Table Tag , Div Tag ,Anchor tags , Image Tag, Object Tag, Iframe Tag , Forms , Form Tag , Attributes of Form , POST and GET Method Text input, Text area , Checkbox and Radio Button , Dropdown, List and Opt-group , File Upload and Hidden Fields o Submit, HTML Validators, Introduction to HTML5 o Features of HTML5 , HTML5 DocType.

Unit 2 CSS Codes

Introduction to Cascading Style Sheets ,Types of CSS , CSS Selectors , Universal Selector ID Selector, Tag Selector , Class Selector , Sub Selector , Child Combinatory Selector CSS Properties, Type Properties , Background Properties , Block Properties , Box Properties , List Properties , Border Properties , Positioning Properties , Real-time Implementation, Converstion of Table to CSS Layout , CSS Menu Design (Horizontal, Vertical).

Unit 3 Javascript JQuery

Introduction to Client Side Scripting , Introduction to Java Script , JavaScript Types , Variables in JS , Operators in JS , Conditions Statements , Java Script Loops , JS Popup Boxes , JS EventsJS Arrays , Working with Arrays , JS Objects , JS Functions , Using Java Script in Real-time Related Examples Introduction to jQuery o jQuery Features, Installing jQuery , jQuery Syntax ,jQuery Functions and form UI designing.

Unit 4 Node JS and Angular

JS server-side JS applications. Installing Node JS, Node JS Modules Create , publish, extend, manage, Node JS HTTP, Express, Mongo-DB, overview of structural framework Angular JS.

Unit 5 Introduction to web technologies

How website works, client, server, uploading, FTP,HTTP,client server scripting languages, domains hosting, Intro to CMS word press, joomla, drupal

Books Suggested:

- Mastering HTML,CSS,Javascript Web publishing HTML5BlackBook.
- JavaScript:The Definitive Guide by David Flanagan.
- Professional JavaScript for Web Developers by Nicholas C.Zakas.
- Mike Cantelon, T.J.Holowaychuk, MarcHarter,NathanRajlich,Node.JS

R Programming for Data Science and Data Analysis (SA_AIML_03)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Use Open source and platform dependent language.
CO2	Illustrate basic Machine Learning Operations.
CO3	Update and retrieve the data from the array of packages.
CO4	Develop Exemplary support for data wrangling..
CO5	Demonstrate Quality plotting and graphing

Course contents

UNIT I:

Numerical Methods – 1:: Getting Started with R and R Workspace: Introducing R, R as a programming Language, the need of R, Installing R, RStudio, RStudio's user interface, console, editor, environment pane, history pane, file pane, plots pane, package pane, help and viewer pane R Workspace, R's working directory, R Project in R Studio, absolute and relative path, Inspecting an Environment, Inspect existing Symbols, View the structure of object, Removing symbols, Modifying Global Options, Modifying warning level, Library of Packages, Getting to know a package, Installing a Package from CRAN, Updating Package from CRAN, Installing package from online repository, Package Function, Masking and name conflicts

UNIT II: Numerical Methods – 3

Basic Objects and Basic Expressions: Vectors, Numeric Vectors, Logical Vectors, Character Vectors, subset vectors, Named Vectors, extracting element, converting vector, Arithmetic operators, create Matrix, Naming row and columns, subsetting matrix, matrix operators, creating and subsetting an Array, Creating a List, extracting element from list, subsetting a list, setting value, creating a value of data frame, subsetting a data frame, setting values, factors, useful functions of a data frame, loading and writing data on disk, creating a function, calling a function, dynamic typing, generalizing a function. Assignment Operators, Conditional Expression, using if as expression and statement, using if with vectors, vectorized if: ifelse, using switch, using for loop, nested for loop, while loop

UNIT III: Statistical Methods

Working with Basic Objects and Strings: Working with object function, getting data dimensions, reshaping data structures, iterating over one dimension, logical operators, logical functions, dealing with missing values, logical coercion, math function, number rounding functions, trigonometric functions, hyperbolic functions, extreme functions, finding roots, derivatives and integration, Statistical function, sampling from a vector, Working with random distributions, computing summary statistics, covariance and correlation matrix, printing string, concatenating string, transforming text, Formatting text, formatting date and time, formatting date and time to string, finding string pattern, using group to extract data, reading data

UNIT IV: Testing of hypothesis and Estimation

Working with Data – Visualize and Analyze Data: Reading and Writing Data, importing data using built-infunction, READR package, export a data frame to file, reading and writing Excel worksheets, reading and writing native data files, loading built-in data sets, create scatter plot, bar chart, pie chart, histogram and density plots, box plot, fitting linear model and regression tree Reference Books: Hands-On Programming with R by Garrett Grolemund R for Data Science by Hadley Wickham & Garrett Grolemund

UNIT V: Concept of Probability

Set functions, basic axioms, probability of occurrence, elementary probability – Bayes's theorem, Probability: Classical, relative frequency and axiomatic definitions of probability, Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Multivariate probability distribution

Reference Books:

1. AchimKlenke, (2014), Probability Theory A Comprehensive Course Second Edition, Springer, ISBN 978-1-4471-5360- 3
2. Christian Heumann, Michael SchomakerShalabh (2016), Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R, Springer International Publishing, ISBN 978-3-319-46160-1

Probabilistic Modeling and Reasoning with Python (SA_AIML_04)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	learn Basics of Statistics and Probability distributions
CO2	Understand Bayesian inference
CO3	Apply hypothesis testing on a problem
CO4	Calculate confidence interval and make the decision
CO5	Apply other statistical methods to solve various engineering problems

Course Contents

UNIT – I Introduction to Statistics: Introduction to Statistics. Role of statistics in scientific methods, current applications of statistics. Scientific data gathering: Sampling techniques, scientific studies, observational studies, data management. Data description: Displaying data on a single variable (graphical methods, measure of central tendency, measure of spread), displaying relationship between two or more variables, measure of association between two or more variables.
UNIT – II Probability Theory: Sample space and events, probability, axioms of probability, independent events, conditional probability, Bayes' theorem. Random Variables: Discrete and continuous random variables. Probability distribution of discrete random variables, binomial distribution, poisson distribution. Probability distribution of continuous random variables, The uniform distribution, normal (gaussian) distribution, exponential distribution, gamma distribution, beta distribution, t-distribution, χ " distribution. Expectations, variance and covariance. Probability Inequalities. Bivariate distributions
UNIT -III Point Estimations: Methods of finding estimators, method of moments, maximum likelihood estimators, bayes estimators. Methods of evaluating estimators, mean squared error, best unbiased estimator, sufficiency and unbiasedness Interval Estimations: Confidence interval of means and proportions, Distribution free confidence interval of percentiles
UNIT - IV Test of Statistical Hypothesis and p-values: Tests about one mean, tests of equality of two means, test about proportions, p-values, likelihood ratio test, Bayesian tests Bayesian Statistics: Bayesian inference of discrete random variable, Bayesian inference of binomial proportion, comparing Bayesian and frequentist inferences of proportion, comparing Bayesian and frequentist inferences of mean
UNIT – V Univariate Statistics using Python: Mean, Mode. Median, Variance, Standard Deviation, Normal Distribution, t-distribution, interval estimation, Hypothesis Testing, Pearson correlation test, ANOVA F-test

Suggested Books
Douglas C. Montgomery, (2012), Applied Statistics and Probability for Engineers, 5th Edition, , Wiley India, ISBN: 978-8-126-53719-8

B.Tech CSE& AIML LNCT University

IV Semester Syllabus

Analysis and Design of Algorithm (CS-401)/(AL-401)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Evaluate space and time complexity of merge sort algorithms.
CO2	Use greedy strategy to find minimum spanning tree using prim's algorithm.
CO3	Apply backtracking techniques for solving eight-queen problem.
CO4	Implement branch and bound methods to solve traveling salesman problem.
CO5	Solve knapsack problem using dynamic programming algorithm.

Course contents

Unit I: Definitions of algorithms and complexity, Time and Space Complexity; Time space tradeoff, various bounds on complexity, Asymptotic notation, Recurrences and Recurrences solving techniques,
Introduction to divide and conquer technique, example: binary search, merge sort, quick sort, heap sort, strassen's matrix multiplication etc, Code tuning techniques: Loop Optimization, Data Transfer Optimization, Logic Optimization, etc.
Unit II : Study of Greedy strategy, examples of greedy method like optimal merge patterns, Huffman coding, minimum spanning trees, knapsack problem, job sequencing with deadlines, single source shortest path algorithm etc. Correctness proof of Greedy algorithms.
Unit III : Concept of dynamic programming, problems based on this approach such as 0/1 knapsack, multistage graph, reliability design, Floyd-Warshall algorithm etc.
Unit IV : Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph colouring problem etc. Introduction to branch & bound method, examples of branch and bound method like travelling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms.
Unit V : Advanced tree and graph algorithms, NP-hard and NP-complete problems, Approximations Algorithms, Data Stream Algorithms, Introduction to design and complexity of Parallel Algorithms

References:

1. Coremen Thomas, Leiserson CE, Rivest RL, Introduction to Algorithms, Third edition, PHI.
2. Horowitz &Sahani, Analysis & Design of Algorithm, Fourth Edition Computer Science Press.
3. Dasgupta, algorithms, Fifth Edition, TMH
4. Ullmann; Analysis & Design of Algorithm, Addison-wesley publishing company,
5. Michael T Goodrich, RobartoTamassia, Algorithm Design, Wiely India
6. Rajesh K Shukla: Analysis and Design of Algorithms: A Beginner's Approach; Wiley

List of Experiments:

1. Write a program for Iterative and Recursive Binary Search.

2. Write a program for Merge Sort.

3. Write a program for Quick Sort.

4. Write a program for Strassen's Matrix Multiplication.

5. Write a program for optimal merge patterns.

6. Write a program for Huffman coding.

7. Write a program for minimum spanning trees using Kruskal's algorithm.

8. Write a program for minimum spanning trees using Prim's algorithm.

9. Write a program for single sources shortest path algorithm.

10. Write a program for Floye-Warshal algorithm.

11. Write a program for traveling salesman problem.

12. Write a program for Hamiltonian cycle problem.

Computer Organization and Architecture (CS-402)/(AL-402)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Analyze instruction execution cycle and addressing modes for computer processor.
CO2	Analyze computer arithmetic and types of micro-processor.
CO3	Describe i/o subsystems
CO4	Explain memory architecture with diagram
CO5	Interpret the use of parallel processing in uniprocessor system & multiprocessor architecture.

Course contents

Basic Structure of Computer: Structure of Desktop Computers, CPU: General Register Organization-Memory Register, Instruction Register, Control Word, Stack Organization,Instruction Format, ALU, I/O System, bus,CPU and Memory Program Counter, Bus Structure, Register Transfer Language-Bus and Memory Transfer, addressing modes.Control Unit Organization: Basic Concept of Instruction, Instruction Types, Micro Instruction Formats, Fetch and Execution cycle, Hardwired control unit, Microprogrammed Control unit microprogram sequencer Control Memory, Sequencing and Execution of Micro Instruction.

Computer Arithmetic: Addition and Subtraction, Tools Compliment Representation,Signed addition and Subtraction, Multiplication and division, Booths Algorithm,Division Operation, Floating Point Arithmetic Operation. design of Arithmetic unit

I/O Organization:I/O Interface –PCI Bus, SCSI Bus, USB, Data Transfer: Serial,Parallel, Synchronous, Asynchronous Modes of Data Transfer, Direct Memory Access(DMA), I/O Processor.

