



1.2.1 Programs in which CBCS/Elective course system implemented in the last completed academic year

| Programme Code | Programme name | Year of Introduction | Status of implementation of CBCS / elective course system (Yes/No) | Year of implementation of CBCS / elective course system | Link to the relevant document |
|---|---|----------------------|--|---|---|
| 04 | Bachelor of Technology (CSE) | 2006 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (IT) | 2006 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (ECE) | 2006 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (ME) | 2006 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (Civil) | 2011 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (EEE) | 2011 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (CSIT) | 2013 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (ECS) | 2013 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| 04 | Bachelor of Technology (AI & ML) | 2021 | Yes | 2020-21 | https://aktu.ac.in/syllabus%202021-2022.html |
| 08 | Master of Business Administration (MBA) | 2007 | Yes | 2016-17 | https://aktu.ac.in/syllabus%202021-2022.html |
| Total Number of Programmes running in HEI | | | | | 9 |
| Total Number of Programmes in which CBCS / Elective course system implemented | | | | | 9 |
| Percentage of Programmes in which Choice Based Credit System (CBCS)/ elective course system has been implemented | | | | | 100% |

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**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW**



Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW**

B. TECH. FIRST SEMESTER

| Sl No. | Subject Code | Subject Name | L-T-P | Th/Lab Marks | Sessional | | Total | Credit |
|--------|--------------------|--|-----------|--------------|-----------|------------|------------|-----------|
| | | | | | Test | Assig/Att. | | |
| 1 | RAS103 | Engineering Maths-I | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 2 | RAS101 | Engineering Physics-I | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 3 | REE101/ RME101 | Basic Electrical Engg/ Elements of Mechanical Engg | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 4 | RAS 104/ RCS101 | Professional Communication/ Computer System & Programming in | 3---0---0 | 70 | 20 | 10 | 100 | 3 |
| 5 | REC101/ RAS102 | Basic Electronics/ Engineering Chemistry | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 6 | RAS151/ RAS152 | Engg. Physics Lab/ Engg. Chemistry Lab | 0---0---2 | 50 | | 50 | 100 | 1 |
| 7 | REE151/ RME151 | Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab | 0---0---2 | 50 | | 50 | 100 | 1 |
| 8 | RAS 154/ RCS151 | Professional Communication Lab/ Computer Progm. Lab | 0---0---2 | 50 | | 50 | 100 | 1 |
| 9 | RME152/ RCE151 | Workshop Practice/ Computer Aided Engg. Graphics | 0---0---3 | 50 | | 50 | 100 | 2 |
| | TOTAL | | | | | | 900 | 24 |

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B. TECH. SECOND SEMESTER

| Sl No. | Subject Code | Subject Name | L-T-P | Th/Lab Marks | Sessional | | Total | Credit |
|--------|--------------------|--|-----------|--------------|-----------|------------|------------|-----------|
| | | | | | Test | Assig/Att. | | |
| 1 | RAS203 | Engineering Maths-II | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 2 | RAS201 | Engineering Physics-II | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 3 | RME201/ REE201 | Elements of Mechanical Engg/ Basic Electrical Engg | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 4 | RCS201/ RAS 204 | Computer System & Programming in C/ Professional Communication | 3---0---0 | 70 | 20 | 10 | 100 | 3 |
| 5 | RAS202/ REC201 | Engineering Chemistry/ Basic Electronics | 3---1---0 | 70 | 20 | 10 | 100 | 4 |
| 6 | RAS252/ RAS251 | Engg. Chemistry Lab/ Engg. Physics Lab | 0---0---2 | 50 | | 50 | 100 | 1 |
| 7 | RME251/ REE251 | Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab | 0---0---2 | 50 | | 50 | 100 | 1 |
| 8 | RCS251/ RAS 254 | Computer Progm. Lab/ Professional Communication Lab | 0---0---2 | 50 | | 50 | 100 | 1 |
| 9 | RCE251/ RME252 | Computer Aided Engg. Graphics/ Workshop Practice | 0---0---3 | 50 | | 50 | 100 | 2 |
| | TOTAL | | | | | | 900 | 24 |

Engineering Mathematics - I

| | | |
|----------|----------|----------|
| L | T | P |
| 3 | 1 | 0 |

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit, Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
 2. Peter V. O'Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
 3. Thomas & Finley, Calculus, Narosa Publishing House
 4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.
- A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

Unit – I: Relativistic Mechanics**08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics**10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics**10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser**08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography**06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

| Unit | Content | Hours |
|---------------|---|----------|
| Unit-1 | Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications | 8 |
| Unit-2 | Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradable polymers. Preparations and applications of some industrially important polymers (Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6, Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization. | 8 |
| Unit-3 | Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications.. | 8 |
| Unit-4 | Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system. | 8 |
| Unit-5 | Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques. | 8 |

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

BASIC ELECTRONICS

| Unit | Topics | Lectures |
|------|---|----------|
| I | PN junction diode: Introduction of Semiconductor Materials Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices :Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays. | 12 |
| II | Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJT: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic, | 10 |
| III | Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current Differential and Common-Mode Operation | 6 |
| IV | Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope. | 6 |
| V | Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, Introduction of various analog modulation techniques , Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM. | 6 |

Text Books:

1. Robert L. Boylestand / Louis Nashelsky “*Electronic Devices and Circuit Theory*”, Latest Edition, Pearson Education.
2. H S Kalsi, “*Electronic Instrumentation*”, Latest Edition, TMH Publication,.
3. George Kennedy, “*Electronic Communication Systems*”, Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits*", Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, *Electronic Instrumentation and Measurements*, Latest Edition, Oxford University Press India.

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroid and Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries. Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine, difference between SI and CI engines. P-v and T-s diagrams of Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduct friction experiment on screw-jack.

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1. "Basic Electrical Engineering", S N Singh; Prentice Hall International
2. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers
3. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
4. "Principles of Electrical Engineering", V. Del Toro; Prentice Hall International
5. "Electrical Engineering", J. B. Gupta, Kataria and Sons

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar, M.S. Shukhija; Oxford University Press

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verification of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

Unit1:

(10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2:

(8 Lectures)

Standard I/O in “C”, **Fundamental data types**- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3:

(10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4:

(6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5:

(8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

- 1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
- 2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
- 3.WAP to calculate the area and circumference of a circle.
- 4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula $C/5=(F-32)/9$.
- 5.WAP that swaps values of two variables using a third variable.
- 6.WAP that checks whether the two numbers entered by the user are equal or not.
- 7.WAP to find the greatest of three numbers.
- 8.WAP that finds whether a given number is even or odd.
- 9.WAP that tells whether a given year is a leap year or not.
- 10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%-----Print 'A'
80-90%-----Print 'B'
60-80%-----Print 'C'
Below 60%-----Print 'D'
- 11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
- 12.WAP to print the sum of all numbers up to a given number.
- 13.WAP to find the factorial of a given number.
- 14.WAP to print sum of even and odd numbers from 1 to N numbers.
- 15.WAP to print the Fibonacci series.
- 16.WAP to check whether the entered number is prime or not.
- 17.WAP to find the sum of digits of the entered number.
- 18.WAP to find the reverse of a number.
- 19.WAP to print Armstrong numbers from 1 to 100.
- 20.WAP to convert binary number into decimal number and vice versa.
- 21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
- 22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
- 23.WAP to find the minimum and maximum element of the array.

24. WAP to search an element in an array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order $n \times n$.
27. WAP that finds the sum of diagonal elements of a $m \times n$ matrix.
28. WAP to implement `strlen()`, `strcat()`, `strcpy()` using the concept of Functions.
- 23
29. Define a structure data type `TRAIN_INFO`. The type contains Train No.: integer type Train name: string Departure Time: aggregate type `TIME` Arrival Time : aggregate type `TIME` Start station: string End station : string The structure type `Time` contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:
- (i) List all the trains (sorted according to train number) that depart from a particular section.
 - (ii) List all the trains that depart from a particular station at a particular time.
 - (iii) List all the trains that depart from a particular station within the next one hour of a given time.
 - (iv) List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

Professional Communication

| S.No. | Unit | Contents |
|-------|---|---|
| 1 | Unit-1 Fundamentals of Communications | Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication. |
| 2 | Unit-II Written Communication | Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc. |
| 3 | Unit-III Business Communication | Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills. |
| 4 | Unit-IV Presentation Strategies and Soft Skills. | Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills. |
| 5 | Unit –V Value- Based Text Readings | Following essays from the prescribed text book with emphasis on Mechanics of writing. (i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior (ii) The Language of Literature and Science by A. Huxley (iii) Man and Nature by J. Bronowski (iv) Science and Survival by Barry Commoner (v) The Mother of the Sciences by A.J. Bahm. |
| 6 | Text Book | 1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi. |
| 7 | Reference Books | 1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi. |

| | | |
|--|--|---|
| | | <ol style="list-style-type: none">4. Developing Communication skills by Krishna Mohan, Meca Bannerji- Macmillan India Ltd. 1990, Delhi.5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi. |
|--|--|---|

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Presentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

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

1. Carpentry Shop:

- (a) Study of tools & operations and carpentry joints.
- (b) Simple exercise using jack plane.
- (c) To prepare half-lap corner joint, mortise & tenon joints.
- (d) Simple exercise on wood working lathe.

2. Fitting (Bench Working) Shop:

- (a) Study of tools & operations
- (b) Simple exercises involving fitting work.
- (c) Make perfect male female joint.
- (d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

- (a) Study of tools & operations
- (b) Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop:

- (a) Study of tools & operations of Gas welding & Arc welding
- (b) Simple butt and Lap welded joints.
- (c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

- (a) Study of tools & operations.
- (b) Making Funnel complete with 'soldering'.
- (c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

- (a) Study of Single point cutting tool, machine tools and operations.
- (b) Planeturning.
- (c) Step turning
- (d) Taper turning.
- (e) Threading

7. Foundry Shop:

- (a) Study of tools & operations
- (b) Pattern making.
- (c) Mould making with the use of a core.
- (d) Casting

Introduction

Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.

2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes

2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

1 – Sheet Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres.

1-Sheet

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
 2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.
- Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition, 2

Engineering Mathematics - II

| | | |
|----------|----------|----------|
| L | T | P |
| 3 | 1 | 0 |

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena. Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

Unit – I: Crystal Structures and X-ray Diffraction 10Hrs.

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials 10Hrs.

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory 06 Hrs.

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids 06 Hrs.