Memory Organization: Main memory-RAM, ROM, Secondary Memory –Magnetic Tape, Disk, Optical Storage, Cache Memory: Cache Structure and Design, Mapping Scheme, Replacement Algorithm, Improving Cache Performance, Virtual Memory, memory management hardware

Multiprocessors: Characteristics of Multiprocessor, Structure of Multiprocessor-Interprocessor Arbitration, Inter-Processor Communication and Synchronization. Memory in Multiprocessor System, Concept of Pipelining, Vector Processing, Array Processing, RISC And CISC, Study of Multicore Processor –Intel, AMD.

Reference Books:

1. Morris Mano , "Computer System Organization "PHI
2. Alan Clements: "Computer Organization and Architecture", Cengage Learning
3. SubrataGhosal: "Computer Architecture and Organization", Pearson
4. William stalling ,"Computer Architecture and Organization" PHI
5. M. Usha, T.S. Shrikant: "Computer System Architecture and Organization", Willey India
6. Chaudhuri, P.Pal: "Computer Organization and Design", PHI
7. Sarangi: "Computer Organization and Architecture",Mc-Graw Hills

Software Engineering (CS-403)/(AL-403)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Compare software development models with their merits and demerits.
CO2	Construct software requirement specification with functional and non-functional requirements.
CO3	Apply boundary value analysis and equivalence partitioning testing techniques.
CO4	Calculate cyclomatic complexity for given program.
CO5	Apply cocomo model for estimating cost and efforts.

Course contents.

Unit I : The Software Product and Software Process
Software Product and Process Characteristics, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model,Spiral Model, Component Assembly Model, RUP and Agile processes. Software Process customization and improvement, CMM, Product and Process Metrics

Unit II: Requirement Elicitation, Analysis, and Specification
Functional and Non-functional requirements, Requirement Sources and Elicitation Techniques,Analysis Modeling for Function-oriented and Object-oriented software development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability

Unit III: Software Design
The Software Design Process, Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function- oriented Design, SA/SD Component Based Design, and Design Metrics.

Unit IV : Software Analysis and Testing
Software Static and Dynamic analysis, Code inspections, Software Testing, Fundamentals,Software Test Process, Testing Levels, Test Criteria, Test Case Design, Test Oracles, Test Techniques, Black-Box Testing, White-Box Unit Testing and Unit, Testing Frameworks, Integration Testing, System Testing and other Specialized, Testing, Test Plan, Test Metrics, Testing Tools. , Introduction to Object-oriented analysis, design and comparison with structured Software Engg.

Unit V : Software Maintenance & Software Project Measurement
Need and Types of Maintenance, Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance (SQA). Project Plan, Project Metrics.

Practical and Lab work :
Lab work should include a running case study problem for which different deliverable sat the end of each phase of a software development life cycle are to be developed. This will include modeling the requirements, architecture and detailed design. Subsequently the design models will be coded and tested. For modeling, tools like Rational Rose products. For coding and testing, IDE like Eclipse, Net Beans, and Visual Studio can be used.

References:

1. Pankaj Jalote ,"An Integrated Approach to Software Engineering", NarosaPub, 2005
2. Rajib Mall, "Fundamentals of Software Engineering" Second Edition, PHI Learning
3. R S. Pressman,"Software Engineering: A Practitioner's Approach", Sixth edition 2006, McGraw-Hill.
4. Sommerville,"Software Enginerring",PearsonEducation.
5. Richard H.Thayer,"SoftwareEnginerring& Project Managements",WileyIndia
6. Waman S.Jawadekar,"Software Enginerring",TMH
7. BobHughes, M.Cotterell, RajibMall"SoftwareProjectManagement", McGrawHill

Energy and Environmental Engineering Sciences (EEES)(CS-404)/(AL-404)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Develop an understanding of various sources of fossil fuel sources and energy storage.
CO2	Identify eco-systems and its importance in food chain.
CO3	Develop an understanding of biodiversity and its conservation at various levels.
CO4	Understanding causes of environmental pollution, and its control including disaster management.
CO5	Appreciation and understanding of sustainable development including various acts for prevention of pollution.

Course contents

Module 1: Introduction to Energy Science:
Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment; Overview of energy systems, sources, transformations, efficiency, and storage; Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) -past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

***Module2*: Ecosystems**
• Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

***Module 3*: Biodiversity and its conservation**
• Introduction – Definition: genetic, species and ecosystem diversity; Biogeographically classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

***Module 4:* Environmental Pollution**
Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards; Solid waste Management: Causes, effects and control measures of
urban and industrial wastes; Role of an individual in prevention of pollution; Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides.

***Module 5:* Social Issues and the Environment**
From Unsustainable to Sustainable development; urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns. Case Studies

Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Wasteland reclamation; Consumerism and waste products; Environment
Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.
Field work • Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural • Study of common plants, insects, birds.

REFERENCE

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.

2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).

3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,

Environmental Encyclopedia, Jaico Publ. House, Mumabai,

4. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

5. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R)

6. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.

Modern Application Development (CS405)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Develop an understanding of various sources of fossil fuel sources and energy storage.
CO2	Identify eco-systems and its importance in food chain.
CO3	Develop an understanding of biodiversity and its conservation at various levels.
CO4	Understanding causes of environmental pollution, and its control including disaster management.
CO5	Appreciation and understanding of sustainable development including various acts for prevention of pollution.

Course contents

UNIT I
Overview of Java
Java Introduction, Variables, Control statements, class and object, encapsulation, abstraction, string, array, Inheritance, Interface and Packages.
UNIT II
Learning the language (Java)
Exception Handling, try and catch block, Multiple catch block, Nested try, finally block, throw keyword, throws keyword, Custom Exception, Nested Classes, Multi threading, Synchronization, Java IO Classes and Serialization.
UNIT III
Collection Framework, Array List class, LinkedList class, ListIterator interface, HashSet class, Linked Hash Set class, TreeSet class, Priority Queue class, Array Dequeclass, Map interface, Hash Map class, Linked Hash Map class, Tree Map class, Hashtable class, Comparable and Comparator. JDBC Introduction, JDBC Drivers, Steps to connect to the database, Driver Manager, Connection interface, Statement interface, Result Set interface, Prepared Statement, Result Set Meta Data, Database Meta Data, Storing image, Retrieving image, Storing file, Retrieving file, Transaction Management.
UNIT IV
Basics of HTML, CSS and Java script, Introduction of Servlet, Servlet API, Servlet Interface, Generic Servlet, Http Servlet, Servlet Life Cycle, Working with Apache Tomcat Server, Steps to create a servlet in Tomcat, how servlet works, Servlet Request methods, Request Dispatcher, send Redirect, Servlet Config and Servlet Context, Session Tracking.
UNIT V
Introduction of JSP, Difference between Servlet and JSP, Life cycle of JSP, JSP API, JSP in IDE, Scripting elements, Implicit Objects, Directive Elements, Action Elements.
Reference Books

1. E. Balaguruswamy, “Programming In Java”; TMH Publications

2. The Complete Reference: Herbert Schildt, TMH

3. Deitel&Deitel, ”JAVA, How to Program”; PHI, Pearson.

4. Cay Horstmann, Big JAVA, Wiley India.

5. Merlin Hughes, Java Network Programming , Manning Publications/Prentice Hall.

Machine Learning and Pattern Recognition (SA_AIML_05)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Apply knowledge of computing and mathematics to machine learning problems, models and algorithms
CO2	Analyse a problem and identify the computing requirements for ML regression model
CO3	Apply regularization to improve regression performance
CO4	Design and implement an algorithm or ml model for accurate outcome.
CO5	Evaluate efficiency and related parameters of various ml models.

Course contents

UNIT – I

Introduction: Learning systems, real world applications of machine learning, why machine learning, variable types and terminology, function approximation

Types of machine learning: Supervised learning, unsupervised learning, reinforcement learning

Important concepts of machine learning: Parametric vs non-parametric models, the trade-off between prediction accuracy and model interpretability, the curse of dimensionality, measuring the quality of fit, bias-variance trade off, overfitting, model selection, no free lunch theorem

UNIT – II

Linear Regression: Linear regression, estimating the coefficients, accessing the accuracy of coefficient estimates, accessing the accuracy of the model, multiple linear regression, qualitative predictors

Classification: Logistic regression, estimating regression coefficients, making predictions, multiple logistic regressions, linear discriminant analysis, bayes' theorem of classification, LDA for p=1, LDA for p>1, quadratic discriminant analysis

UNIT – III

Resampling Methods, Model Selection and Regularization: Cross-validation, leave-one-out cross-validation, k-fold cross-validation, the bootstrap, subset selection, shrinkage methods, ridge and lasso regression, dimension reduction methods, principal components regression, partial least square

Tree Based Methods: Advantages and disadvantages of trees, regression Trees, classification trees, bagging, random forest, boosting

UNIT – IV

Support Vector Machine: Maximum margin classifier, classification using a separating hyperplane, the maximal margin classifier, support vector classifier, support vector machines, classification with non-linear decision boundaries, support vector machine, one-versus-one classification, one-versus-many classification

Unsupervised Learning: Principle component analysis, what are principal components, clustering methods, k-means clustering, hierarchical clustering, Independent component analysis, latent semantic indexing, Markov Models, Hidden Markov Models.

References:

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer-Verlag New York Inc., 2nd Edition, 2011.
2. Tom M. Mitchell, “Machine Learning”, McGraw Hill Education, First edition, 2017.
3. Ian Goodfellow and YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press, 2016

Suggested Practicals

Different problems to be framed to enable students to understand the concept learnt and get hands-on on various tools and software related to the subject. Such assignments are to be framed for 10 to 12 lab sessions.

Programming Practices (CS-406)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Analyse basic features of python and compare it with other programming language.
CO2	Implement primitive and derived data structures with python.
CO3	Implement structural and functional programming concept with python.
CO4	Implement object oriented programming concept with python.
CO5	Illustrate concurrent programming with python.

Course contents

Introduction to PYTHON

Basic syntax, Literal Constants, Numbers, Variable and Basic data types, String, Escape Sequences, Operators and Expressions, Evaluation Order, Indentation, Input Output, Functions, Comments.

Data Structure: List, Tuples, Dictionary and Sets.

Control Flow:Conditional Statements - If, If-else, Nested If-else. Iterative Statement -For, While, Nested Loops Control statements - Break, Continue, and Pass.

Object oriented programming:

Class and Object, Attributes, Methods, Scopes and Namespaces, Inheritance, Overloading,

Overriding, Data hiding.

Exception: Exception Handling, except clause, Try finally clause, User Defined, Exceptions.

Modules and Packages

Standard Libraries: File I/0, Sys, logging, Regular expression, Date and Time, Network Programming,multi-processing and multi-threading.

Framework: Introduction to flask & Django

Data visualization: Introduction to NumPy & Pandas, Matplotlib

References

1. Timothy A. Budd: Exploring python, McGraw-Hill Education
2. R.Nageshwar Rao,"Python Programming", Wiley India
3. Think Python: Allen B. Downey, O'Reilly Media, Inc**.**

Programming Practices (AL-406)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Explain basic architecture of java and capabilities of java language.
CO2	Apply basic data types of Java for simple operations
CO3	Illustrate Java strings
CO4	Illustrate input output methods of Java
CO5	Illustrate basic concepts of object oriented programming and apply these concepts with the help of java language.

Course content

Objective: To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class, objects , also learn about lifetime, scope and the initialization mechanism of variables and improve the ability general problem solving abilities in programming. Be able to use the Java SDK environment to create, debug and run simple Java program.

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

Suggested List of Program :

1. Installation of J2SDK
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONTRUCTOR
10. Write a program to show Interfacing between two classes

B.Tech CSE& AIML LNCT University

V Semester Syllabus

Operating System (CS-501)/(AL-501)
COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Compare various types of operating systems
CO2	Analyse fcfs, sstf, scan and look disk scheduling algorithm techniques
CO3	Implement fcfs, sjf, priority, rrcpu scheduling algorithm.
CO4	Summarize various memory management techniques.
CO5	Differentiate between remote procedure call and remote method invocation.

Course content

Unit-1

Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine. Process Management. Processes: Definition , Process Relationship , Process states , Process State transitions , Process Control Block ,Context switching – Threads – Concept of multithreads , Types of threads. Process Scheduling: Definition , Scheduling objectives ,Types of Schedulers ,Scheduling criteria : CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only) , Scheduling algorithms : Pre emptive and Non , pre emptive , FCFS – SJF – RR , Multiprocessor scheduling , IPC.

UNIT- II

Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery. Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, and Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc., Scheduling, Scheduling Algorithms

Unit – III

Basic Memory Management: Definition, Logical and Physical address map, Memory allocation : Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction , Paging : Principle of operation – Page allocation – Hardware support for paging – ,Protection and sharing – Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Optimal (OPT) , First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)

Unit – IV

Principles of I/O Hardware: I/O devices, Disk structure, Disk scheduling algorithm File concept, Aaccess methods, File types, File operation, Directory structure, File System structure,

Allocation methods (contiguous,linked, indexed), Free-space management (bit vector, linked list, grouping).

Unit -V

Security Environment, Design Principles Of Security, User Authentication, Protection Mechanism: Protection Domain, Access Control List Introduction to Network, Distributed and Multiprocessor Operating Systems. Case Studies: Unix/Linux, WINDOWS and other Contemporary Operating Systems.

Books Suggested:

1. Modern Operating system by Andrew S. Tanenbaum , PHI
2. Operating system concepts, by Abraham Silberschatz, Willey.

Data Base Management System ((CS-502)/(AL-502)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Explain various data models with their merits and demerits.
CO2	Construct sql queries using various data manipulation statements.
CO3	Apply normalization upto 3nf on given relations.
CO4	Summarize concurrency control mechanism for database transactions.
CO5	Utilize triggers and cursors in pl/sql programming.

Course content

Unit - I
DBMS Concepts and architecture Introduction, Database approach v/s Traditional file accessing approach, Advantages, of database systems, Data models, Schemas and instances, Data independence, Data Base Language and interfaces, Functions of DBA, ER data model: Entitles and attributes, Entity types, Defining the E-R diagram, Concept of Generalization, Aggregation and Specialization. transforming ER diagram into the tables.

Unit - II
Relational Data models: Domains, Tuples, Attributes, Relations, Characteristics of relations, Keys, Key attributes of relation, Relational database, Schemas, Integrity constraints. Referential integrity, Intension and Extension, Relational Query languages: SQL-DDL, DML, integrity con straints, various joins, Relational algebra and relational calculus, Relational algebra operations like select, Project, Join, Division, outer union.

Unit - III
Data Base Design: Introduction to normalization, Normal forms, Functional dependency, Decomposition, Dependency preservation and lossless join, problems with null valued and , multivalued dependencies. Query Optimization: Introduction, steps of optimization.

Unit - IV
Transaction Processing Concepts: -Transaction System, Testing of Serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures. Log based recovery. Checkpoints deadlock handling. Concurrency Control Techniques: Concurrency Control, locking Techniques for concurrency control, time stamping protocols for concurrency control.

Unit - V
Study of Relational Database Management Systems through Oracle/PL SQL Distributed database, database links, and snapshot. Data dictionary, SQL queries, Data extraction from single, multiple tables equi- join, non equi-join, self -join, outer join. Usage of like, any, all, exists, in Special operators. Hierarchical quires, inline queries, flashback queries.

Books Suggested:

1. Date C J, “An Introduction to Database System”, Pearson Educations
2. Korth, Silbertz, Sudarshan, “Fundamental of Database System”, McGraw Hill
3. Rob, “ Data Base System: Design Implementation & Management”, Cengage Learninig
4. Elmasri, Navathe, “Fundamentals Of Database Systems”, Pearson Educations
5. AtulKahate , “ Introduction to Database Management System”, Pearson Educations
6. Oracle 9i Database Administration Fundamental-I, Volume I, Oracle Press,TMH.
7. Paneerselvam,”DataBase Management System”, PHI Learning
8. dev.mysql.com
9. www.postgressql.org

Theory of Computation & Compiler Design (CS-503-A/Al-503-A) Elective I

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Compare deterministic and nondeterministic finite state machines.
CO2	Sketch finite state machine and push down automata on various types of languages
CO3	Classify various types of languages based on recognizer and generator
CO4	Explain recursive and recursively enumerable languages
CO5	Illustrate Turing machine as a capacitor with its capabilities

Course content

UNIT-1
Finite Automata: Types of Automata Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines. Meaning of union, intersection, concatenation and closure, 2 way DFA.

UNIT-2
Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa. , regular expression, Arden's theorem.

UNIT-3
Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

UNIT-4
Push down Automata: example of PDA, deterministic and non-deterministic PDA, and conversion of PDA into context free grammar and vice versa. Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems.

UNIT-5
Introduction of Compiler, Major data Structure in compiler, types of Compiler, Front-end and Back-end of compiler, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering, Specification & Recognition of Tokens,Design of a Lexical Analyzer Generator, LEX.

Books Suggested:

1. Introduction to Automata Theory Language & Computation, Hopcroft& Ullman, Narosa Publication.
2. Element of the Theory Computation, Lewis &Christors, Pearson.
3. Theory of Computation, Chandrasekhar & Mishra, PHI.
4. Theory of Computation, Wood, Harper & Row.
5. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools , Pearson Education

Artificial Intelligence (CS-503-B/AL-503-B) Elective I

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Compare artificial intelligence techniques A*, Best First Search, Hill climbing.
CO2	Apply Intelligent algorithm for problem solving
CO3	Analyse standard neural networks ART, Boltzmann machine.
CO4	Discuss types of learning and back propagation mechanism
CO5	Discuss evolutionary based algorithms and genetic algorithm modules for AI applications

Course content

Unit 1
Fundamental of Artificial Intelligence, history, motivation and need of AI, Production systems, Characteristics of production systems , goals and contribution of AI to modern technology, search space, different search techniques: hill Climbing, Best first Search, heuristic search algorithm, A* and AO* search techniques etc.
Unit 2. Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning.
Unit 3. Probabilistic reasoning, Baye's theorem, semantic networks, scripts, schemas, frames, conceptual dependency, forward and backward reasoning.
Unit 4. Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding, natural language processing (NLP), Components of NLP, application of NLP to design expert systems.
Unit 5. Expert systems (ES) and its Characteristics, requirements of ES, components and capability of expert systems, Inference Engine Forward & backward Chaining, Expert Systems Limitation, Expert System Development Environment, technology, Benefits of Expert Systems..

Books Suggested:

1. Russel,S., and Norvig,P., "Artificial Intelligence: A Modern Approach", 4th Edition, 2020, Pearson.
2. Elaine Rich, Kevin Knight,Shivashankar B. Nair, "Artificial Intelligence", McGraw-Hill International.
3. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Morgan-Kauffman.
4. Janakiraman, K.Sarukesi, 'Foundations of Artificial Intelligence and Expert systems', Macmillan Series in Computer Science.
5. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', Prentice Hall of India.

Microprocessor and Microcontroller(CS-503-C/AL-503-C) Elective I

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understand register organization and pin diagram of 8086
CO2	Illustrate assembly language programming of 8086
CO3	Illustrate interfacing with microprocessor and micro controller
CO4	Understand basics of DMa operations
CO5	Understand architecture of 8051 microcontroller

Course content

Unit I EC-504 Microprocessors and Microcontrollers Architecture of 8086 Microprocessor BIU and EU, register organization, pin diagram, memory organization, clock generator 8284, buffers and latches, 8288 bus controller, maximum and minimum modes.
Unit II Assembly Language Programming of 8086 Instruction formats, addressing modes, instruction set, assembly language programming, ALP tools- editor, assembler, linker, locator, debugger, emulator. 8086 based multiprocessor systems Interconnection topologies, coprocessors 8087 NDP, I/O processors 8089 IOP, bus arbitration and control, lightly and tightly coupled systems.
Unit III Peripheral devices and their interfacing Memory interfacing, Programmable input/output ports 8255, Programmable interval timer 8253, keyboard/ display controller 8279, CRT controller 8275, Programmable communication interface 8251 USART.
Unit IV Interrupts of 8086 Interrupts and interrupt service routine, interrupt cycle, maskable and non-maskable interrupts, interrupt programming. Programmable interrupt controller 8259. DMA in 8086 Basic DMA operation, modes of DMA transfer, DMA controller 8257.
Unit V 8051 Microcontroller Features, architecture, Pin Diagram, memory organization, external memory interfacing, instruction syntax, data types, subroutines, addressing Modes, instruction set, ALP of 8051. Applications of 8051..

Books Suggested:

1. Ray and Bhurchandi: Advanced microprocessors and peripherals, TMH.
2. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
3. Senthil Kumar: Microprocessors and interfacing, Oxford University press.
4. Bahadure: Microprocessors 8086 and Pentium family, PHI Learning.
5. Udayashankara and Mallikarjunaswamy: 8051 Microcontroller, TMH.

Cyber Security (CS-504-A) Elective 2

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Classify cybercrime and analyse its challenges
CO2	Analyse cryptography with its various techniques
CO3	Analyse role of it act and strategies to apply it against cyber crime
CO4	Demonstrate digital signature with its component.
CO5	Analyse types and design principle for firewall.

Course content

UNIT 1

Introduction of Cyber Crime, Challenges of cyber crime, Classifications of Cybercrimes: EMail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique,

UNIT 2

Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime, Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers were hacking, session hijacking.

UNIT 3

Cyber Crime and Criminal justice: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and E-mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies to tackle Cyber Crime and Trends.

UNIT 4

The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

UNIT 5

Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks , Buffer and Overflow, Attack on Wireless Networks, Phishing : Method of Phishing, Phishing Techniques.

REFERENCES:

1. Principles of Cyber crime, Jonathan Clough Cambridge University Press
2. John R. Vacca, Computer Forensics:Computer Crime Scene Investigation, 2nd Edition, Charles River Media, 2005
3. Cyber Law Simplified, VivekSood, Pub: TMH.
4. Cyber Security by Nina Godbole, SunitBelapure Pub: Wiley-India
5. Information Warfare: Corporate attack and defense in digital world, William Hutchinson, Mathew Warren, Elsevier.
6.Cyber Laws and IT Protection, Harish Chander, Pub:PHI.

Internet and Web Technology (CS-504-B/AL-504-B) Elective 2

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Describe the concepts of www including browser and http protocol
CO2	Use the various html tags to develop the user friendly web pages
CO3	Use css to provide the styles to the webpages at various levels.
CO4	Demonstrate characteristics of java scripts for dynamic web pages.
CO5	Develop the modern web applications with client side and server side technologies

Course contents

UNIT 01
Introduction: Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0 Web Design: Concepts of effective web design, Webdesign issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Web site, Page Layout and linking, User centric design, Sitemap, Planning and publishing website,Designing effective navigation.