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials 08Hrs.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

**DR. A.P.J. ABDUL KALAM TECHNICAL
UNIVERSITY LUCKNOW**



Study & Evaluation Scheme with Syllabus

For

B.Tech. Second Year

**(Computer Science and Engineering, Computer Engg. & Information
Technology)**

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

| S. No. | Subject Code | Subject Name | L-T-P | ESE Marks | Sessional | | Total | Credit |
|--------------|---------------------------------------|--|-------|-----------|-----------|----|-------------|-----------|
| | | | | | CT | TA | | |
| 1. | RAS301/ ROE030, 032 to 037, 039 | Mathematics-III/ Science Based OE | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 2. | RVE301/ RAS302 | Universal Human Values & Professional Ethics / Environment & Ecology | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 3. | REC301 | Digital Logic Design | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 4. | RCS301 | Discrete Structures & Theory of Logic | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 5. | RCS302 | Computer Organization and Architecture | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 6. | RCS305 | Data Structures | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 7. | REC351 | Digital Logic Design Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 8. | RCS351 | Discrete Structure & Logic Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 9. | RCS352 | Computer Organization Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 10. | RCS355 | Data Structures Using C/ Java Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 11. | RME101* | Elements of Mechanical Engineering* | 3-1-0 | 70 | 20 | 10 | 100* | -- |
| 12. | RCE151* | Computer Aided Engineering Graphics* | 0-0-3 | 50 | 30 | 20 | 100* | -- |
| TOTAL | | | | | | | 1000 | 24 |

CT: Class Test

TA: Teacher Assessment

L/T/P: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

- a. ROE030/040 Manufacturing Process
- b. ROE032/042 Nano Science
- c. ROE033/043 Laser System and Application
- d. ROE034/044 Space Science
- e. ROE035/045 Polymer Science & Technology
- f. ROE036/046 Nuclear Science
- g. ROE037/047 Material Science
- h. ROE039/049 Applied Linear Algebra

2nd Year IV-SEMESTER

| S. No. | Subject Code | Subject Name | L-T-P | ESE Marks | Sessional | | Total | Credit |
|--------------|---------------------------------|---|-------|-----------|-----------|----|-------------|-----------|
| | | | | | CT | TA | | |
| 1. | ROE040, 042 to 047, 049/ RAS401 | Science Based OE/ Mathematics-III | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 2. | RAS402/ RVE401 | Environment & Ecology/ Universal Human Values & Professional Ethics | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 3. | REC405 | Introduction to Microprocessor | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 4. | RCS401 | Operating Systems | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 5. | RCS402 | Software Engineering | 3-0-0 | 70 | 20 | 10 | 100 | 3 |
| 6. | RCS403 | Theory of Automata and Formal Languages | 3-1-0 | 70 | 20 | 10 | 100 | 4 |
| 7. | RCS451 | Operating Systems Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 8. | RCS452 | Software Engineering Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 9. | RCS453 | TAFL Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 10. | RCS454 | Python Language Programming Lab | 0-0-2 | 50 | 30 | 20 | 100 | 1 |
| 11. | RME201* | Elements of Mechanical Engineering* | 3-1-0 | 70 | 20 | 10 | 100* | -- |
| 12. | RCE251* | Computer Aided Engineering Graphics* | 0-0-3 | 50 | 30 | 20 | 100* | -- |
| TOTAL | | | | | | | 1000 | 24 |

CT: Class Test

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Science Based Open Electives:

- a. ROE030/040 Manufacturing Process
- b. ROE032/042 Nano Science
- c. ROE033/043 Laser System and Application
- d. ROE034/044 Space Science
- e. ROE035/045 Polymer Science & Technology
- f. ROE036/046 Nuclear Science
- g. ROE037/047 Material Science
- h. ROE039/049 Applied Linear Algebra

RCS301: DISCRETE STRUCTURES & THEORY OF LOGIC

UNIT I

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

UNIT II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo n.

UNIT III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits.

UNIT IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.

Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

UNIT V

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill
3. YN Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010.
4. RP Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and SC Ross, "Discrete Mathematical Structures", PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, "Discrete Mathematics" Oxford Higher Education.
7. Biswal, "Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, "Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
9. Lipschutz, "Discrete Mathematics", McGraw Hill
10. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

RCS302: COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT I

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer, Processor organization, general register organization, stack organization and addressing modes, Look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

UNIT II

Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc), micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

UNIT III

Basic concept and hierarchy, semiconductor RAM memories, $2D$ & $2\frac{1}{2}D$ memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation.

UNIT IV

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

UNIT V

Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Reference Books:

1. Patterson, "Computer Organization and Design" Elsevier Pub. 2009
2. William Stalling, "Computer Organization", PHI
3. M. Morris Mano, "Computer System Architecture", Pearson Learning
4. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approach" 2nd Edition
5. Kai Hwang, "Advance Computer Architecture", TMH
6. Vravice, Hamacher & Zaky, "Computer Organization", TMH
7. John P Hays, "Computer Organization", McGraw Hill
8. Tannenbaum, "Structured Computer Organization", PHI
9. P Pal Chaudhry, "Computer Organization & Design" PHI
10. Dezso and Sima, "Advanced Computer Architecture", Pearson
11. Alan Clements "Computer Organization and Architecture" , Cengage Learning
12. Behrooz Parhami "Computer Architecture", Oxford

RCS305/ RCS405: DATA STRUCTURES

UNIT I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

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

UNIT II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT III

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

UNIT IV

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

UNIT V

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

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

Hashing: Hash Function, Collision Resolution Strategies.

Storage Management: Garbage Collection and Compaction.

References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.

3. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, "Data Structure Using C" Oxford Higher Education.
5. AK Sharma, "Data Structure Using C", Pearson Education India.
6. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
8. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
9. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
12. Adam Drozdek "Data Structures and Algorithm in Java", Cengage Learning

RCS351: DISCRETE STRUCTURE & LOGIC LAB

Understanding of mathematical computation software such as Mapple, Prolog to experiment the followings:

1. Working of Computation software
2. Discover a closed formula for a given recursive sequence vice-versa
3. Recursion and Induction: Practice of proof techniques
4. Practice of various set operations
5. Testing of set operating using software
6. Counting
7. Combinatorial equivalence
8. Permutations and combinations
9. Difference between structures, permutations and sets
10. Implementation of a recursive counting technique
11. N digit binary sequences not having adjacent 1's
12. Probability simulation
13. The Birthday problem
14. Poker Hands problem
15. Baseball best-of-5 series: Experimental probabilities
16. Comparison of theoretical probability with experimental probability
17. Baseball: Binomial Probability
18. Basketball: One and one
19. Expected value problem
20. Binary relations

RCS352: COMPUTER ORGANIZATION LAB

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two $n * n$ matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

RCS355/RCS455: DATA STRUCTURE USING C/ JAVA LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

REC405: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

UNIT II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India.
4. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, "IBM PC Assembly language and programming", Fifth Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education.

RCS401: OPERATING SYSTEMS

UNIT I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Re-entrant Kernels, Monolithic and Microkernel Systems.

UNIT II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer/ Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

UNIT III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

UNIT IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

UNIT V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhare, "Operating Systems : A Concept based Approach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick & John J. Donovan. *Operating Systems*. McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

RCS402: SOFTWARE ENGINEERING

UNIT I

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT IV

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT V

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, "Software Engineering", Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

RCS403: THEORY OF AUTOMATA AND FORMAL LANGUAGES

UNIT I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

UNIT II

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. KLP Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. YN Singh "Mathematical Foundation of Computer Science", New Age International.
5. Malviya, AK "Theory of Computation and Application", BPaperback Publications
6. Papadimitrou, C. and Lewis, CL, "Elements of the Theory of Computation", Pearson Publication.

7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.
10. Katuri Viswanath, “Introduction to Mathematical Computer Science, An” Universities Press.

RCS451: OPERATING SYSTEMS LAB

1. To implement CPU Scheduling Algorithms
 - FCFS
 - SJF
 - SRTF
 - PRIORITY
 - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
 - FIFO
 - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS452: SOFTWARE ENGINEERING LAB

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

RCS453: TAFL Lab

Understanding of software like JFLAP for experimenting with formal languages

1. Deterministic Finite Automata (DFA)
2. Nondeterministic Finite Automata (NFA)
3. Conversion of NFA to DFA
4. DFA Minimization
5. DFA to regular grammar conversion
6. DFA to regular expression conversion
7. Combining automata
8. Regular expression to DFA conversion
9. Mealy and Moore machine
10. Pushdown automata
11. Single tape Turing machine
12. Multi-tape Turing machine
13. Context free grammars (CFG) with single symbols
14. CFG with multiple symbols
15. LL Parsing
16. LR Parsing
17. Regular expressions
18. Regular pumping lemma
19. Context free pumping lemma
20. CFG to Chomsky Normal form transformation

RCS454: PYTHON LANGUAGE PROGRAMMING LAB

Write a Python program to: -

1. Demonstrate the working of 'id' and 'type' functions
2. To find all prime numbers within a given range.
3. To print 'n' terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5.
 - a. To add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
Sample String : 'abc'
Expected Result : 'abcing'
Sample String : 'string'
Expected Result : 'stringly'
 - b. To get a string from a given string where all occurrences of its first char have been changed to '\$', except the first char itself.
6.
 - a. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
 - b. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method
17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition
20. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form

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

Installing Python; basic syntax, interactive shell, editing, saving, and running a script, the concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; reading input from console, writing to console, comments in the program; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);

String manipulations: subscript operator, indexing, slicing a string; other functions on strings: string module, strings and number system, format functions: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers

Lists, tuples, sets, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries, Array in Python

Regular Expressions: re modules, match function, search function, modifiers and patterns

Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions, scope and global statements, Lambda expressions, Importing Modules, math Module & Random Modules, creating own module.

Exception Handling: Exceptions, except clause, try and finally clause user defined exceptions

File Handling: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file;

Simple Graphics: “turtle” module; simple 2d drawing - colors, shapes; digital images, image file formats. Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

Database: cx_ Oracle module, Connections, Executing Queries, calling procedure and functions, Using GUI to access Database.

Object Oriented Programming: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in Python, classes, objects, attributes and methods; defining classes; design with classes, constructors and destructors, inheritance, polymorphism, operator overloading (`_eq_`, `_str_`, etc); abstract classes; aggregation and composition.

Reference books:

1. John M. Sewart, “Python for Scientist”, Cambridge Universities Press.
2. Reema Thareja, “Python Programming” Oxford Higher Education.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python” Pearson
4. Mrak Litz, “ Learning Python”,O’ Reilly
5. Mark Pilgrim, “Dive into Python”, Apress
6. James L. Young, “Python made Simple and Practical”, Kindle Edition (paperback)
7. Y. Daniel Liang “Introduction to Programming using Python” Pearson

DR. A.P.J. ABDUL KALAM TECHNICAL
UNIVERSITY, LUCKNOW



EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. SECOND YEAR

ELECTRONICS AND COMPUTER ENGINEERING

AS PER

AICTE MODEL CURRICULUM

[Effective from the Session: 2020-21

B.TECH. (ELECTRONICS AND COMPUTER ENGINEERING)

Semester III & IV

| Sr. No. | Course Code | Course Title | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credits |
|---------|----------------------|---|---------|---|---|-------------------|----|-------|-----|--------------|----|-------|---------|
| | | | L | T | P | CT | TA | Total | P S | TE | PE | | |
| | KOE031-38/ KAS302 | Engg. Science Course /Maths IV | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 1. | KAS301/ KVE301 | Technical Communication /Universal Human values | 2 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| | | | 3 | 0 | 0 | | | | | | | | |
| 2. | KEC301 | Electronic Devices | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 3. | KEC302 | Digital System Design | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 4. | KCS303 | Discrete Structures & Theory of Logic | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 6. | KEC351 | Electronics Devices Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 7. | KEC352 | Digital System Design Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 8. | KCS353 | Discrete Structures & Logic Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 9. | KEC354 | Mini Project or Internship Assessment | 0 | 0 | 2 | | | 50 | | | | 50 | 1 |
| 10. | KNC301 /KNC302 | Computer System Security /Python Programming | 2 | 0 | 0 | 15 | 10 | 25 | | 50 | | | 0 |
| 11. | | MOOCs (Essential for Hons. Degree) | | | | | | | | | | | |
| | | TOTAL | | | | | | | | | | 950 | 22 |