UNIT 02
HTML :Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists,tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

UNIT 03
Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3 JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects,the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and Javascript, Events and buttons

UNIT 04
XML : Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT 05
PHP and MySQL:Basic commandswith PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and databasebugs.

REFERENCES:

1.Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2.Web Technologies, Black Book, dreamtech Press
3.HTML 5, Black Book, dreamtech Press
4.Web Design, Joel Sklar, Cengage Learning
5.Developing Web Applications in PHP and AJAX, Harwani, McGrawHill
6.Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel , Pearson

Salesforce (CS-504-C/AL-504-C) Elective 2

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Learn overview of Salesforce
CO2	Learn to configure and customize salesforce objects
CO3	Learn to secure data p[rofiles
CO4	Demonstrate data management with SQL.
CO5	Develop app with apex programming

Course contents

UNIT 1

Introduction to salesforce, Overview of CRM, Overview of Cloud Computing
How to create Salesforce developer edition account, Walkthrough Salesforce.com platform,

UNIT 2

Configuring and customization, types of Objects , Types of Fields, Creating custom objects, tabs and app, Field Dependency, Validation Rules, Object Relationships, Approval process & Flows and Process Builder, Page Layouts, Reports and Dashboards, Lightning App Builder

UNIT 3

Securing and sharing data profiles, Permission Sets, Org-Wide Defaults, Role Hierarchies, Sharing Rules, Manual Sharing, Record Types

UNIT 4

Data management Import and Export Data with Salesforce, apex programming overview, MVC pattern , Datatypes and Variables, Control flow statements, Collections – Sets, lists, and map Data Loader.

UNIT 5

Integration Using SOAP Services, Using Rest API Services, Using Email Services, Platform Events Visual Studio Code IDE for deployment

REFERENCES:

1. Development on the Salesforce Platform Standard Requirements, Gerardus Blokdyk, University Press
2. Lars Malmqvist, Architecting AI solutions in Salesforce, Pearson

Neural Networks and Deep Learning (AL-504-A) Elective II

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Classify the neural networks
CO2	Analyse tensorflow with its various techniques
CO3	Analyse role of gradient descent
CO4	Demonstrate CNN and RNN with real life example.
CO5	Analyse types of representation learning.

Course content

Unit 1
The neural network: neuron, linear perceptron, feed forward neural network, limitations of linear neurons, sigmoid ,tanh, relu neurons, softmax output layer, information theory, cross entropy,kullback-leibier divergence Training feed-forward neural network: gradient descent, delta rules and learning rates, gradient descent with sigmolidal neurons, the backpropagation algorithms, stochastic and mini batch gradient descent, test sets, validation sets and overfitting, preventing overfitting

Unit 2
Tensorflow: Computation graphs, graphs, sessions and fetches, constructing and managing graphs ,flowingtensors,sessions,datatypes,tensor arrays, shapes, names,variables, placehoders, simple optimization,linear regression and logistic regression

Implement Neural network: keras, using keras building NN,evaluating models, data preprocessing, feature engineering,featurelearning,overfitting, underfitting, dropouts, universal workflow of DL

Unit 3
Moving beyond gradient descent: local minima vs global minima vs saddle, model identifiablity, correcting gradient points in wrong direction, momentum based optimization, second order methods, learning rate adaption, adagrad, rmsprop, adam

Unit 4
Convolutional Neural Network: convolution operation, filters and feature maps, sparse interaction, parameters sharing and equivalent representation, padding and stride, max pooling , full architectural description, build cnn using data augmentation

Unit 5
Embedding and Representation Learning: Principal component analysis, one hot encoding,word embedding, auto encoder denoising sparsity Models for sequence analysis analyzing variable length inputs,seq-to-seq with neural n-gram, speech tagger, LSTM, challenges with vanishing gradient

REFERENCES:

1. Ian Goodfellow and YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press,2016
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 1 edition (2018)

LNCTU – V Sem.

BTech V SEM Branch-CSE

Advanced JAVA (Front End and Back End) (CS-505)(P)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Study and practice exception handling
CO2	Analyse collection framework of Java
CO3	Analyse role of JDBC
CO4	Demonstrate graphics framework AWT
CO5	Demonstrate graphics framework SWING.

Course Contents

Exception Handling, try and catch block, Multiple catch block, Nested try, finally block, throw keyword, throws keyword, Custom Exception, Nested Classes, Multithreading, Synchronization, Java IO Classes and Serialization.

Collection Framework, Array List class, Linked List class, List Iterator interface, Hash Set class, Linked Hash Set class, Tree Set class, Priority Queue class, Array Deque class, Map interface, Hash Map class, Linked Hash Map class, Tree Map class, Hash table class, Comparable and Comparator, JDBC Introduction, JDBC Drivers, Steps to connect to the database, Driver Manager, Connection interface, Statement interface, Result Set interface,PreparedStatement,ResultSetMetaData,DatabaseMetaData,Storing image, Retrieving image, Storing file, Retrieving file, Transaction Management.
AWT and SWING Framework, Swing and Event API, Swing with JDBC, Java networking
Project Development

Books Suggested:

1. G. Booch, "Object Oriented Analysis& Design", Addison Wesley.
2. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
3. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
4. Herbert Schildt, "Java 2: The Complete Reference", McGraw-Hill Osborne Media, 7 th Edition.

LNCTU – V Sem.

BTech V SEM Branch-AIML

Java Programming (AL-505)

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Explain basic architecture of java and capabilities of java language.
CO2	Illustrate basic concepts of object oriented programming and apply these concepts with the help of java language.
CO3	Update and retrieve the data from the database using jdbc connectivity.
CO4	Develop the graphical user interaction programs.
CO5	Demonstrate development of web based applications with the help of servlets and jip.

Course contents

Unit-1

Introduction, History and Features of Java,Flow of Java Program, JDK,JRE and JVM, Internal Details of JVM, Variable and Data Type, Operators, Array 1-D and 2-D, Array of Array, String class implementation ,String Methods, String Buffer class, String Builder class and Object oriented Programming Concepts.

Basics of HTML, CSS and Java script, Introduction of Servlet, Servlet API, Servlet Interface, Generic Servlet, Http Servlet, Servlet Life Cycle, Working with Apache Tomcat Server,

Introduction of JSP, Difference between Servlet and JSP,Life cycle of JSP, JSP API,JSP in IDE, Scripting elements, Implicit Objects, Directive Elements, Action Elements.

Books Suggested:

1. G. Booch, "Object Oriented Analysis& Design", Addison Wesley.
2. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.
3. Peter Coad and Edward Yourdon, "Object Oriented Design", Prentice Hall/PTR.
4. Herbert Schildt, "Java 2: The Complete Reference", McGraw-Hill Osborne Media, 7 th Edition.

B.Tech CSE& AIML LNCT University

VI Semester Syllabus

Machine Learning (CS-601)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Apply knowledge of computing and mathematics to machine learning problems, models and algorithms
CO2	Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer-based systems
CO3	Analyse a problem and identify the computing requirements for ml model.
CO4	Design and implement an algorithm or ml model for accurate outcome.
CO5	Evaluate efficiency and related parameters of various ml models.

COURSE CONTENTS:
THEOTY:
Unit –I
Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis function and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.
Unit –II
Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, backpropagation, weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters,
Unit –III
Convolutional neural network, flattening, subsampling, padding, stride, convolution layer, pooling layer, loss layer, dance layer 1x1 convolution, inception network, input channels, transfer learning, one shot learning, dimension reductions, implementation of CNN like tensor flow, keras etc.
Unit –IV
Recurrent neural network, Long short-term memory, gated recurrent unit, translation, beam search and width, Bleu score, attention model, Reinforcement Learning, RL-framework, MDP, Bellman equations, Value Iteration and Policy Iteration, , Actor-critic model, Q-learning, SARSA
Unit –V
Support Vector Machines, Bayesian learning, application of machine learning in computer vision, speech processing, natural language processing etc, Case Study: Image Net Competition

TEXT BOOKS RECOMMENDED:

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer-Verlag New York Inc., 2nd Edition, 2011.
2. Tom M. Mitchell, “Machine Learning”, McGraw Hill Education, First edition, 2017.
3. Ian Goodfellow and YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press, 2016
4. Aurelien Geon, “Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems”, Shroff/O'Reilly; First edition (2017).
5. Francois Chollet, "Deep Learning with Python", Manning Publications, 1 edition (10 January 2018).
6. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly; First edition (2016).
7. Russell, S. and Norvig, N. “Artificial Intelligence: A Modern Approach”, Prentice Hall Series in Artificial Intelligence. 2003.

PRACTICAL:

Different problems to be framed to enable students to understand the concept learnt and get hands-on on various tools and software related to the subject. Such assignments are to be framed for ten to twelve lab sessions.

NATURAL LANGUAGE PROCESSING (Al-601)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Extract information from text automatically using concepts and methods from natural language processing (NLP)
CO2	Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.
CO3	Extract information from text automatically using concepts and methods from natural language processing (NLP)
CO4	Develop system that can work on topic classification
CO5	Develop system that can perform translation work

Course Contents

UNIT – I
Introduction to NLP: Natural Language Processing in real world, what is language, Approached to NLP,
Build NLP model: Eights Steps for building NLP Model, Web Scrapping
UNIT – II
Text Representation: Basic Vectorization, One-Hot Encoding, Bag of Words, Bag of N Grams, TF-IDF, Pre-trained Word Embedding, Custom Word Embeddings, Vector Representations via averaging, Doc2Vec Model, Visualizing Embeddings using TSNW and Tensorbaord
Text Classification: Application of Text Classification, Steps for building text classification system, Text classification using Naïve Bayes Classifier, Logistic Regression, and Support Vector Machine, Neural embedding for Text Classification, text classification using deep learning, interpret text classification model
UNIT – III
Information Extraction: Applications of Information Extraction, Processes for Information Extraction. Key phrase Extraction, Named Entity Recognition, Disambiguation and linking of named entity, Relationship extraction
Chatbot: Real life applications of chatbot, Chatbot Taxonomy, Dialog Systems, Process of building a dialog, Components of Dialog System, End to End Approach, Rasa NLU
UNIT – IV
NLP for social media: Application of NLP in social media, challenges with social media, Natural Language Processing for Social Data, Understanding Twitter Sentiments, Identifying memes and Fake News
NLP for E-Commerce: E-commerce catalog, Search in E-Commerce, How to build an e-commerce catalog, Review and Sentiment Analysis, Recommendations for E-Commerce.

Reference Books-

1. Natural Language Processing with Python by Steven Bird, Ewan Klein and Edward Loper.
2. Foundations of Statistical Natural Language Processing by Christophe

Computer Networks (CS-602)/(AL-602)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Explain computer network protocol hierarchy of osi and tcp/ip models.
CO2	Describe mechanisms of data link layer and related protocols to avoid collision and congestion.
CO3	Compare various data transmission protocol.
CO4	Evaluate efficiency of various routing algorithms.
CO5	Differentiate ipv4 and ipv6 internet protocol.