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

| Sr. No. | Course Code | Course Title | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credits |
|---------|----------------------|---|---------|---|---|-------------------|----|-------|----|--------------|-----|-------|---------|
| | | | L | T | P | C T | TA | Total | PS | TE | P E | | |
| 1. | KAS402/ KOE041-48 | Maths-IV / Engg. Science Course | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 2. | KVE401/ KAS401 | Universal Human Values/ Technical Communication | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| | | | 2 | 1 | 0 | | | | | | | | |
| 3. | KCS401 | Operating Systems | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 4. | KEC402 | Analog Circuits | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 5. | KEC403 | Signal & System | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 6. | KEC452 | Analog Circuits Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 7. | KEC452 | Signal System Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 8. | KCS451 | Operating Systems Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 9. | KNC402/ KNC401 | Python Programming/ Computer System Security | 2 | 0 | 0 | 15 | 10 | 25 | | 50 | | | 0 |
| 10. | | MOOCs (Essential for Hons. Degree) | | | | | | | | | | | |
| | | TOTAL | | | | | | | | | | 900 | 21 |

| | | | |
|--------|---------------------|----------|-----------|
| KEC301 | Electronics Devices | 3L:1T:0P | 4 Credits |
|--------|---------------------|----------|-----------|

| Unit | Topics | Lectures |
|------|--|----------|
| I | Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams. | 8 |
| II | Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current, drift current, mobility and resistivity, sheet resistance, design of resistors. | 8 |
| III | Generation and recombination of carriers, Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models. | 8 |
| IV | Avalanche breakdown, Zener diode, Schottky diode, Bipolar Junction Transistor, I-V characteristics, Ebers-Moll model. | 8 |
| V | MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell. | 8 |

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson, 2014.
2. D. Neamen , D. Biswas, "Semiconductor Physics and Devices," McGraw-Hill Education.
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, "Fundamentals of Solid State Electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsvetkov and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford univ. press, 2011.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

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

1. Understand the principles of semiconductor Physics.
 2. Understand and utilize the mathematical models of semiconductor junctions.
 3. Understand carrier transport in semiconductors and design resistors.
 4. Utilize the mathematical models of MOS transistors for circuits and systems.
 5. Analyse and find application of special purpose diodes.
-

| | | | |
|--------|-----------------------|----------|-----------|
| KEC302 | Digital System Design | 3L:1T:0P | 4 Credits |
|--------|-----------------------|----------|-----------|

| Unit | Topics | Lectures |
|------|--|----------|
| I | Logic simplification and combinational logic design: Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, tabulation method. | 8 |
| II | MSI devices like comparators, multiplexers, encoder, decoder, driver & multiplexed display, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU. | 8 |
| III | Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, edge triggered FF, state diagram, state reduction, design of sequential circuits, ripple and synchronous counters, shift registers, finite state machines, design of synchronous FSM, algorithmic state machines charts. Designing synchronous circuits like pulse train generator, pseudo random binary sequence generator, clock generation. | 8 |
| IV | Logic families and semiconductor memories: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices. | 8 |
| V | Digital-to-Analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. analog-to-digital converters (ADC): single slope, dual slope, successive approximation, flash etc. switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc. | 8 |

Text/Reference Books:

1. R.P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 4th edition, 2009.
2. A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.
3. W.H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice," PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems," Tata McGraw Hill, 1989.
5. A. K. Singh, "Foundation of Digital Electronics & Logic Design," New Age Int. Publishers.
6. Subrata Ghosal, "Digital Electronics," Cengage publication, 2nd edition, 2018

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

1. Design and analyze combinational logic circuits.
 2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
 3. Design & analyze synchronous sequential logic circuits
 4. Analyze various logic families.
 5. Design ADC and DAC and implement in amplifier, integrator, etc.
-

| KCS303 | Discrete Structures & Theory of | 3L:0T:0P | 3 Credits |
|---|---|----------|------------------|
| Course Outcome (CO) | | | |
| At the end of course , the student will be able to understand | | | |
| CO 1 | Write an argument using logical notation and determine if the argument is or is not valid. | | |
| CO 2 | Understand the basic principles of sets and operations in sets. | | |
| CO 3 | Demonstrate an understanding of relations and functions and be able to determine their properties. | | |
| CO 4 | Demonstrate different traversal methods for trees and graphs. | | |
| CO 5 | Model problems in Computer Science using graphs and trees. | | |
| DETAILED SYLLABUS | | | |
| Unit | Topic | | Proposed Lecture |
| I | Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction. | | 08 |
| II | Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields. | | 08 |
| III | Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. | | 08 |
| IV | Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. (8) Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic. | | 08 |
| V | Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle | | 08 |
| Text books: | | | |
| 1.Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006. | | | |
| 2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004. | | | |
| 3.E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000. | | | |
| 4.R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004 | | | |
| 5.Liptschutz, Seymour, “ Discrete Mathematics”, McGraw Hill. | | | |
| 6.Trembley, J.P & R. Manohar, “Discrete Mathematical Structure with Application to Computer Science”, McGraw Hill. | | | |
| 4. Deo, 7.Narsingh, “Graph Theory With application to Engineering and Computer.Science.”, PHI. | | | |
| 8. Krishnamurthy, V., “Combinatorics Theory & Application”, East-West Press Pvt. Ltd., New Delhi | | | |

| | | | |
|--------|------------------------|----------|-----------|
| KEC351 | Electronic Devices Lab | 0L:0T:2P | 1 Credits |
|--------|------------------------|----------|-----------|

SUGGESTIVE LIST OF EXPERIMENTS

1. Study of Lab Equipment and Components: CRO, multimeter, and function generator, power supply- active, passive components and bread board.
2. P-N Junction diode: Characteristics of PN junction diode - static and dynamic resistance measurement from graph.
3. Applications of PN Junction diode: Half & Full wave rectifier- Measurement of V_{rms} , V_{dc} , and ripple factor.
4. Characteristics of Zener diode: V-I characteristics of Zener diode, graphical measurement of forward and reverse resistance.
5. Characteristics of Photo diode: V-I characteristics of photo diode, graphical measurement of forward and reverse resistance.
6. Characteristics of Solar cell: V-I characteristics of solar cell, graphical measurement of forward and reverse resistance.
7. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
8. Characteristic of BJT: BJT in CE configuration- graphical measurement of h-parameters from input and output characteristics. Measurement of A_v , A_i , R_o and R_i of CE amplifier with potential divider biasing.
9. Field Effect Transistors: Single stage common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. Metal Oxide Semiconductor Field Effect Transistors: Single stage MOSFET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

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

1. Understand working of basic electronics lab equipment.
 2. Understand working of PN junction diode and its applications.
 3. Understand characteristics of Zener diode.
 4. Design a voltage regulator using Zener diode.
 5. Understand working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.
-

| | | | |
|--------|---------------------------|----------|-----------|
| KEC352 | Digital System Design Lab | 0L:0T:2P | 1 Credits |
|--------|---------------------------|----------|-----------|

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuits and other components.

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

1. Design and analyze combinational logic circuits.
 2. Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.
 3. Design & analyze synchronous sequential logic circuits.
 4. Design & build mini project using digital ICs.
-

Discrete Structure & Logic Lab (KCS353)

Programming Language/Tool Used: C and Mapple

1. Write a program in C to create two sets and perform the Union operation on sets.
2. Write a program in C to create two sets and perform the Intersection operation on sets.
3. Write a program in C to create two sets and perform the Difference operation on sets.
4. Write a program in C to create two sets and perform the Symmetric Difference operation.
5. Write a program in C to perform the Power Set operation on a set.
6. Write a program in C to Display the Boolean Truth Table for AND, OR , NOT .
7. Write a C Program to find Cartesian Product of two sets
8. Write a program in C for minimum cost spanning tree.
9. Write a program in C for finding shortest path in a Graph

Note: Understanding of mathematical computation software Mapple to experiment the followings
(Exp. 10 to 25):

10. Working of Computation software
11. Discover a closed formula for a given recursive sequence vice-versa
12. Recursion and Induction
13. Practice of various set operations
14. Counting
15. Combinatorial equivalence
16. Permutations and combinations
17. Difference between structures, permutations and sets
18. Implementation of a recursive counting technique
19. The Birthday problem
20. Poker Hands problem
21. Baseball best-of-5 series: Experimental probabilities
22. Baseball: Binomial Probability
23. Expected Value Problems
24. Basketball: One and One
25. Binary Relations: Influence

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

Semester-IV

| KEC403 | Signal System | 3L:1T:0P | 4 Credits |
|--------|---|----------|-----------|
| Unit | Topics | Lectures | |
| I | Signals and systems as seen in everyday life, and in various branches of engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability. | 8 | |
| II | Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems, system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response | 8 | |
| III | Fourier series representation, Fourier transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality, Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour. | 8 | |
| IV | The z-Transform for discrete time signals and systems-Eigen functions, region of convergence, z-domain analysis. | 8 | |
| V | The sampling theorem and its implications- spectra of sampled signals, reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on, aliasing and its effects, relation between continuous and discrete time systems. | 8 | |

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete," 4th edition, Prentice Hall, 1998.
3. B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill International Edition: 1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems," John Wiley and Sons (Asia) Private Limited, 1998.
6. V. Krishnaveni, A. Rajeswari, "Signals and Systems," Wiley India Private Limited, 2012.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB," TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi, 2001.
10. A. Anand Kumar, "Signals and Systems," PHI 3rd edition, 2018.
11. D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, "Signal, Systems, and Stochastic Processes," Cengage publication, 2018.

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|--------|-----------------|----------|-----------|
| KEC402 | Analog Circuits | 3L:1T:0P | 4 Credits |
|--------|-----------------|----------|-----------|

| Unit | Topics | Lectures |
|------|---|----------|
| I | Diode circuits, amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers. | 8 |
| II | High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin. | 8 |
| III | Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. | 8 |
| IV | Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation. | 8 |
| V | Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass, band pass and band stop, design guidelines. | 8 |

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," Mc Graw Hill, 1992.
2. J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College11 Publishing, 4th edition.
5. Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

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

1. Understand the characteristics of diodes and transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Design LPF, HPF, BPF, BSF.

| | | | |
|--------|-------------------|----------|-----------|
| KCS401 | Operating systems | 3L:0T:0P | 3 Credits |
|--------|-------------------|----------|-----------|

| Course Outcome (CO) | | |
|----------------------|---|--|
| CO 1 | Understand the structure and functions of OS | |
| CO 2 | Learn about Processes, Threads and Scheduling algorithms. | |
| CO 3 | Understand the principles of concurrency and Deadlocks | |
| CO 4 | Learn various memory management scheme | |
| CO 5 | Study I/O management and File systems. | |

DETAILED SYLLABUS

| Unit | Topic | Proposed Lecture |
|------|---|------------------|
| I | Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems. | 08 |
| II | Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation. | 08 |
| III | CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, | 08 |
| IV | Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference. | 08 |
| V | I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security. | 08 |

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhare, "Operating Systems : A Concept based Approach", 2nd Edition,
5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

| | | | |
|--------|--------------------|----------|-----------|
| KEC452 | Analog Circuit Lab | 0L:0T:2P | 1 Credits |
|--------|--------------------|----------|-----------|

SUGGESTIVE LIST OF EXPERIMENTS

1. Characteristic of BJT: Study of BJT in various configurations (such as CE/CS, CB/CG, CC/CD).
2. BJT in CE configuration: Graphical measurement of h-parameters from input and output characteristics, measurement of A_v , A_i , R_o and R_i of CE amplifier with potential divider biasing.
3. Study of Multi-stage amplifiers: Frequency response of single stage and multistage amplifiers.
4. Feedback topologies: Study of voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.
5. Measurement of Op-Amp parameters: Common mode gain, differential mode gain, CMRR, slew rate.
6. Applications of Op-Amp: Op-Amp as summing amplifier, difference amplifier, integrator and differentiator.
7. Field effect transistors: Single stage common source FET amplifier –plot of gain in dB vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
8. Oscillators: Study of sinusoidal oscillators- RC oscillators (phase shift, Wien bridge etc.).
9. Study of LC oscillators (Hartley, Colpitt, Clapp etc.),
10. Study of non-sinusoidal oscillators.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.
12. ADC/DAC: Design and study of Analog to Digital Converter.
13. Design and study of Digital to Analog Converter.

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

1. Understand the characteristics of transistors.
 2. Design and analyze various configurations of amplifier circuits.
 3. Design sinusoidal and non-sinusoidal oscillators.
 4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
 5. Design ADC and DAC.
-

SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to MATLAB
 - a. To define and use variables and functions in MATLAB.
 - b. To define and use Vectors and Matrices in MATLAB.
 - c. To study various MATLAB arithmetic operators and mathematical functions.
 - d. To create and use m-files.
2. Basic plotting of signals
 - a. To study various MATLAB commands for creating two and three dimensional plots.
 - b. Write a MATLAB program to plot the following continuous time and discrete time signals.
 - i. Step Function
 - ii. Impulse Function
 - iii. Exponential Function
 - iv. Ramp Function
 - v. Sine Function
3. Time and Amplitude transformations
Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
 - a. Write a MATLAB program to compute autocorrelation of a sequence $x(n)$ and verify the property.
 - b. Write a MATLAB program to compute cross-correlation of sequences $x(n)$ and $y(n)$ and verify the property.
6. Fourier Series and Gibbs Phenomenon
 - a. To calculate Fourier series coefficients associated with Square Wave.
 - b. To Sum the first 10 terms and plot the Fourier series as a function of time.
 - c. To Sum the first 50 terms and plot the Fourier series as a function of time.
7. Calculating transforms using MATLAB
 - a. Calculate and plot Fourier transform of a given signal.
 - b. Calculate and plot Z-transform of a given signal.
8. Impulse response and Step response of a given system
 - a. Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
 - b. Compute and plot the response of a given system to a given input.
9. Pole-zero diagram and bode diagram
 - a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function.
 - b. Write a MATLAB program to find, bode diagram of a given system from the given system function.

10. Frequency response of a system

Write a MATLAB program to plot magnitude and phase response of a given system.

11. Checking linearity/non-linearity of a system using SIMULINK

- a. Build a system that amplifies a sine wave by a factor of two.
- b. Test the linearity of this system using SIMULINK.

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

1. Understand the basics operation of MATLAB.
 2. Analysis the time domain and frequency domain signals.
 3. Implement the concept of Fourier series and Fourier transforms.
 4. Find the stability of system using pole-zero diagrams and bode diagram.
 5. Design frequency response of the system.
-

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|--------|-----------------------|----------|-----------|
| KCS451 | Operating Systems Lab | 0L:0T:2P | 1 Credits |
|--------|-----------------------|----------|-----------|

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8)
2. Execute various UNIX system calls for
 - i. Process management
 - ii. File management
 - iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
 - i. SJF
 - ii. Priority
 - iii. FCFS
 - iv. Multi-level Queue
4. Implement file storage allocation technique:
 - i. Contiguous(using array)
 - ii. Linked –list(using linked-list)
 - iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
 - i. Worst-Fit
 - ii. Best- Fit
 - iii. First- Fit
6. Calculation of external and internal fragmentation
 - i. Free space list of blocks from system
 - ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph RAG)
9. Implementation of Banker's algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR
PRADESH, LUCKNOW**



Evaluation Scheme & Syllabus

For

B.Tech. 2nd Year

Computer Science and Engineering (Artificial Intelligence)

**Computer Science and Engineering (Artificial Intelligence & Machine
Learning)**

Computer Science and Engineering (Data Science)

Computer Science and Engineering (Internet Of Things)

On

AICTE Model Curriculum

(Effective from the Session: 2021-22)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B.TECH
(CSAI/CSML/CSDS/CSIOT)
COMPUTER SCIENCE AND ENGINEERING)
SEMESTER- III

| Sl. No. | Subject Codes | Subject | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
|---------|----------------------|--|---------|---|---|-------------------|----|-------|----|--------------|----|------------|-----------|
| | | | L | T | P | CT | TA | Total | PS | TE | PE | | |
| 1 | KOE031-38/ KAS302 | Engineering Science Course/Maths IV | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 2 | KAS301/ KVE 301 | Technical Communication/Universal Human values | 2 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| | | | 3 | 0 | 0 | | | | | | | | |
| 3 | KCS301 | Data Structure | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 4 | KCS302 | Computer Organization and Architecture | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 5 | KCS303 | Discrete Structures & Theory of Logic | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 6 | KCS351 | Data Structures Using C Lab | 0 | 0 | 2 | | | | | 25 | 25 | 50 | 1 |
| 7 | KCS352 | Computer Organization Lab | 0 | 0 | 2 | | | | | 25 | 25 | 50 | 1 |
| 8 | KCS353 | Discrete Structure & Logic Lab | 0 | 0 | 2 | | | | | 25 | 25 | 50 | 1 |
| 9 | KCS354 | Mini Project or Internship Assessment* | 0 | 0 | 2 | | | 50 | | | | 50 | 1 |
| 10 | KNC301/ KNC302 | Computer System Security/Python Programming | 2 | 0 | 0 | 15 | 10 | 25 | | 50 | | | 0 |
| 11 | | MOOCs (Essential for Hons. Degree) | | | | | | | | | | | |
| | | Total | | | | | | | | | | 950 | 22 |

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV

| Sl. No. | Subject Codes | Subject | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
|---------|----------------------|--|---------|---|---|-------------------|----|-------|----|--------------|----|------------|-----------|
| | | | L | T | P | CT | TA | Total | PS | TE | PE | | |
| 1 | KAS402/ KOE041-48 | Maths IV/Engg. Science Course | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 2 | KVE401/ KAS301 | Universal Human Values/ Technical Communication | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| | | | 2 | 1 | 0 | | | | | | | | |
| 3 | KCS401 | Operating Systems | 3 | 0 | 0 | 30 | 20 | 50 | | 100 | | 150 | 3 |
| 4 | KCS402 | Theory of Automata and Formal Languages | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 5 | KCS403 | Microprocessor | 3 | 1 | 0 | 30 | 20 | 50 | | 100 | | 150 | 4 |
| 6 | KCS451 | Operating Systems Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 7 | KCS452 | Microprocessor Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 8 | KCS453 | Python Language Programming Lab | 0 | 0 | 2 | | | | 25 | | 25 | 50 | 1 |
| 9 | KNC402/ KNC401 | Python Programming/Computer System Security | 2 | 0 | 0 | 15 | 10 | 25 | | 50 | | | 0 |
| 10 | | MOOCs (Essential for Hons. Degree) | | | | | | | | | | | |
| | | Total | | | | | | | | | | 900 | 21 |

B.TECH.
(CSAI/CSML/CSDS/CSIOT)
(COMPUTER SCIENCE AND ENGINEERING)
THIRD SEMESTER (DETAILED SYLLABUS)

| DATA STRUCTURE (KCS301) | | |
|--|--|-------------------------------------|
| Course Outcome (CO) | Bloom's Knowledge Level (KL) | |
| At the end of course , the student will be able to understand | | |
| CO 1 | Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications. | K₁, K₂ |
| CO 2 | Discuss the computational efficiency of the sorting and searching algorithms. | K₂ |
| CO 3 | Implementation of Trees and Graphs and perform various operations on these data structure. | K₃ |
| CO 4 | Understanding the concept of recursion, application of recursion and its implementation and removal of recursion. | K₄ |
| CO 5 | Identify the alternative implementations of data structures with respect to its performance to solve a real world problem. | K₅, K₆ |
| DETAILED SYLLABUS | | 3-1-0 |
| Unit | Topic | Proposed Lecture |
| I | <p>Introduction: Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT)</p> <p>Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations.</p> <p>Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.</p> | 08 |
| II | <p>Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion.</p> <p>Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.</p> | 08 |
| III | <p>Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.</p> | 08 |
| IV | <p>Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm.</p> | 08 |

| | | |
|---|--|----|
| V | <p>Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps</p> | 08 |
|---|--|----|

Text books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, “Data Structures Using C and C++”, PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.
3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, “Data Structure Using C” Oxford Higher Education.
5. AK Sharma, “Data Structure Using C”, Pearson Education India.
6. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
8. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
9. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education.
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
12. Adam Drozdek “Data Structures and Algorithm in Java”, Cengage Learning

| Computer Organization and Architecture (KCS302) | | |
|---|---|-------------------------------------|
| Course Outcome (CO) | | Bloom's Knowledge Level (KL) |
| At the end of course , the student will be able to understand | | |
| CO 1 | Study of the basic structure and operation of a digital computer system. | K ₁ , K ₂ |
| CO 2 | Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations. | K ₂ , K ₄ |
| CO 3 | Implementation of control unit techniques and the concept of Pipelining | K ₃ |
| CO 4 | Understanding the hierarchical memory system, cache memories and virtual memory | K ₂ |
| CO 5 | Understanding the different ways of communicating with I/O devices and standard I/O interfaces | K ₂ , K ₄ |
| DETAILED SYLLABUS | | 3-1-0 |
| Unit | Topic | Proposed Lecture |
| I | Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes. | 08 |
| II | Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers | 08 |
| III | Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming. | 08 |
| IV | Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation. | 08 |
| V | Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces. | 08 |
| Text books: | | |
| <ol style="list-style-type: none"> 1. Computer System Architecture - M. Mano 2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012 3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books 4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006. 5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011. 6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012 7. Structured Computer Organization, Tannenbaum(PHI) | | |

| Discrete Structures & Theory of Logic (KCS303) | | |
|---|---|---------------------------------|
| Course Outcome (CO) | | Bloom's Knowledge Level (KL) |
| At the end of course , the student will be able to understand | | |
| CO 1 | Write an argument using logical notation and determine if the argument is or is not valid. | K ₃ , K ₄ |
| CO 2 | Understand the basic principles of sets and operations in sets. | K ₁ , K ₂ |
| CO 3 | Demonstrate an understanding of relations and functions and be able to determine their properties. | K ₃ |
| CO 4 | Demonstrate different traversal methods for trees and graphs. | K ₁ , K ₄ |
| CO 5 | Model problems in Computer Science using graphs and trees. | K ₂ , K ₆ |
| DETAILED SYLLABUS | | 3-0-0 |
| Unit | Topic | Proposed Lecture |
| I | Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction. | 08 |
| II | Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields. | 08 |
| III | Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. | 08 |
| IV | Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. (8) Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic. | 08 |
| V | Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle | 08 |
| Text books: | | |
| 1.Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006. | | |
| 2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004. | | |
| 3.E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000. | | |
| 4.R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004 | | |
| 5.Liptschutz, Seymour, “ Discrete Mathematics”, McGraw Hill. | | |
| 6.Trembley, J.P & R. Manohar, “Discrete Mathematical Structure with Application to Computer Science”, McGraw Hill. | | |
| 4. Deo, 7.Narsingh, “Graph Theory With application to Engineering and Computer.Science.”, PHI. | | |
| 8. Krishnamurthy, V., “Combinatorics Theory & Application”, East-West Press Pvt. Ltd., New Delhi | | |

Data Structure using C Lab (KCS351)

Write C Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Implementation of Stack using Array.
5. Implementation of Queue using Array.
6. Implementation of Circular Queue using Array.
7. Implementation of Stack using Linked List.
8. Implementation of Queue using Linked List.
9. Implementation of Circular Queue using Linked List.
10. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
11. Graph Implementation, BFS, DFS, Minimum cost spanning tree, shortest path algorithm.