Course contents

Unit –I
Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principals of physical layer: Media, Bandwidth, Data rate and Modulations

Unit-II
Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary &Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models. ARP/RARP/GARP

Unit-III
MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted-ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols: Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Unit-IV
Network Layer: Need, Services Provided , Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6

Unit-V
Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management.Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

References:

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks” Pearson Education.
2. Douglas E Comer, “Internetworking WithTcp/Ip Principles, Protocols, And Architecture - Volume I” 6th Edition,Pearson Education
3. DimitriBertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4. KavehPahlavan, Prashant Krishnamurthy, “Networking Fundamentals”, Wiley Publication.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill.

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of farming methods.
6. Study of Tool Command Language (TCL).
7. Study and Installation of Standard Network Simulator: N.S-2, N.S3.OpNet,Qual Netetc .
8. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
9. Configure 802.11 WLAN.
10. Implement &simulate various types of routing algorithm.
11. Study & Simulation of MAC Protocols like Aloha, CSMA, CSMA/CD and CSMA/CA using Standard Network Simulators.
12. Study of Application layer protocols-DNS, HTTP, HTTPS, FTP and TelNet.

Advanced Computer Architecture (CS-603-A) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Discuss the classes of computers, and new trends and developments in computer architecture
CO2	Study advanced performance enhancement techniques such as pipelines ,dynamic scheduling branch predictions, caches
CO3	Compare and contrast the modern computer architectures such as RISC, Scalar, and multi CPU systems
CO4	Improve the performance of applications running on different CPU architectures
CO5	Develop applications for high performance computing systems

Course Contents

Unit-I
Flynn's Classification, System Attributes to Performance, Parallel computer models - Multiprocessors and multicomputers, Multivector and SIMD Computers. Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Control flow, data flow and Demand driven mechanisms. Static interconnection networks, Dynamic interconnection Networks: Bus Systems, Crossbar Switch, Multiport Memory, Multistage and Combining Networks

Unit-II
Instruction set architecture, CISC Scalar Processors , RISC Scalar Processors, VLIW architecture, Memory Hierarchy, Inclusion, Coherence and Locality, Memory capacity planning. Interleaved memory organization-memory interleaving, pipelined memory access, Bandwidth and Fault Tolerance. Backplane Bus System :Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt.

Unit-III
Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, pipeline hazards, Dynamic instruction scheduling -score boarding and Tomosulo's algorithm, Branch handling techniques, Arithmetic Pipeline Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines. Superscalar pipeline design, Super pipeline processor design.

Unit-IV
Cache coherence, Snoopy protocols, Directory based protocols. Message routing schemes in multicomputer network, deadlock and virtual channel. Vector Processing Principles, Vector instruction types, Vector-access memory schemes. Vector supercomputer architecture, SIMD organization: distributed memory model and shared memory model. Principles of Multithreading: Multithreading Issues and Solutions, Multiple-Context Processors

Unit-V
Parallel Programming Models, Shared-Variable Model, Message-Passing Model, Data-Parallel Model, Object-Oriented Model, Functional and Logic Models, Parallel Languages and Compilers, Language Features for Parallelism, Parallel Programming Environment, Software Tools and Environments.

REFERENCES:

1. Kai Hwang, “Advanced computer architecture”, TMH.
2. J.P.Hayes, “computer Architecture and organization”; MGH.
3. V.Rajaranam & C.S.R.Murthy, “Parallel computer”; PHI Learning.
4. Kain,”Advance Computer Architecture: -A System Design Approach”, PHI Learning
5. M.J Flynn, “Computer Architecture, Pipelined and Parallel Processor Design”; Narosa Publishing.
6. Hwang and Briggs, “Computer Architecture and Parallel Processing”; MGH.
7. David E. Callav & Jaswinder Pal Singh Marge Kaufmann”Advance Computer Architecture”,EIS India.
8. Sajjan G. Shiva, Taylar & Francis, “Advance Computer Architecture

Computer Graphics and Visualization (CS-603-B/AL-603-B) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Explain the core concepts of computer graphics
CO2	Apply 2-D transformation to images
CO3	Apply 3D transformations to images
CO4	Illustrate the fundamental concepts of visualization
CO5	Analyze basics of multimedia and its application

Course Contents

Unit-I Introduction to Raster Scan displays, Pixels, Frame buffer, Vector & Character generation, Random Scan systems, Display devices, Scan Conversion techniques, Line Drawing algorithms: simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms: Midpoint Circle drawing and Bresenham's Algorithm, Polygon fill algorithm: Boundary-fill and Flood-fill algorithms.

Unit-II 2-D Transformation: Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogeneous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping & Polygon Clipping Algorithms

Unit-III 3-D Transformations: Translation, Rotation and Scaling. Parallel & Perspective Projection: Types of Parallel & Perspective Projection, Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painter's Algorithm, Z-Buffer Algorithm. Curve generation, Bezier and B-spline methods. Basic Illumination Model: Diffuse reflection, Specular reflection, Phong Shading, Gouraud shading, Ray Tracing, Color models like RGB, YIQ, CMY, HSV.

Unit-IV Visualization: Visualization of 2D/3D scalar fields: color mapping, ISO surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, Non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitive foundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional, key framing

Unit –V Multimedia :Basic of multimedia, application of Multimedia, Text-Types, Unicode Standard ,text Compression, Text file formats, Audio Components, Digital Audio, Digital Audio processing, Sound cards, Audio file formats ,Audio Processing software ,Video-Video color spaces, Digital Video, Digital Video processing, Video file formats. Animation: Uses of Animation, Principles of Animation, Computer based animation, 3D Animation, Animation file formats, Animation software,Special Effects in animation, Storyboarding for Animation, Compression: Lossless/Lossy Compression techniques, Image, Audio & Video Compression, MPEG Standards ,Multimedia Architecture, Multimedia databases.

REFERENCES:

1. Donald Hearn and M.P. Becker “Computer Graphics” Pearson Pub.
2. Foley, Van Dam, Feiner, Hughes, “Computer Graphics: Principles and Practice” Addison-Wesley
3. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill
4. Parekh “Principles of Multimedia” Tata McGraw Hill
5. Maurya, “Computer Graphics with Virtual Reality System “ , Wiley India
6. Pakhira,”Computer Graphics ,Multimedia & Animation”,PHI learning
7. Andleigh, Thakral , “Multimedia System Design “ PHI Learning
8. Khalid Sayood , “Introduction to Data Compression”, Morgan Kaufmann

Cloud computing (CS-603-C/AL-603-C) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Explain the core concepts of the cloud computing paradigm
CO2	Apply fundamental concepts in cloud infrastructures
CO3	Discuss system, network and storage virtualization
CO4	Illustrate the fundamental concepts of cloud storage
CO5	Analyze various cloud program and setups

Course Contents

UNIT-1.
Introduction of Cloud Computing: What is Cloud Computing?, How it works?, Types of Cloud, Goals & Challenges, Leveraging Cloud Computing, Cloud Economics and Total Cost of Ownership, Cloud Service Models Software as a Service (SaaS): Introduction, Challenges in SaaS Model, SaaS Integration Services, Advantages and Disadvantages. Infrastructure As a Services (IaaS): Introduction, Virtual Machines, VM Migration Services, Advantages and Disadvantages. Platform As a service (PaaS): Introduction, Integration of Private and Public Cloud, Advantages and Disadvantages

UNIT-II
Virtualization and Abstraction: What is Virtualization and how abstraction is provided in cloud? Advantages and Disadvantages, Types of Hypervisor, and Load balancing.

UNIT-III
Amazon Web Services Getting started with AWS, AWS Compute, Storage, and Networking, AWS Security, Identity, and Access Management, AWS Database Options, AWS Elasticity and Management Tools

UNIT-IV
Architecting on AWS Introduction to System Design: AWS Essentials Review and System Design for High Availability, Automation and Serverless Architectures: Event-Driven Scaling, Well-Architected Best Practices: Security, Reliability, Performance Efficiency, Cost Optimization and Deployment and Implementation: Design Patterns and Sample Architectures

UNIT-V
Cloud Security Tools and technologies to secure the data in Private and Public Cloud Architecture. Security Concerns, Legal issues and Aspects, Multi-tenancy issues, Cloud Simulation

REFERENCES:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011Cloud 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

Data Science-Tool &Techniques (AL-603-A)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understanding Concepts of Hadoop and HDFS
CO2	Learning the objectives of MapReduce
CO3	Gaining knowledge about Big data tools Pig, Hive, Spark, Zookeeper, HBase
CO4	Develop an understanding of data virtualization
CO5	Prepare case study of Big data system

Course contents

UNIT – I
Big Data: Fundamentals of Big Data, defining big data, building successful big data management architecture, big data journey
Big Data Types: Structured and unstructured data types, real time and non-real time requirements
Distributed Computing: History of distributed computing, basics of distributed computing
UNIT – II
Big Data Technology Foundation: Big Data stack, redundant physical infrastructure, security infrastructure, operational databases, organising data services and tools, analytical data warehouse, big data analytics
Virtualization: Basics of virtualization, hypervisor, abstraction and virtualization, implementing virtualization with big data
Cloud and Big Data: Defining cloud, cloud deployment and delivery models, cloud as an imperative for big data, use the cloud for big data
UNIT – III
Operational Databases: Relational database, nonrelational database, key-value pair databases, document databases, columnar databases, graph databases, spatial databases
MapReduce Fundamentals: Origin of MapReduce, map function, reduce function, putting map and reduce together, optimizing map reduce
Hadoop: Discovering Hadoop, Hadoop distributed file system, Hadoop MapReduce, Hadoop file system, dataflow, Hadoop I/O, data integrity, compression, serialization, file-based data structure
UNIT – IV
Avro: Avro data types and schemas, in-memory serialization and deserialization, avrodatafiles, schema Resolution, Pig**:** Comparison with databases, pig latin, user defined functions, data processing operators
Hive: Running hive, comparison with traditional databases, HiveQL, tables, querying data, user-defined functions

Spark: Resilient distributed datasets, shared variables, anatomy of a spark job run, executors and cluster managers,
HBase: HBasics, concepts, clients, HBase vs RDBMS, Praxis
ZooKeeper: ZooKeeper services, building application with ZooKeeper

Reference Books:

1. Hadoop: The Definitive Guide, 4th Edition by Tom White - Shroff Publishers & Distributers Private Limited - Mumbai; Fourth edition (2015)
2. Big Data: Principles and Best Practices of Scalable Real-time Data Systems by James Warren and Nathan Marz, Manning Publications (2015)

Knowledge Management (CS-604-A)/(AL-604-A)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Learn the Evolution of Knowledge management
CO2	Learn and practice the various knowledge management tools
CO3	Have exposure to the engineering based knowledge management Applications
CO4	Create the culture of learning and knowledge sharing
CO5	Explore fure trends and case studies of knowledge management

Course content:

UNIT I : INTRODUCTION
Introduction: An Introduction to Knowledge Management – The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management – Key Challenges Facing the Evolution of Knowledge Management – Ethics for Knowledge Management.

UNIT II : CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING
Organization and Knowledge Management – Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists – Tacit Knowledge and QualityAssurance.

UNIT III : KNOWLEDGE MANAGEMENT-THE TOOLS
Telecommunications and Networks in Knowledge Management – Internet Search Engines and Knowledge Management – Information Technology in Support of Knowledge Management – Knowledge Management and Vocabulary Control – Information Mapping in Information Retrieval – Information Coding in the Internet Environment – Repackaging Information.