Computer Organization Lab (KCS352)

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

Discrete Structure & Logic Lab (KCS353)

Programming Language/Tool Used: C and Mapple

1. Write a program in C to create two sets and perform the Union operation on sets.
2. Write a program in C to create two sets and perform the Intersection operation on sets.
3. Write a program in C to create two sets and perform the Difference operation on sets.
4. Write a program in C to create two sets and perform the Symmetric Difference operation.
5. Write a program in C to perform the Power Set operation on a set.
6. Write a program in C to Display the Boolean Truth Table for AND, OR, NOT.
7. Write a C Program to find Cartesian Product of two sets
8. Write a program in C for minimum cost spanning tree.
9. Write a program in C for finding shortest path in a Graph

Note: Understanding of mathematical computation software Mapple to experiment the followings (exp. 10 to 25):

10. Working of Computation software
11. Discover a closed formula for a given recursive sequence vice-versa
12. Recursion and Induction
13. Practice of various set operations
14. Counting
15. Combinatorial equivalence
16. Permutations and combinations
17. Difference between structures, permutations and sets
18. Implementation of a recursive counting technique
19. The Birthday problem
20. Poker Hands problem
21. Baseball best-of-5 series: Experimental probabilities
22. Baseball: Binomial Probability
23. Expected Value Problems
24. Basketball: One and One
25. Binary Relations: Influence

B.TECH. (COMPUTER SCIENCE AND ENGINEERING)**FOURTH SEMESTER (DETAILED SYLLABUS)**

| Operating systems (KCS401) | | |
|---|--|-------------------------------------|
| Course Outcome (CO) | | Bloom's Knowledge Level (KL) |
| At the end of course , the student will be able to understand | | |
| CO 1 | Understand the structure and functions of OS | K ₁ , K ₂ |
| CO 2 | Learn about Processes, Threads and Scheduling algorithms. | K ₁ , K ₂ |
| CO 3 | Understand the principles of concurrency and Deadlocks | K ₂ |
| CO 4 | Learn various memory management scheme | K ₂ |
| CO 5 | Study I/O management and File systems. | K ₂ ,K ₄ |
| DETAILED SYLLABUS | | 3-0-0 |
| Unit | Topic | Proposed Lecture |
| I | Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems. | 08 |
| II | Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation. | 08 |
| III | CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock. | 08 |
| IV | Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference. | 08 |
| V | I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security. | 08 |
| Text books: | | |
| <ol style="list-style-type: none"> 1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley 2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education 3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education 4. D M Dhamdhare, "Operating Systems : A Concept based Approach", 2nd Edition, 5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education | | |

| Theory of Automata and Formal Languages (KCS402) | | |
|---|---|---------------------------------|
| Course Outcome (CO) | | Bloom's Knowledge Level (KL) |
| At the end of course , the student will be able to understand | | |
| CO 1 | Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars | K ₄ , K ₆ |
| CO 2 | Analyse and design, Turing machines, formal languages, and grammars | K ₄ , K ₆ |
| CO 3 | Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving | K ₁ , K ₅ |
| CO 4 | Prove the basic results of the Theory of Computation. | K ₂ ,K ₃ |
| CO 5 | State and explain the relevance of the Church-Turing thesis. | K ₁ , K ₅ |
| DETAILED SYLLABUS | | 3-1-0 |
| Unit | Topic | Proposed Lecture |
| I | Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ϵ -Transition, Equivalence of NFA's with and without ϵ -Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA | 08 |
| II | Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language. | 08 |
| III | Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs. | 08 |
| IV | Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs. | 08 |
| V | Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance Problem, Introduction to Recursive Function Theory. | 08 |
| Text books: | | |
| <ol style="list-style-type: none"> 1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia 2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill 3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI 4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age Internationa | | |

| Microprocessor (KCS403) | | |
|--|--|-------------------------------------|
| Course Outcome (CO) | | Bloom's Knowledge Level (KL) |
| At the end of course , the student will be able to understand | | |
| CO 1 | Apply a basic concept of digital fundamentals to Microprocessor based personal computer system. | K ₃ , K ₄ |
| CO 2 | Analyze a detailed s/w & h/w structure of the Microprocessor. | K ₂ ,K ₄ |
| CO 3 | Illustrate how the different peripherals (8085/8086) are interfaced with Microprocessor. | K ₃ |
| CO 4 | Analyze the properties of Microprocessors(8085/8086) | K ₄ |
| CO 5 | Evaluate the data transfer information through serial & parallel ports. | K ₅ |
| DETAILED SYLLABUS | | 3-1-0 |
| Unit | Topic | Proposed Lecture |
| I | Microprocessor evolution and types, microprocessor architecture and operation of its components, addressing modes, interrupts, data transfer schemes, instruction and data flow, timer and timing diagram, Interfacing devices. | 08 |
| II | Pin diagram and internal architecture of 8085 microprocessor, registers, ALU, Control & status, interrupt and machine cycle. Instruction sets. Addressing modes. Instruction formats Instruction Classification: data transfer, arithmetic operations, logical operations, branching operations, machine control and assembler directives. | 08 |
| III | Architecture of 8086 microprocessor: register organization, bus interface unit, execution unit, memory addressing, and memory segmentation. Operating modes. Instruction sets, instruction format, Types of instructions. Interrupts: hardware and software interrupts. | 08 |
| IV | Assembly language programming based on intel 8085/8086. Instructions, data transfer, arithmetic, logic, branch operations, looping, counting, indexing, programming techniques, counters and time delays, stacks and subroutines, conditional call and return instructions | 08 |
| V | Peripheral Devices: 8237 DMA Controller, 8255 programmable peripheral interface, 8253/8254programmable timer/counter, 8259 programmable interrupt controller, 8251 USART and RS232C. | 08 |
| Text books: | | |
| <ol style="list-style-type: none"> 1. Gaonkar, Ramesh S , “Microprocessor Architecture, Programming and Applications with 8085”, Penram International Publishing. 2. Ray A K , Bhurchandi K M , “Advanced Microprocessors and Peripherals”, TMH 3. Hall D V ,”Microprocessor Interfacing’, TMH 4. Liu and, “ Introduction to Microprocessor”, TMH 5. Brey, Barry B, “INTEL Microprocessors”, PHI 6. Renu Sigh & B.P. Gibson G A , “ Microcomputer System: The 8086/8088 family” ,PHI 7. Aditya P Mathur Sigh, “Microprocessor, Interfacing and Applications M Rafiqzaman, “Microprocessors, Theory and Applications 8. J.L. Antonakos, An Introduction to the Intel Family of Microprocessors, Pearson, 1999 | | |

Operating Systems Lab (KCS451)

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8)
2. Execute various UNIX system calls for
 - i. Process management
 - ii. File management
 - iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
 - i. SJF
 - ii. Priority
 - iii. FCFS
 - iv. Multi-level Queue
4. Implement file storage allocation technique:
 - i. Contiguous(using array)
 - ii. Linked –list(using linked-list)
 - iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques:
 - i. Worst-Fit
 - ii. Best- Fit
 - iii. First- Fit
6. Calculation of external and internal fragmentation
 - i. Free space list of blocks from system
 - ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph (RAG)
9. Implementation of Banker’s algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -Semaphore

Microprocessor Lab (KCS452)

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port.

Python Language Programming Lab (KCS453)

1. To write a python program that takes in command line arguments as input and print the number of arguments.
2. To write a python program to perform Matrix Multiplication.
3. To write a python program to compute the GCD of two numbers.
4. To write a python program to find the most frequent words in a text file.
5. To write a python program find the square root of a number (Newton's method).
6. To write a python program exponentiation (power of a number).
7. To write a python program find the maximum of a list of numbers.
8. To write a python program linear search.
9. To write a python program Binary search.
10. To write a python program selection sort.
11. To write a python program Insertion sort.
12. To write a python program merge sort.
13. To write a python program first n prime numbers.
14. To write a python program simulate bouncing ball in Pygame.

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW**



Evaluation Scheme & Syllabus

for

MBA First Year

On

Choice Based Credit System

(Effective from the Session: 2016-17)

Dr. APJ Abdul Kalam Technical University, Lucknow

Study and Evaluation Scheme

MBA Evaluation Scheme For Session 2016-17

Semester I

| S. No. | Course Title | Credit | Evaluation Scheme | | | | | |
|--------|--------------|--|-------------------|----|-------|-----|-------|------------|
| | | | Sessional Exams | | | ESE | Total | |
| | | | CT | TA | Total | | | |
| 1 | RMB101 | Management Concepts and Applications | 3 | 20 | 10 | 30 | 70 | 100 |
| 2 | RMB102 | Managerial Economics | 3 | 20 | 10 | 30 | 70 | 100 |
| 3 | RMB103 | Financial Accounting for Managers | 4 | 20 | 10 | 30 | 70 | 100 |
| 4 | RMB104 | Business Statistics | 4 | 20 | 10 | 30 | 70 | 100 |
| 5 | RMB105 | Organisational Behaviour | 3 | 20 | 10 | 30 | 70 | 100 |
| 6 | RMB106 | Marketing Management | 4 | 20 | 10 | 30 | 70 | 100 |
| 7 | RMB107 | Business Communication | 3 | 20 | 10 | 30 | 70 | 100 |
| 8 | RMB108 | Computer Application & Management Information System | 3 | 20 | 10 | 30 | 70 | 100 |
| | | TOTAL | 27 | | | | | 800 |

* Non credit but qualifying

Semester II

| S. No. | Course Title | Credit | Evaluation Scheme | | | | | |
|--------|--------------|--|-------------------|----|-------|-----|-------|------------|
| | | | Sessional Exams | | | ESE | Total | |
| | | | CT | TA | Total | | | |
| 1 | RMB201 | Business Environment | 3 | 20 | 10 | 30 | 70 | 100 |
| 2 | RMB202 | Human Resource Management | 3 | 20 | 10 | 30 | 70 | 100 |
| 3 | RMB203 | Business Research Methods | 3 | 20 | 10 | 30 | 70 | 100 |
| 4 | RMB204 | Financial Management | 3 | 20 | 10 | 30 | 70 | 100 |
| 5 | RMB205 | Management Accounting & Control | 3 | 20 | 10 | 30 | 70 | 100 |
| 6 | RMB206 | Production Operation & Supply Chain Management | 3 | 20 | 10 | 30 | 70 | 100 |
| 7 | RMB207 | Quantitative Techniques for Managers | 4 | 20 | 10 | 30 | 70 | 100 |
| 8 | RMB208 | Legal Aspects for Business | 3 | 20 | 10 | 30 | 70 | 100 |
| 9 | RMB209 | Comprehaensive Viva | 2 | | | | | 100 |
| | | TOTAL | 27 | | | | | 900 |

* Non credit but qualifying

MANAGEMENT CONCEPTS AND APPLICATION

Code : RMB101 Course

Objectives:

- The purpose of this course is to expose the student to the basic concepts of management in order to aid the student in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms.
- Discuss the various concepts of planning, Decision making and controlling to help solving managerial problems
- Study and understand management concepts and styles in Global context.
- Familiarising the students with the contemporary issues in management.

Course Credit: 3

Contact Hours: 36 hours

UNIT-1

Management practices from past to present, Different levels of management, Managerial skills, Roles & Functions, Manager and Business environment. (7 hours)

UNIT-2

Planning- Objective of planning, planning process, Types of planning, Types of plans, Corporate planning, Management by Objective, Decision-making- types, process & techniques, making decision effective. (7 hours)

UNIT-3

Organising & staffing- Meaning of organization, types of organization, Organization structure, Span of management, Line and staff relationship, Departmentation, Delegation Centralization and decentralization of authority, Meaning of staffing, Recruitment, selection & placement, Training & development. (8 Hours)

UNIT-4

Directing & Controlling- Principle of directing, Essence of coordination, Basic control process, Different control techniques, Management by exception.

UNIT-5 (7 Hours)

International Perspective: Contemporary issues and international perspective of management. Benchmarking, TQM, 5S.

Course Outcomes: After completing the course student will be able to understand and explain

1. The concept of management and its managerial perspective.
2. It subject will equip students to map complex managerial aspect arise due to ground realities of an organization.
3. They will Gain knowledge of contemporary issues in Management principles and various approaches to resolve those issues.

| Employable Skills | Measuring Tools |
|---|--|
| Ability to identify and apply the | Exercise |
| knowledge of subject practically in real life situations | Workshop Quiz Classroom Discussions |

Reference Books:

1. Koontz Harold & Weihrich Heinz – Essentials of management (Tata Mc Graw Hill, 5th Edition ,2008)
2. Robbins & Coulter - Management (Prentice Hall of India, 9th Edition)
3. Robbins S.P. and Decenzo David A. - Fundamentals of Management: Essential Concepts and Applications Pearson Education, 6th Edition.
4. Weihrich Heinz and Koontz Harold - Management: A Global and Entrepreneurial Perspective.
5. James F.Stoner,et al,Management, Pearsons Education Delhi, 2008
6. Principles of Management, George R. Terry & S.G. Franklin, AITBS, Delhi.

Text Books:

1. L. M. Prasad- Principles and Practices of Management, Sulatn Chand & Sons, 7th edition, 2007.

MANAGERIAL ECONOMICS:

Code : RMB102

Course Objective:

- Understand the relative importance of Managerial Economics
- Know how the application of the principles of managerial economics can aid in achievement of business objectives
- Understand the modern managerial decision rules and optimization techniques.
- Be equipped with the tools necessary in analysis of consumer behavior as well as in forecasting product demand
- Understand and be able to apply latest pricing strategies
- Understand and analyse the macro environment affecting the business decision making.

Course Credit: 3

Contact Hours: 36 hours

UNIT –I

Basic Concepts and principles: (6 Hrs)

Definition, Nature and Scope of Economics-Micro Economics and Macro Economics.

Managerial Economics and its relevance in business decisions. Fundamental Principles of Managerial Economics - Incremental Principle, Marginal Principle, Opportunity Cost Principle, Discounting Principle, Concept of Time Perspective. Equi-Marginal Principle. Utility Analysis. Cardinal Utility and Ordinal Utility.

UNIT –II

Demand and Supply Analysis : (8Hrs)

Theory of Demand. Types of Demand. Determinants of demand , Demand Function , Demand Schedule , Demand curve , Law of Demand, Exceptions to the law of Demand , Shifts in demand curve , Elasticity of Demand and its measurement. Price Elasticity. Income Elasticity. Arc Elasticity. Cross Elasticity and Advertising Elasticity. Uses of Elasticity of Demand for managerial decision making , Demand forecasting meaning, significance and methods.(numerical Exercises)

Supply Analysis; Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making.

Price of a Product under demand and supply forces

UNIT –III

Production and cost Analysis: (10Hrs)

Production concepts & analysis; Production function, Types of production function ,Laws of production : Law of diminishing returns , Law of returns to scale.

Cost concept and analysis: Cost , Types of costs, Cost output relationship in the short-run.

Cost output relationship in the Long-run.

Estimation of Revenue. Average Revenue, Marginal Revenue

UNIT –IV

Market structures : (8Hrs)

Perfect and Imperfect Market Structures , Perfect Competition, features, determination of price under perfect competition. Monopoly: Feature, pricing under monopoly, Price Discrimination. Monopolistic: Features, pricing under monopolistic competition, product

differentiation. Oligopoly: Features, kinked demand curve, cartels, price leadership. Pricing Strategies; Price determination, full cost pricing, product line pricing, price skimming, penetration pricing

UNIT –V National Income; Concepts and various methods of its measurement, Inflation, types and causes, Business (8Hrs)

| Employable Skills | Measuring tool |
|--|---------------------|
| Ability to forecast demand | Exercise + Workshop |
| Ability to analyse various market structures | Exercise + Workshop |
| Ability to appreciate the role of various monetary policy tools in controlling inflation | Exercise + Workshop |

Expected Course outcome:

- This course would provide students with the knowledge , tools and techniques to make effective economic decisions under conditions of risk and uncertainty
- Micro economic principles would equip the students with tools and principles which are applied for analyzing the ever changing demand and supply conditions
- The students would be able to apply the basic macroeconomic concepts to analyze the volatility in the business world.

Text Books:

- Managerial Economics, GEETIKA, McGraw-Hill Education 2nd Ed.
- Managerial Economics: Concepts and Applications (SIE), THOMAS & MAURICE, McGraw-Hill Education, 9th Ed
- Managerial Economics, H.L Ahuja, S.Chand, 8th Ed
- Managerial Economics ,D.N.Dwivedi,Vikas Publication, 7th Ed
- Managerial Economics – Theory and Applications, Dr.D.M.Mithani, Himalaya Publications, 7th Ed.

FINANCIAL ACCOUNTING FOR MANAGERS

Code RMB103

COURSE OBJECTIVE:

- To provide a comprehensive treatment of accounting principles, technique and practices.
- To get the students acquainted with fundamental concepts and processes of accounting so that they are able to appreciate the nature of item presented in the annual accounts of an organization.
- To have a basic understanding of significant tools and techniques of financial analysis, which are useful in the interpretation of financial statements.
- To have a brief knowledge about international accounting standards as to have a global competence.

Course Credit: 3 Contact Hours: 40 hours

Unit I (6Hrs)

Meaning and Scope of Accounting : Overview of Accounting, Users of Accounting, Accounting Concepts Conventions, Book keeping and Accounting, Principles of Accounting, Basic Accounting terminologies, Accounting Equation , Overview to Deprecation (straight line and diminishing method) .

Unit II(6Hrs)

Accounting Standards and IFRS : International Accounting Principles and Standards; Matching of Indian Accounting Standards with International Accounting Standards, Human Resource Accounting, Forensic Accounting.

Unit III (10 Hrs)

Mechanics of Accounting : Double entry system of Accounting, Journalizing of transactions; Ledger posting and Trial Balance ,Preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Excel Application to make Balance sheet, Case studies and Workshops.

Unit IV(10 Hrs)

Analysis of financial statement: Ratio Analysis- solvency ratios, Profitability ratios, activity ratios, liquidity ratios, Market capitalization ratios; Common Size Statement; Comparative Balance Sheet and Trend Analysis of manufacturing, Service & banking organizations, Case Study and Workshops in analyzing Balance sheet.

Unit V (8 Hrs)

Funds Flow Statement :Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis; Cash Flow Statement: Various cash and non-cash transactions, flow of cash, difference between cash flow and fund flow, preparation of Cash Flow Statement and its analysis.

SUGGESTED READINGS :

Text Books :

- 1) Maheshwari S.N & Maheshwari S K – A text book of Accounting for Management (Vikas, 10th Edition)
- 2) Essentials of Financial Accounting (based on IFRS), Bhattacharya (PHI,3rd Ed) 3) Ramachandran Kakani- Financial Accounting for Management(TMH ,3rd Edition).
- 4) PC Tulsian- Financial Accounting (Pearson, 2016)
- 5) Dhamija - Financial Accounting for managers: (Prentice Hall, 2nd Edition).

Reference Books

- 1) Narayanswami - Financial Accounting: A Managerial Perspective (PHI,5th Ed)
- 2) Dhaneshk Khatri- Financial Accounting (TMH,2015)
- 3) Ambrish Gupta - Financial Accounting: A Managerial Perspective (Prentice Hall, 4th Edition)
- 4) Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
- 5) Mukherjee - Financial Accounting for Management (TMH, 2nd Edition).

Expected Course Outcome:

- Subject will provide an insight to the concepts and principles for their routine monetary transaction.
- Prepare financial statements in accordance with Generally Accepted Accounting Principles and its excel application.
- Employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.
- Effectively define the needs of the various users of accounting data and demonstrate the ability to communicate such data effectively, as well as the ability to provide knowledgeable recommendations.
- Recognize circumstances providing for increased exposure to fraud and define preventative internal control measures. Employable skills

| | | |
|---|--|---|
| Ability to apply excel techniques for Balance Sheet and Profit and Loss Preparation | Exercise Workshop | + |
| Ability to analyze balance sheet | Exercise | |
| Knowledge about Indian and International Accounting Standards | www.icaai.org | |

BUSINESS STATISTICS

RMB104

Course Objectives

1. To compute and understand the measures of central tendency, symmetrical and asymmetrical distribution, patterns.
2. To understand the time series analysis and to compute index number.

3. Performing Correlation & Compute the equation of simple regression line from a sample data and interpret the slope and the intercept of the equation
4. To understand the probability concepts and perform probability theoretical distributions
5. Use Estimation Theory and Hypothesis Testing concepts & perform various parametric and non parametric tests.

Course Credit: 3 Contact Hours: 36 hours

Unit I (10 Sessions): Descriptive Statistics

Scope, functions and limitations of statistics, Measures of Central tendency – Mean, Median, Mode, Percentiles, Quartiles, Measures of Dispersion – Range, Interquartile range, Mean deviation, Mean Absolute deviation, Standard deviation, Variance, Coefficient of Variation. Measures of shape and relative location; Skewness and Kurtosis; Chebyshev's Theorem.

Unit II (8 Sessions): Time Series & Index Number

Time series analysis: Concept, Additive and Multiplicative models, Components of time series,

Trend analysis: Least Square method - Linear and Non- Linear equations, Applications in business decision-making.

Index Numbers:- Meaning , Types of index numbers, uses of index numbers, Construction of Price, Quantity and Volume indices:- Fixed base and Chain base methods.