UNIT IV : KNOWLEDGE MANAGEMENT-APPLICATION
Components of a Knowledge Strategy – Case Studies (From Library to Knowledge Center,Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

UNIT V : FUTURE TRENDS AND CASE STUDIES
Advanced topics and case studies in knowledge management – Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan – A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.

TEXT BOOK:

1. Srikantaiah, T.K., Koenig, M., "Knowledge Management for the Information Professional" Information Today, Inc., 2000.
2. Nonaka, I., Takeuchi, H., "The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation", Oxford University Press, 1995.

Industry 4.0 (CS-604-B)/(AL-604-B)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Describe Industry 4.0 and scope for Indian Industry
CO2	Demonstrate conceptual framework and road map of Industry 4.0
CO3	Describe Robotic technology and Augmented reality for Industry 4.0
CO4	Demonstrate obstacle and framework conditions for Industry 4.0
CO5	Understand role of Augmented Reality in Industry 4.0

Course content:

Unit 1 Introduction to Industry 4.0: Introduction, core idea of Industry 4.0,origin concept of industry 4.0,Industry 4.0 production system, current state of industry 4.0, Technologies, How is India preparing for Industry 4.0

Unit 2 A Conceptual Framework for Industry 4.0: Introduction, Main Concepts and Components of Industry 4.0, State of Art, Supportive Technologies, Proposed Framework for Industry 4.0.

Unit 3 Technology Roadmap for Industry 4.0 :
Introduction, Proposed Framework for Technology Roadmap, Strategy Phase, Strategy Phase, New Product and Process Development Phase.

Unit 4 Advances in Robotics in the Era of Industry 4.0:
Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly.

Unit 5 The Role of Augmented Reality in the Age of Industry 4.0:
Introduction, AR Hardware and Software Technology, Industrial Applications of AR.

REFERENCES:

1. Alp Ustundag and Emre Cevikcan,"Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan,"The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröder ,"The Challenges of Industry 4.0 for Small and Medium-sized Enterprises".

Software Project Management (CS-604-C)/(AL-604-C)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understanding the evolution and improvement of software economics according to the basic parameters and transition to the modern software management
CO2	Learning the objectives, activities and evaluation criteria of the various phases of the life cycle of software management process
CO3	Gaining knowledge about the various artifacts, workflows and checkpoints
CO4	Develop an understanding of project planning, organization, responsibilities
CO5	Develop an understanding of automation and control of the processes to achieve the desirable results.

Course content:

1. **Introduction:** Evolving Role of Software; Software Characteristics; Software Applications. What is meant by Software Engineering?, The System Development Life Cycle, Software Process Models
2. **Conventional Software Management**.

Evolution of software economics. Improving software economics: reducing product size, software processes, team effectiveness, automation through software environments. Principles of modern software management.

3. **Software Management Process**

Framework,: Life cycle phases- inception, elaboration, construction and training phase. Artifacts of the process- the artifact sets, management artifacts, engineering artifacts, pragmatics artifacts. Model based software architectures. Workflows of the process. Checkpoints of the process.

4. **Software Management Disciplines**

Iterative process planning. Project organisations and responsibilities. Process automation. Project control And process instrumentation- core metrics, management indicators, life cycle expections. Process discriminants.

5. **Software Project Management**

Cost Estimation: LOC,Function Point (FP) Based Estimation, COCOMO Model, Project Scheduling, Risk Management, Introduction of MIS & DSS and Object Oriented Software Engineering.

REFERENCES:

1. Software Project management, Walker Royce, Addison Wesley, 1998.

2. Project management 2/e ,Maylor.

3. Managing the Software Process, Humphrey.

4. Managing global software Projects, Ramesh, TMH,2001.

5. Pankaj Jalote “Software Engg” Narosa Publications

B.Tech CSE& AIML LNCT University

VII Semester Syllabus

Web Engineering (CS-701)/(AL-701)

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Describe the concepts of www including browser and http protocol
CO2	Use the various html tags to develop the user friendly web pages
CO3	Use css to provide the styles to the webpages at various levels.
CO4	Demonstrate characteristics of java scripts for dynamic web pages.
CO5	Develop the modern web applications with client side and server side technologies

Course contents

UNIT I : INTRODUCTION TO WEB ENGINEERING
Motivation, Categories of Web Applications, Characteristics of Web Applications. Requirements of Engineering in Web Applications- Web Engineering-Components of Web Engineering-Web Engineering Process-Communication-Planning. Overview of static and dynamic web pages with example, difference between web design and web development. Introduction of API and its applications.

UNIT III : WEB APPLICATION DESIGN Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes. Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Modeling Framework-Modeling languages- Analysis Modeling for Web Apps-The Content Model-The Interaction Model-Configuration Model.

UNIT IV : DEVELOPMENT CONCEPTS
Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.

UNIT IV : TESTING WEB APPLICATIONS
Introduction-Fundamentals-Test Specifics in Web Engineering-Test Approaches- Conventional Approaches, Agile Approaches, Testing concepts, Testing Process, Test Scheme, Test Methods and Techniques like Link Testing, Browser Testing, Usability Testing Load, Stress, and Continuous Testing, Testing Security, Test-driven.

UNIT V : PROMOTING WEB APPLICATIONS
Introduction-challenges in launching the web Application-Promoting Web Application- Content Management-Usage Analysis-Web Project Management-Challenges in Web Project Management-Managing Web Team- Managing the Development Process of a Web Application-Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project. Introduction to node JS - web sockets.

TEXT BOOKS

1. GertiKappel, Birgit Proll, “Web Engineering”, John Wiley and Sons Ltd, 2006.
2. Roger S. Pressman, David Lowe, “Web Engineering”, Tata McGraw Hill Publication, 2007.
3. Guy W. Lecky-Thompson, “Web Programming”, Cengage Learning, 2008.

Big Data Analytics (CS-702-A) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understand the concept and challenges of big data.
CO2	Demonstrate knowledge of big data analytics.
CO3	Develop big data solutions using hadoop eco system.
CO4	Gain hands-on experience on large-scale analytics tools.
CO5	Analyse the social network graphs

Course contents

UNIT I: INTRODUCTION
Introduction to Big Data and Hadoop: First understand cloud and set up an AWS (Amazon Web Services) account. Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System,

UNIT II: BIG DATA STRATEGY AND DESIGN
IBM Big Data Strategy, Introduction to Infosphere Big Insights and Big Sheets, Apache Spark HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and

UNIT III : HADOOP INTRODUCTION AND ROLE
Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV : PIG, HIVE AND HIVEQL
Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

UNIT V : Clients And Data Analytics With R
Hbase:HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. *Big SQL* : Introduction Data Analytics with R *Machine Learning* : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with Big R.

Text Books

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O"reily Media, 2012.
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015. References
3. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
4. AnandRajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Pete Warden, "Big Data Glossary", O"Reily, 2011.
6. Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging

Wireless and Mobile computing (CS-702-B/AL-702-B) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Design and create traditional network
CO2	Understand the different issues in MAC and routing issues in multi hop wireless and ad-hoc networks and existing solutions for the same
CO3	Evaluate the transport layer issues in wireless networks due to error's and mobility of nodes and understand existing solutions for the same
CO4	Explain the architecture of GSM
CO5	Discuss the services, emerging issues and future trends in M-Commerce.

Course contents

Unit 1: Review of traditional networks: Review of LAN, MAN, WAN, Intranet, Internet, and interconnectivity devices: bridges, Routers etc. Review of TCP/IP Protocol Architecture: ARP/RARP, IP addressing, IP Datagram format and its Delivery, Routing table format, ICMP Messages, Subnetting, Supernetting and CIDR, DNS. NAT: Private addressing and NAT, SNAT, DNAT, NAT and firewalls, VLANS: Concepts, Comparison with Real LANS, Type of VLAN, Tagging, IPV6: address structure, address space and header.

Unit 2: Study of traditional routing and transport: Routing Protocols: BGP- Concept of hidden network and autonomous system, An Exterior gateway protocol, Different messages of BGP. Interior Gateway protocol: RIP, OSPF. Multiplexing and ports, TCP: Segment format, Sockets, Synchronization, Three Way Hand Shaking, Variable window size and Flow control, Timeout and Retransmission algorithms, Connection Control, Silly window Syndrome. Example of TCP: Taho, Reno, Sack etc. UDP: Message Encapsulation, Format and Pseudo header.

Unit 3: Wireless LAN: Transmission Medium For WLANs, MAC problems, Hidden and Exposed terminals, Near and Far terminals, Infrastructure and Ad hoc Networks, IEEE 802.11-System arch, Protocol arch, Physical layer, Concept of spread spectrum, MAC and its management, Power management, Security. Mobile IP: unsuitability of Traditional IP; Goals, Terminology, Agent advertisement and discovery, Registration, Tunneling techniques. Ad hoc network routing: Ad hoc Network routing v/s Traditional IP routing, types of routing protocols, Examples: OADV, DSDV, DSR, ZRP etc.

Unit 4: Mobile transport layer: unsuitability of Traditional TCP; I-TCP, S-TCP, M-TCP. Wireless Cellular networks: Cellular system, Cellular networks v/s WLAN, GSM – Services, system architecture, Localization and calling, handover and Roaming.

Unit 5: Mobile Device Operating Systems: Special Constraints & Requirements, Commercial Mobile Operating Systems. Software Development Kit: iOS, Android etc.MCommerce : Structure , Pros &Cons, Mobile Payment System ,Security Issues

Text Books

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O"reily Media, 2012.
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015. References
3. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
4. Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging

Deep Learning (CS-702-C/AL-702-C) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Describe in-depth about theories, models and algorithms in machine learning.
CO2	Compare and contrast different learning algorithms with parameters.
CO3	Examine the nature of a problem and find the appropriate learning algorithms
CO4	Design and implement of deep learning approaches for solving real-life problems.
CO5	Analyse the social network graphs for Deep learning CNN model

Course contents

Unit 1: History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Activation functions, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalue Decomposition. Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention overimages.
Unit 2: Autoencoders and relation to PCA, Regularization in autoencoders, Denoisingautoencoders, Sparse autoencoders, Contractive autoencoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Batch Normalization, Instance Normalization, Group Normalization.
Unit 3: Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Learning Vectorial Representations Of Words, Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Recent Trends in Deep Learning Architectures.
Unit 4: Introduction to reinforcement learning(RL), Bandit algorithms – UCB, PAC,Median Elimination, Policy Gradient, Full RL & MDPs, Bellman Optimality, Dynamic Programming - Value iteration, Policy iteration, and Q-learning & Temporal Difference Methods, Temporal-Difference Learning, Eligibility Traces, Function Approximation, Least Squares Methods
Unit 5: Fitted Q, Deep Q-Learning , Advanced Q-learning algorithms , Learning policies by imitating optimal controllers , DQN & Policy Gradient, Policy Gradient Algorithms for Full RL, Hierarchical RL,POMDPs, Actor-Critic Method, Inverse reinforcement learning, Maximum Entropy Deep Inverse Reinforcement Learning, Generative Adversarial Imitation Learning,Recent Trends in RL

Text Books

1. Deep Learning, An MIT Press book, Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.
3. Reinforcement Learning: An Introduction, Sutton and Barto, 2nd Edition.
4. Reinforcement Learning: State-of-the-Art, Marco Wiering and Martijn van Otterl Anand Rajaraman and Jefrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

Data Visualization (AL-702-A) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understanding of the basics data handling
CO2	Understanding of data manipulation using function
CO3	Knowledge about tableau software
CO4	Build views and reports with tablaeu.
CO5	Getting hands-on experience of various Data Analytics and visualization tools

Course contents

UNIT - I

INTRODUCTION TO DATA HANDLING Overview of Data analysis, Introduction to Data visualization, Working with statistical formulas - Logical and financial functions , Data alidation & data models, Power Map for visualize data , Power BI-Business Intelligence , Data Analysis using statistical methods, Dashboard designing.