Unit III (6 Sessions): Correlation & Regression Analysis

Correlation Analysis: Rank Method & Karl Pearson's Coefficient of Correlation and Properties of Correlation.

Regression Analysis: Fitting of a Regression Line and Interpretation of Results, Properties of Regression Coefficients and Relationship between Regression and Correlation.

Unit IV (8 Sessions): Probability Theory & Distribution

Probability: Theory of Probability, Addition and Multiplication Law, Baye's Theorem

Probability Theoretical Distributions: Concept and application of Binomial; Poisson and Normal distributions.

Unit V (8 Sessions) Estimation Theory & Hypothesis Testing

Estimation Theory: Theory of Estimation, Point Estimation, Interval Estimation.

Hypothesis Testing: Null and Alternative Hypotheses; Type I and Type II errors; Testing of Hypothesis: Large Sample Tests, Small Sample test, (t, F, Z Test and Chi Square Test)

Text Book

1. Chandrasekaran & Umavparvathi-Statistics for Managers, 1st edition, PHI Learning
2. G C Beri – Business Statistics, 3rd ed, TATA McGrawHill

Reference Book

1. Davis , Pecar – Business Statistics using Excel, Oxford
2. Ken Black – Business Statistics, 5th ed., Wiley India
3. Levin and Rubin – statistics for Management, 7th ed., Pearson
4. Lind, Marchal, Wathen – Staistical techniques in business and economics, 13th ed, McGrawHill
5. Newbold, Carlson, Thorne – Statistics for Business and Economics, 6th ed., Pearson
6. S. C.Gupta – Fundamentals of Statistics, Himalaya Publishing
7. Walpole – Probability and Statistics for Scientists and Engineers, 8th ed., Pearson

Course Outcome

1. Students should be able to calculate and interpret measures of central tendency, symmetrical and asymmetrical distribution, patterns.
2. To estimate the time series analysis by least square method and to calculate, understand the significance and usage of index number.
3. To calculate and interpret correlation coefficients & Formulate regression line by identifying dependent and independent variables.
4. Students should understand basic concepts of probability and perform probability theoretical distributions.
5. Understand Estimation Theory and to develop understanding of hypothesis testing concepts & perform various parametric and non parametric tests.

| Employable Skills | Measuring Tools |
|--|---|
| Ability to identify and apply the knowledge of subject practically in real life situations | Exercise Workshop Quiz Classroom Discussions SPSS AND MS EXCEL |

ORGANIZATIONAL BEHAVIOR**RMB105****Course Objectives:**

To enhance the understanding of the dynamics of interactions between individual and the organization. –

To facilitate a clear perspective to diagnose and effectively handle human behavior issues in Organizations. –

To develop greater insight into their own behavior in interpersonal and group, team, situations.

Course Credit: 36 Hrs

Unit I: (8 Hours)

Introduction to OB: The meaning of OB, Why study organizational behaviour, Fundamentals of individual behaviour. Determinants of Personality, types of personality. Personal effectiveness. Attitudes: Meaning, Types, Components, Theory of attitude formation and attitude change.

Unit II: (8 Hours)

Foundation of Group Behaviour: Group: Meaning, types, group dynamics, group cohesiveness, Meaning of Interpersonal Behaviour & Interpersonal skills, Transactional Analysis, Johari Window, FIRO – B, MBTI

Unit III: (8 Hours)

Motivation: Meaning & definition, Traditional theory of Motivation: Maslow’s, Herzberg’s, Mc Clelland, Contemporary theories of Motivation: Self Determination Theory, Self Efficacy Theory, Vroom’s Expectancy Theory, Equity Theory, Reinforcement Theory, OB MOD.

Perception: Meaning, process, principles and errors of perception, managerial & behavioural applications of perception.

Unit IV: (8 Hours)

Leadership: What is leadership, types of leaders and leadership styles, traits and qualities of effective leader, trait theory, LSM – Leadership Situational Model, Team Building, Tuckman Model of Team Development.

Unit V: (4 Hours)

Organizational Change: Meaning of organizational change, approaches to managing organizational change, creating a culture for change, implementing the change, Kurt Lewin Model of change.

| Employable Skills | Measuring Tools |
|--|---|
| Ability to identify and apply the knowledge of subject practically in real life situations | Exercise Workshop Quiz Classroom Discussions |

Course Outcomes: The degree to which one can make an individual to think beyond self is the real outcome of the course. Upon the successful completion of this course, the student will be able to:

1. Analyse the behaviour of individuals and groups in organisations
2. Assess the potential effects of organisational-level factors (such as structure, culture and change) on organisational behaviour.

3. Critically evaluate the potential effects of important developments in the external environment (such as globalisation and advances in technology) on organisational behaviour.

4. Analyse organisational behavioural issues in the context of organisational behaviour theories, **References:**

Books:

1. Fred Luthans, —Organizational Behaviourll, 12th Edition, McGraw Hill International Edition
2. Stephen P. Robbins, —Organizational Behaviourll, 12th Edition, Prentice Hall
3. Aswathappa K, —Organizational Behaviour (Text, Cases and Games)ll, Himalaya Publication
4. UdaiPareek, —Organizational Behaviorll, Oxford University Press

MARKETING MANAGEMENT

RMB106

Course Objectives:

- Assess market opportunities by analyzing customers, competitors, collaborators, context, and the strengths and weaknesses of a company.
- Understand consumers' requirements and their behaviours.
- Develop effective marketing strategies to achieve organizational objectives.
- Communicate and defend your recommendations and critically examine and build upon the recommendations of your classmates both quantitatively and qualitatively.
- Develop the understanding the current global and digital aspect of marketing.

Course Credit: 3 Contact Hours: 40 hours

Unit 1(8 hours)

Introduction: Nature and scope of marketing, Evolution, Various marketing orientations, Core concepts of marketing, customer value and the value delivery process. Marketing challenges in the globalized economic scenario.

Understanding Consumer Behavior: Buying motives, factors influencing buying behavior, buying habits, stages in consumer buying decision process, types of consumer buying decisions, Business buying and Business buying process.

Unit 2 (8 hours)

Market segmentation, Targeting and Positioning: Meaning, Factors influencing segmentation, Market Aggregation, Basis for segmentation, Segmentation of Consumer and Industrial markets.

Targeting: Meaning, Basis for identifying target customers, Target Market Strategies.

Positioning: Meaning, product differentiation strategies, tasks involved in positioning.

Branding: Concept of Branding, Brand Types, Brand equity, Branding Positioning.

Unit 3 (8 hours)

Product Decisions: Concept, product hierarchy, new product development, diffusion process, Product Life cycle, Product mix strategies and merchandise planning and strategies.

Packaging / Labeling: Packaging as a marketing tool, requirement of good packaging, Role of labeling in packaging

Pricing Decisions: Pricing concepts for establishing value, Pricing strategies-Value based, Cost based, Market based, Competitor based, New product pricing – Price Skimming & Penetration pricing

Unit 4 (8 hours)

Place Decision: Meaning, Purpose, Channel alternatives, Factors affecting channel choice, Channel design and Channel management decisions, Channel conflict, Distribution system, Multilevel Marketing (Network Marketing)

Advertising: Advertising Objectives, Advertising Budget, Advertising Copy, AIDA model, Advertising Agency Decisions, **Public Relation:** Meaning, Objectives, Types, Functions of Public Relations.

Sales Promotion: Sales Promotion Mix, Kinds of promotion, Tools and Techniques of sales promotion, Push-pull strategies of promotion, **Personal selling:** Concept, Features, Functions, Steps/process involved in Personal Selling,

Unit 5 (8 hours)

Direct Marketing: Meaning, Features, Functions, Growth and benefits of direct marketing, different forms, online marketing, and policy issues in Direct Marketing

Global Marketing: current scenario, Global Marketing environment, Entry strategies, Global P's of Marketing.

TEXT BOOKS:

- 1) Marketing Management: A South Asian Perspective - Kotler, Keller, Kevin 15/e, Pearson Education, 2016.
- 2) Marketing Management - Ramaswamy V. S. & Namakumar S, 5/e, McGrawHill Education Publishers, 2015.
- 3) Marketing Management - Tapan Panda, 5/e, Excel Publication, 2007.
- 4) Fundamentals of Marketing Management - Etzel M. J, B J Walker & William J. Stanton, 14/e, McGrawHill Education Publishers, 2015.
- 5) Marketing: Asian Edition Paul Bainies, Chris Fill Kelly Page third edition, Oxford.

REFERENCE BOOKS:

- 1) Marketing: An Introduction - Rosalind Masterson & David Pickton, 2/e, Sage Publications, 2010.

- 2) Marketing Management- Russ Winer, Ravi Bhar 4/e Pearson Education 2015. 3) Managing Marketing, Noel Capon, SidharthShekar Singh, 4/e Wiley
- 4) Marketing: Lamb, Hair, Mc Danniel, Cengage Learning 2012.

Expected Course Outcome:

- Explain and discuss the general concepts about marketing management and the marketing process.
- Discuss consumer and buyer behaviour models as they influence customer purchase decision-making.
- Explain the concepts of segmentation, targeting and positioning as part of a comprehensive Marketing plan.
- Develop a set of skills important to successful performance in marketing management positions, including critical thinking, working in a group environment, oral and written presentation skills.
- Explain the prospect of the global market and application of digitalization to reach there.

| Employable Skills | Measuring Tools |
|--|---|
| Ability to identify and apply the knowledge of subject practically in real life situations | Exercise Workshop Quiz Classroom Discussions |

Business Communication

RMB107

Course Objectives

1: To understand business communication strategies and principles for effective communication in domestic and international business situations.

2: To understand and appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.

3: To develop the ability to research and write a documented paper and/or to give an oral presentation.

4 : To develop the ability to communicate via electronic mail, Internet, and other technologies for presenting business messages.

5: To understand and apply basic principles of critical thinking, problem solving, and technical proficiency in the development of exposition and argument.

Course Credits 3

Hours 36 Hrs

UNIT 1: (8 hrs)

Introduction: Role of communication – defining and classifying communication – purpose of communication – process of communication – characteristics of successful communication – importance of communication in management – communication structure in organization – communication in crisis - barriers to communication. **Unit 2: (7 hrs)**

Oral communication: What is oral Communication – principles of successful oral

communication – what is conversation control – reflection and empathy: two sides of effective oral communication – effective listening – non – verbal communication. Written

communication: Purpose of writing – clarity in writing – principles of effective writing – approaching the writing process systematically: The 3X3 writing process for business communication: Pre writing – Writing – Revising – Specific writing features – coherence – electronic writing process.

Unit 3: (7 hrs)

Business letters and reports: Introduction to business letters – writing routine and persuasive letters – positive and negative messages- writing memos – what is a report purpose, kinds and objectives of report writing. Presentation skills: What is a presentation – elements of presentation – designing a presentation. Advanced visual support for business presentation types of visual aid **Unit 4: (7 hrs)**

Employment communication: Introduction – writing CVs – Group discussions – interview skills Impact of Technological Advancement on Business Communication Communication networks – Intranet – Internet – e mails – SMS – teleconferencing – video conferencing .

Unit 5: (7 hrs)

Group communication: Meetings – Planning meetings – objectives – participants – timing – venue of meetings – leading meetings. Media management – the press release press conference – media interviews Seminars – workshop – conferences. Business etiquettes.