UNIT - II

INTRODUCTION TO DATA MANIPULATION USING FUNCTION: Heat Map, Tree Map, Smart Chart, Azure Machine learning , Column Chart, Line Chart , Pie,Bar, Area, Scatter Chart, Data Series, Axes , Chart Sheet , Trendline , Error Bars, Sparklines, Combination Chart, Gauge, Thermometer Chart , Gantt Chart , Pareto Chart etc , Frequency Distribution, Pivot Chart, Slicers , Tables: Structured References, Table Styles , What-If Analysis: Data Tables, Goal Seek, Quadratic Equation , Transportation Problem, Maximum Flow Problem, Sensitivity Analysis, Histogram, Descriptive, Statistics, Anova, F-Test, t-Test, Moving, Average, Exponential Smoothing | Correlation model | Regression model, Practical Lab

UNIT - III

TABLEAU SOFTWARE: GETTING STARTED WITH TABLEAU SOFTWARE: What is Tableau? What does the Tableau product suite comprise of? How Does Tableau Work? Tableau Architecture, What is My Tableau Repository? Connecting to Data & Introduction to data source concepts, Understanding the Tableau workspace, Dimensions and Measures, Data Types & Default Properties, Building basic views, Saving and Sharing your work-overview, Practical Lab

UNIT - IV

TABLEAU: BUILDING VIEWS (REPORTS): Date Aggregations and Date parts, Cross tab & Tabular charts, Totals & Subtotals, Bar Charts & Stacked Bars, Trend lines, Forecasting, Filters, Context filters, Line Graphs with Date & Without Date, Tree maps, Scatter Plots.

UNIT V- case study

Reference Books

1. Aurelien Geon, “Hands-On Machine Learning with Scikit-Learn and Tensorflow:Concepts, Tools, and Techniques to Build Intelligent Systems”, O'Reilly.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015

Cryptography and Information Security (CS-703-A) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understanding of the basics of Cryptography and Network Security and working knowledge of Mathematics used in Cryptology
CO2	Understanding of previous attacks on cryptosystems to prevent future attacks from securing a message over an insecure channel by various means.
CO3	Knowledge about how to maintain the Confidentiality, Integrity and Availability of a data..
CO4	Understanding of various protocols for network security to protect against the network threats.
CO5	Getting hands-on experience of various Information Security Tools

Course contents

UNIT I:
Mathematical Background for Cryptography: Abstract Algebra, Number Theory, Modular Inverse,Extended Euclid Algorithm, Fermat's Little Theorem, Euler Phi-Function, Euler's theorem.Introduction to Cryptography: Principles of Cryptography, Classical Cryptosystem, Cryptanalysis on Substitution Cipher (Frequency Analysis), Play Fair Cipher, Block Cipher. Data Encryption Standard (DES), Triple DES, Modes of Operation, Stream Cipher.

UNIT II:
Advanced Encryption Standard (AES), Introduction to Public Key Cryptosystem, Discrete Logarithmic Problem, Diffie-Hellman Key Exchange Computational & Decisional Diffie-Hellman Problem, RSA Assumptions & Cryptosystem,RSA Signatures & Schnorr Identification Schemes, Primarily Testing, Elliptic Curve over the Reals, Elliptic curve Modulo a Prime., Chinese Remainder Theorem.

UNIT III:
Message Authentication, Digital Signature, Key Management, Key Exchange, Hash Function. Universal Hashing, Cryptographic Hash Function, MD, Secure Hash Algorithm (SHA), Digital Signature Standard (DSS), Cryptanalysis: Time-Memory Trade-off Attack, Differential Cryptanalysis. Secure channel and authentication system like Kerberos.

UNIT IV:
Information Security: Threats in Networks, Network Security Controls–Architecture, Wireless Security, Honey pots, Traffic Flow Security, Firewalls – Design and Types of Firewalls, Personal Firewalls,IDS, **Email Security:** Services Security for Email Attacks Through Emails, Privacy-Authentication of Source Message, Pretty Good Privacy(PGP), S-MIME. **IP Security**: Overview of IPSec, IP& IP version 6 Authentication, Encapsulation Security Payload ESP, Internet Key Exchange IKE, **Web Security:** SSL/TLS, Basic protocols of security. Encoding –Secure Electronic Transaction SET.

UNIT V:Cryptography and Information Security Tools: Spoofing tools**:** like Arping etc., **Foot printing Tools** (ex-nslookup, dig, Whois,etc..), **Vulnerabilities Scanning Tools** (i.e. Angry IP, HPing2, IP Scanner, Global Network Inventory Scanner, Net Tools Suite Pack.), NetBIOS Enumeration Using NetView Tool, **Steganography** Merge Streams, Image Hide, Stealth Files, Blindsideusing:**STools, Steghide, Steganos**.Stegdetect, Steganalysis - Stego Watch- Stego Detection Tool, **StegSpy**.**Trojans Detection Tools**(i.e. Netstat, fPort, TCPView, CurrPorts Tool, Process Viewer), Lan Scanner Tools (i.e.look@LAN, Wireshark, Tcpdump). **DoS Attack Understanding Tools-** Jolt2, Bubonic.c, Land and LaTierra, Targa, Nemesy Blast, Panther2, Crazy Pinger, Some Trouble, UDP Flood, FSMax.

Recommended Text:

1. Cryptography and Network Security Principles and Practice Fourth Edition,William Stallings, Pearson Education.
2. Network Security Essentials: Applications and Standards, by William Stallings.Prentice Hall.
3. Behrouz A Ferouzan, "Cryptography and NetworkSecurity" Tata Mc Graw Hills, 2007
4. Charles PPfleeger, Shari Lawrence Pfleeger "Security in Computing", 4thEdition Prentice Hall of India, 2006.
5. Introduction to Modern Cryptography by Jonathan Katz and Yehuda Lindell, Chapman and Hall/CRC

Agile Software Development (CS-703-B/AL-703-B) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understand the basics of agile process , manifesto and principles
CO2	Describe the fundamental principles and practices associated with each of the agile development methods
CO3	Compare agile software development model with traditional development models and identify the benefits and pitfalls.
CO4	Use techniques and skills to establish and mentor Agile Teams for effective software development
CO5	Apply core values and principles of Agile Methods in software development

Course contents

UNIT I:
Fundamentals of Agile Process: Introduction and background, Agile Manifesto and Principles, Stakeholders and Challenges, Overview of Agile Development Models: Scrum, Extreme Programming, Feature Driven Development, Crystal, Kanban, and Lean Software Development.

UNIT II:
Agile Projects: Planning for Agile Teams: Scrum Teams, XP Teams, General Agile Teams, Team Distribution; Agile Project Lifecycles: Typical Agile Project Lifecycles, Phase Activities, Product Vision, Release Planning: Creating the Product Backlog, User Stories, Prioritizing and Estimating, Creating the Release Plan; Monitoring and Adapting: Managing Risks and Issues, Retrospectives.

UNIT III:
Introduction to Scrum: Agile Scrum Framework, Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, Sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study.

UNIT IV:
Introduction to Extreme Programming (XP): XP Lifecycle, The XP Team, XP Concepts: Refactoring, Technical Debt, Timeboxing, Stories, Velocity; Adopting XP: Pre-requisites, Challenges; Applying XP: Thinking- Pair Programming, Collaborating, Release, Planning, Development; XP Case Study.

UNIT V: Agile Software Design and Development: Agile design practices, Role of design Principles, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control; Agility and Quality Assurance: Agile Interaction Design, Agile approach to Quality Assurance, Test Driven Development, Pair programming: Issues and Challenges..

Recommended Text:

1. Robert C. Martin, Agile Software Development- Principles, Patterns and Practices, Prentice Hall, 2013.
2. Kenneth S. Rubin, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison Wesley, 2012.
3. James Shore and Shane Warden, The Art of Agile Development, O'Reilly Media, 2007.
4. Craig Larman, ―Agile and Iterative Development: A manager's Guide, Addison-Wesley, 2004.
5. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson, 2001.
6. Cohn, Mike, Agile Estimating and Planning, Pearson Education, 2006.
7. Cohn, Mike, User Stories Applied: For Agile Software Development Addison Wisley, 2004.

Data Mining and Warehousing (CS-703-C/AL-703-C) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	understand the value of Historical data and data mining in solving real-world problems.
CO2	Understand OLAP system and basic concepts, queries
CO3	Perform basic data mining tasks of knowledge discovery.
CO4	affluent with the basic Supervised and unsupervised learning algorithms commonly used in data mining
CO5	develop the skill in using data mining for solving real-world problems.

Course contents

UNIT I:
Data Warehousing: Introduction, Delivery Process, Data warehouse Architecture, Data Preprocessing: Data cleaning, Data Integration and transformation, Data reduction. Data warehouse Design: Datawarehouse schema, Partitioning strategy Data warehouse Implementation, Data Marts, Meta Data, Example of a Multidimensional Data model. Introduction to Pattern Warehousing.
UNIT II:
OLAP Systems: Basic concepts, OLAP queries, Types of OLAP servers, OLAP operations etc.
Data Warehouse Hardware and Operational Design: Security, Backup And Recovery,
UNIT III:
Introduction to Data& Data Mining :Data Types, Quality of data, Data Preprocessing, Similarity measures, Summary statistics, Data distributions, Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Issues in Data mining. Introduction to Fuzzy sets and fuzzy logic..
UNIT IV:
Supervised Learning: Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree-based algorithms, Neural network-based algorithms, Rule-based algorithms,Probabilistic Classifiers
UNIT V: Clustering & Association Rule mining : Hierarchical algorithms, Partitional algorithms, Clustering large databases – BIRCH, DBSCAN, CURE algorithms.Association rules : Parallel and distributed algorithms such as Apriori and FP growth algorithms

Recommended Text:
1. Pang – ningTan , Steinbach & Kumar, *"Introduction to Data Mining"*, Pearson Edu, 2019.
2. Jaiwei Han, Micheline Kamber, "*Data Mining : Concepts and Techniques*", Morgan Kaufmann Publishers.
Margaret H. Dunham, "*Data Mining : Introductory and Advanced topics*", Pearson Edu., 2009.
2. Anahory& Murray, "*Data Warehousing in the Real World"*, Pearson Edu., 2009.

DevOps for Web development (AL-703-A) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understanding of the basics of DevOps Infrastrusture
CO2	Understanding of devops framework.
CO3	Deploy with DevOps integration
CO4	Understanding Applications with Docker and Kubernetes .
CO5	Getting hands-on experience of various DevOps Tools and case studies

UNIT – I

DevOps Infrastructure: What is DevOps, Implement Continuous Integration (CI), Continuous Delivery (CD), and Continuous Delivery (CD), understand Infrastructure as Code (IaC) practices, Business drivers for DevOps adoption, data explosion, cloud computing, Big data, data science and machine learning, in-memory computing, planning DevOps strategy, benefits of DevOps

UNIT – II

DevOps Framework: DevOps process, Source code management, code review, configuration management, build management, Artifacts repository management, release management, test automation, continuous integration, continuous delivery, continuous deployment, routine automation, DevOps maturity life cycle, DevOps Maturity Map, DevOps progression framework, DevOps Maturity checklists, Agile framework

UNIT – III

DevOps – Continuous Integration, Delivery and Deployment: Best Practices for CI/CD, Jenkins setup, Git (SCM) integration with Jenkins, Integrating GitHub with Jenkins, Maven (Build) tool integration with Jenkins, Building Jobs with Jenkins, Source Code Review – Gerrit, Installation of Gerrit, Repository Management, Testing with Jenkins, Continuous Delivery – Build Pipeline, DevOps continuous Deployment, Chef landscape components, features of Chef, Chef Automate workflow, Features of Ansible, Ansible CMDB, Playbooks, Modules, Inventory, Plugins, Ansible Tower, Ansible Vault, Ansible Galaxy, Monitoring, Aplunk, Nagios Monitoring Tool,

UNIT – IV

Containerized Applications with Docker and Kubernetes: Installing Docker, Creating Dockerfile, Building and running a container on a local machine, pushing an image to Docker Hub, managing containers with Kubernetes, Technical requirements of Kubernetes, Kubernetes architecture overview, Installing Kubernetes on a local machine, Installing Kubernetes Dashboard, Using HELM as package manager, AKS,

UNIT V- case study

Recommended Text:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim, Jez Humble, Patrick Debois, John Willis,TMH

B.Tech CSE& AIML LNCT University

VIII Semester Syllabus

Internet of Things (CS-801-A)/(AL-801-A) Elective

COURSE OUTCOMES:

After Completing the course student should be able to

CO1	Understand internet of things and its hardware and software components
CO2	Design interface i/o devices, sensors & communication modules.
CO3	Analyse data from various sources in real-time
CO4	Monitor data and devices with remote control.
CO5	Develop real life iot based projects.

Course contents:

Unit I IoT definition, Characteristics, IoT conceptual and architectural framework, Components Of IoT ecosystems, Physical and logical design of IoT, IoT enablers, Modern day IoT applications, M2M communications, IoT vs M2M, IoT vs WoT, IoT reference architecture, IoT Network configurations, IoT LAN, IoT WAN, IoT Node, IoT Gateway, IoT Proxy, Review of Basic Microcontrollers and interfacing.

Unit II Define Sensor, Basic components and challenges of a sensor node, Sensor features, Sensor resolution; Sensor classes: Analog, Digital, Scalar, Vector Sensors; Sensor Types, bias, drift, Hysteresis error, quantization error; Actuator; Actuator types: Hydraulic, Pneumatic, electrical, thermal/magnetic, mechanical actuators, soft actuators

Unit III Basics of IoT Networking, IoT Components, Functional components of IoT, IoT service Oriented architecture, IoT challenges, 6LowPAN, IEEE 802.15.4, ZigBee and its types, RFID Features, RFID working principle and applications, NFC (Near Field communication), Bluetooth, Wireless Sensor Networks and its Applications

Unit IV MQTT, MQTT methods and components, MQTT communication, topics and applications, SMQTT, CoAP, CoAP message types, CoAP Request-Response model, XMPP, AMQP features and components, AMQP frame types

Unit V IoT Platforms, Arduino, Raspberry Pi Board, Other IoT Platforms; Data Analytics for IoT, Cloud for IoT, Cloud storage models & communication APIs, Attacks in IoT system, Vulnerability analysis in IoT, IoT case studies: Smart Home, Smart framing etc.

References:

1. Vijay Madisetti, Arshdeep Bahga, "IoT, A Hands on Approach", University Press
2. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
7. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media

Block Chain (CS-801-B/Al-801-B) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understand concepts and terminology of blockchain.
CO2	Utilize block chain concepts for crypto currency application.
CO3	Classify block chain and compare the types for design issues.
CO4	Illustrate the block chain application development with simulator
CO5	Understand block chain enabled trade

Course contents

UNIT I: OVERVIEW OF BLOCK CHAIN
Public Ledgers, Bit coin, Smart Contracts, Block in a Block chain, Transactions, Crypto currency to Block chain, Distributed Consensus, Public vs Private Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain; Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography.

UNIT II: UNDERSTANDING BLOCK CHAIN WITH CRYPTO CURRENCY
Bit coin and Block chain: Creation of coins, Payments and double spending, Bit coin Scripts, Bit coin P2P Network, Transaction in Bit coin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bit coin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hash Cash PoW, Bit coin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool

UNIT III UNDERSTANDING BLOCK CHAIN FOR ENTERPRISES
Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT IV ENTERPRISE APPLICATION OF BLOCK CHAIN
Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, and Identity on Block chain

UNIT V BLOCK CHAIN APPLICATION DEVELOPMENT
Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda

References

1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O‟Reilly, 2015
2. Josh Thompsons, “Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming”.
3. Daniel Drescher, “Block Chain Basics”, Apress; 1stedition, 2017
4. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.
5. Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing
6. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O‟Dowd, Venkatraman Ramakrishna, “Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer”, Import, 2018

Natural Language Processing (CS-801-C) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Extract information from text automatically using concepts and methods from natural language processing (NLP)
CO2	Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.
CO3	Extract information from text automatically using concepts and methods from natural language processing (NLP)
CO4	Develop system that can work on topic classification
CO5	Develop system that can perform translation work

Course contents

UNIT I: INTRODUCTION

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT II: WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III: SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Tree banks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT IV: SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selection restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm, Coreference Resolution, Resources: Porter Stemmer, Lemmatizer,

Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

REFERENCES:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. 1. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
4. Richard M Reese, —Natural Language Processing with Java, OReilly Media, 2015.
5. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

AIML Case study (AL-801-C) Elective

The objective of the course is to apply all the specialization subjects to understand Case Studies: AI Examples in Industry. Students can take up any of the case studies mentioned in the examples or related to AI application case study as elective.

For ex.

- AI supply chain optimisation
- Accelerating data science delivery in digital transformation, using AI Cloud
- tax automation using AI and machine learning
- AI in health care

Optimization Techniques (CS-802-A/AL-802 A) Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	To Create an Engineering design methodology using a mathematical formulation
CO2	Analyze the syntax, semantics, of optimization methods
CO3	to solve the mathematical results and numerical techniques
CO4	to go in research by applying optimization techniques
CO5	to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

Course contents

UNIT I: DATA SCIENCE

Data preprocessing**:** Overview, Data Discovery, data access issue, data characterization, data set assembly: reverse pivoting, feature extraction, physical or behavioral data set, sampling bias, looking at the variable, relationship between variables, Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies

UNIT II: DATA ANALYTICS

Need of Data analytic lifecycle, Key roles for successful analytic projects, various phases of Data analytic lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization. Feature selection with PCA, dimensionality reduction,Descriptive Statistics and Exploratory Data Analytics: Visualization, Summarizing Data, Looking at distributions and relationships, Inferential Statistics.

, regression – linear, non linear, multiple linear regression, logistic regression, hyper parameter tuning, regularization with lasso, ridge, SGD analysis, subgradient descent, risk minimization

UNIT III: Optimization

OPTIMIZATION: Derivative based Optimization, Descent Methods,
The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, Random Search – Downhill Simplex Objective function, Minimization problems, Decision variables, constraints, Types of optimization problems: Linear Programming Problem, Non-linear programming

UNIT IV: Quadratic Optimization

Generalization error , Regularization and stability, Momentum and acceleration , Momentum for quadratic optimization , Momentum for principle component analysis (PCA)

UNIT V: Convex optimization

Convex v/s Non convex: Integer Programming Problem, Mixed Integer Linear Programming Problem, Mixed Integer Non Linear Programming Problem Uniform convergence,

REFERENCES:

1. Shai Ben-David and Shai Shalev-Shwartz Understanding Machine Learning: From Theory to Algorithms 2th Edition Cambridge University PRess
2. Boyd and Vandenberghe, Convex Optimization 1th Edition,. Standford university e book

Computer Vision CS 802-B/Al-802 B Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understand practice and theory of computer vision
CO2	Elaborate computer vision algorithms, methods and concepts
CO3	Implement computer vision systems with emphasis on applications and problem Solving
CO4	Apply skills and algorithms for automatic analysis of digital images.
CO5	Design and implement real-life problems using image processing and computer vision..

Course contents

UNIT I INTRODUCTION
Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level , Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

UNIT II IMAGE FORMATION MODELS
Monocular imaging system , Radiosity: The „Physics" of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection,• Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading , Photometric Stereo, Depth from Defocus , Construction of 3D model from images.

UNIT III IMAGE PROCESSING AND FEATURE EXTRACTION
Image preprocessing, Image representations (continuous and discrete) , Edge detection. Various methods of image segmentation, edge detection, object proposals, Detect and Describe local features of image by using scale-invariant feature transform (SIFT), Motion detection and tracking, Inference of human activity from image sequences.

UNIT IV SHAPE REPRESENTATION AND SEGMENTATION
Contour based representation, Region based representation, Deformable curves and surfaces , Snakes and active contours, Level set representations , Fourier and wavelet descriptors , Medial representations, Multi resolution analysis, Motion detection and tracking, Inference of human activity from image sequences.

UNIT V APPLICATIONS
Photo album -Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis Application: In-vehicle vision system: locating roadway – road marking, identifying road signs, locating pedestrians

Reference and Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
3. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992.

Rural Outreach CS 803-C/Al-80C B Elective

COURSE OUTCOMES:
After Completing the course student should be able to

CO1	Understand principles and practices of rural management
CO2	Elaborate human resource management for Rural India
CO3	Implement management practices for rural financing
CO4	Understand the concepts of research methodology
CO5	Design research strategy for Rural India

Course contents

Unit – I: Rural Management –

Principles and Practices Introduction to Management and Theory of Management B. Planning, Organisation Structure and Design C. Motivation and Leadership D. Management Control and Managerial Decision Making

Unit – II: Human Resource Management for rural India

Nature, Scope of Human Resource Management. F. Human Resource Planning, Recruitment and Selection, Training and Development, Performance Appraisal G. Welfare programme and Fringe benefits, Wage and Salary Administration H. Morale and Productivity, Industrial Relations and Industrial Disputes

Unit-III Management of Rural Financing:

Rural Credit System, Role of Rural Credit in Rural Development. Evolution and Growth of Rural Credit System in India. B: Agricultural Credit, Agricultural Credit Review Committee, Report of different Committees and Commissions, Problems and Prospects. C: Rural Credit to Non-farm Sector, Credit for small and marginal entrepreneurs. D: Role of Government Institutions towards facilitating Rural Credit. Role of Non- Government/ Semi Government / Quasi- Government Institutions. Growth and Present trend of Rural Financing towards Small scale and Cottage Industries.

Unit – IV: Research Methodology:

Concept of Social Research, Traditional Research, Action Research and Participatory Research B: Qualitative Data Construction and Methods of Data Collection C: Techniques of Interview D: Qualitative methods: Sociometry, Case Studies, observation, coding and content analysis

Unit – V: Research Methodology for Rural India

Collection, Tabulation and Presentation of data B: Measures of Central Tendency, Dispersion, Moments, Skewness and Kurtosis, Correlation and Regression: Sampling Theory and Test of Significance

References

1. Research methodology 2nd revised edition. by C R Kothari. McGraw Hill, 2000
2. Fundamentals of Rural Development by Tahir Hussain, Mary Tahir Riya Tahir, Wiley 2000