Suggested Readings:

1. Bovee & Thill – Business Communication Essentials A Skill – Based Approach to Vital Business English. Pearson.
2. Bisen & Priya – Business Communication (New Age International Publication)
3. Kalkar, Suryavanshi, Sengupta-Business Communication(Orient Blackswan) 4. Business Communication : Skill, Concepts And Applications – P D Chaturvedi, Mukesh Chaturvedi Pearson Education.
5. Asha Kaul, Business Communication, Prentice Hall of India.

EMPLOYABLE SKILLS

| Skill | Measurement tool |
|---|--|
| Understanding of fundamentals of business communication strategies. | Presentations, Quiz |
| Apply suitable modes of expression. | Role Play followed by discussion |
| Compose accurate business documents | Group assignment/ Workshop/ Exercise. |
| Develop skills to use latest technology used for communication | Group project, presentations |
| Develop group communication skills. | Role play, Debate, Case study analysis |

Course Outcomes

Upon successful completion of this course, the student should be able to:

1. Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.
2. Identify ethical, legal, cultural, and global issues affecting business communication.
3. Utilize analytical and problem solving skills appropriate to business communication.
4. Participate in team activities that lead to the development of collaborative work skills.
5. Select appropriate organizational formats and channels used in developing and presenting business messages.
6. Compose and revise accurate business documents using computer technology.
7. Communicate via electronic mail, Internet, and other technologies.
8. Deliver an effective oral business presentation.

Computer Applications and Management Information System

RMB108

COURSE OBJECTIVES:

- The course aims to provide knowledge about basic components of a computer and their significance.
- To provide hands on learning of applications of MS Office and Internet in businesses.
- To provide an orientation about the increasing role of management information system in managerial decision making to gain Competitive edge in all aspects of Business.
- To understand various MIS operating in functional areas of an organization.
- To create awareness in upcoming managers, of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision making.

Course Credits 3 Hours 36 Hrs

Unit I (05 hours) Conceptual Framework

Hardware: (a) Input devices - keyboard, printing devices, voice speech devices, scanner, MICR, OMR, Bar code reader, digital camera etc. (b) Output devices - Visual Display Unit, printers, plotters (c) Storage

Devices – Magnetic storage devices, Optical storage devices, Flash Memory.

Software:Types of software with examples; Introduction to languages, compiler, interpreter and

Assembler, Operating System Functions, Types and Classification, Elements of GUI based operating system.

Unit II (06 hours)Communication Technology

Network and Internet: Types of computer networks (LAN, WAN and MAN), Network topologies, EDI.

Internet: Netiquettes, Architecture & Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, Gopher, IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail.

Unit III (12 hours)Office tools for Business

Use of MS-Office:Word: Paragraph formatting, Page formatting, Header and footer, Bullets and numbering, Finding and replacing text, Mail merge, Macros.

Cell referencing, Ranges.

Excel: Formulae, Functions, Auto sum, Copying formula, Formatting data, creating charts, creating

Database, sorting data, filtering.

Power Point: Formatting text on slides, Inserting charts, adding tables, Clipping, Slide animation, Slide shows.

Unit IV (7 hours) Information System Classification

Concept of Data and Information, Operations Support System (OSS), Management Support System (MSS), Transaction Processing System (TPS), Process Control System (PCS), Enterprise Collaboration System (ECS), Management Information System (MIS), Decision Support System (DSS), Executive Information System (EIS).

Artificial Intelligence (AI), Applications of Artificial Intelligence: Neural Networks, Fuzzy Logical Control System, Virtual Reality, Expert System (ES).

Unit V (06 hours) Information Systems for Business

Applications: Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Security and Ethical Challenges Of IT, Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues, Cyber Laws, IT Act 2000.

Suggested Readings

1. Shrivastava-Fundamental of Computer & Information Systems (Wiley Dreamtech)
2. Leon A and Leon M - Introduction to Computers (Vikas, 1st Edition).
3. ITL ESL – Introduction to Information Technology (Pearson, 2nd Edition).
- 4 ITL ESL – Introduction to Computer science (Pearson, 2nd Edition).
5. Introduction to Computers, Norton P. (TATA McGraw Hill)
6. Leon - Fundamentals of Information Technology, (Vikas)

Expected Course Outcomes:

- Have an in-depth knowledge of IT enabled competitive advantage and organizational change.
- Grasp essential of major components of Information technology and various information systems.
- Become familiar in the use of tools such as Excel, Word and power point for modelling and solving Business problems.
- Become familiar about the design and implementation issues related to the development of information systems for Business applications.

Code

RMB201

Business Environment

Course Objectives:

- The basic objective of the course is to develop understanding and provide knowledge about business environment to the management students.
- To promote basic understanding on the concepts of Business Environment and to enable them to realize the impact of environment on Business.
- To provide knowledge about the Indian and international business environment.

Unit 1

Introduction- (8Hrs)

Business – Meaning, Definition, Nature & Scope, Types of Business Organizations , Business Environment- Meaning, Characteristics, Scope and Significance, Components of Business Environment.

Introduction to Micro-Environment – Internal Environment: Value system, Mission, Objectives, Organizational Structure, Organizational Resources, Company Image, Brand Equity External Environment: Firm, customers, suppliers, distributors, Competitors, Society, Introduction to Macro Components – Demographic, Natural, Political, Social, Cultural Economic, Technological, International and Legal) Difference between macro and micro environment.

Unit 2

Economic, Political and Legal environment (8Hrs)

Political Institutions- Legislature, Executive, Judiciary, Role of government in Business, Legal framework in India. Economic environment- economic system and economic policies. Concept of Capitalism, Socialism and Mixed Economy ,Impact of business on Private sector, Public sector and Joint sector , MRTP and fema, Monetary and fiscal policies

Unit 3 (8Hrs)

- A) Social and Cultural Environment – Nature, Impact of foreign culture on Business, Traditional Values and its Impact, Social Audit – Meaning and Importance of Corporate Governance and Social Responsibility of Business Business ethics
- B) Competitive Environment – Meaning, Michael Porter’s Five Forces Analysis, Competitive Strategies

Unit 4 (4 Hrs)

Natural and Technological Environment: Innovation, technological leadership and followership, sources of technological dynamics, impact of technology on globalization, transfer of technology, time lags in technology introduction, Status of technology in India; Management of technology; Features and Impact of technology.

Unit 5

International Environment – (12Hrs)

International forces in Business Environment, SEZ, EPZ, GATT/ WTO, Globalization – Meaning , Nature and stages of Globalization, features of Globalization, Foreign Market entry strategies, LPG model. MNCs – Definition, meaning, merits, demerits, MNCs in India

Employable Skills:

| Employable Skill | Measurement tool |
|------------------------------|-------------------------------|
| Entrepreneurial skill | Workshop on business planning |
| Managerial competitive skill | Assignment on swot analysis |
| Business acumen | Case studies |

Course Outcome : Upon successful completion of this course , the student will be able to:

1. Demonstrate an understanding of the forces that shape the business and economic structure
2. Explain why business ethics is an integral part of every business organization.
3. Understand the business and related factors; and business’s dependency on the interactions with different environmental variables.
4. Develop analytical skills and widen the understanding of macro environmental issues by applying the knowledge of macroeconomic policies and their impact on business organization and strategy.

Journals / Magazines, business world , business today

Books Recommended:

1. Business Environment: Test and Cases , PAUL, Mc Graw Hill Education , 3rd Ed.
2. Business Environment ---Francis Cherunilam, Himalaya Publishing House
3. V. Neelamegam – Business Environment (Vrinda Publications , 2nd Edition)
4. Shaikh & Saleem - Business Environment (Pearson, 2nd Edition)

Code

5. International Business Environment—Ian Brooks, Jamie Weatherstom and Graham Wilkinson

HUMAN RESOURCE MANAGEMENT**RMB202**

Course Objectives: In this course the students will learn the basic concepts and frameworks of Human Resource Management (HRM) and understand the role that HRM has to play in effective business administration. It will provide an insight as to how to use Human Resource as a tool to implement strategies.

Course Credit: 36 Hrs

UNIT I: (6 Hours)

Essentials of HRM: Nature of HRM, Scope, functions and importance of HRM, HRM vs.HRD, SHRM: Introduction, characteristics and scope of SHRM, SHRM vs. Conventional HRM, Barriers to strategic HRM, Linking HR strategy with business strategy, HRM linkage with TQM & productivity.

UNIT II: (8 Hours)

Human Resource Planning and Employee Hiring : Nature of job Analysis, job design, Human Resource Planning, Demand forecasting for manpower planning, HR supply forecasting, factors influencing HRP, Employee hiring- Nature of Recruitment, Sources of recruitment, Employee selection, process of employee selection, recent trends in recruitment.

UNIT III: (8 Hours)

Employee Training & Development: Nature and importance of Training, methods and types of training, career planning, promotion, transfer, demotion and separation, Performance Appraisal: Meaning and types of appraisal, Job Evaluation: Meaning and methods of job evaluation.

UNIT IV: (8 Hours)

Compensation Management and Employee Relations: Introduction to compensation management, Components of employee and executive compensation, Factors affecting employee compensation, Employee incentive schemes, and recent trends in compensations management. Meaning and nature of employee relation and industrial relations.

UNIT V: (6 Hours)

Employee Safety/ Health and International Human Resource Management: Basics of ethics and fair treatment at work, measures and policies for employee safety at work, basic principles governing International Human Resource Management and the role of culture.

| Employable Skills | Measuring Tools |
|---|---|
| Ability to identify and apply the knowledge of subject practically in real corporate situations | Exercise Workshop Quiz Classroom Discussions |

Course Outcomes: After the successful completion of the course the students will be in a position to address the challenges of organizational management through and with human resources. In addition it will help in:

1. synthesize the role of human resources management as it supports the success of the organization including the effective development of human capital as an agent for organizational change.
2. demonstrate knowledge of laws that impact behaviour in relationships between employers and employees that ultimately impact the goals and strategies of the organization.
3. understand the role of employee benefits and compensation as a critical component of employee performance, productivity and organizational effectiveness.
4. show evidence of the ability to analyze, manage and problem solve to deal with the challenges and complexities of the practice of collective bargaining.
5. demonstrate knowledge of practical application of training and employee development as it impacts organizational strategy and competitive advantage.

References: Books:

1. V.S.P.Rao, Human Resource Management (Text and Cases) Himalaya Publications, Thirtieth Edition.
2. Durai Praveen, Human Resource Management Pearson Publication, 2nd Edition.
3. Gary Dessler and BijuVarkkey Human Resource Management, Person Publication, 2013, 14th Edition.
4. Seema Sanghi, Human Resource Management, Vikas Publications, 2014, 5th Edition.
5. K. Aswathappa, Human Resource Management, McGraw Hill Education, 2013, 7th Edition.

BUSINESS RESEARCH METHODS

RMB203

Course Objectives:

- To acquire skills to locate problem areas in organisational settings, and plan, organise, design, and conduct research to help solve the identified problems; □□ To facilitate students in making their own research study.

Code

- To make reader Understand and practice a good standard questionnaire.
- To learn use of statistical analysis in packages available in the market.
- To familiarize research reports; and develop skills and knowledge to prepare research reported in academic and business.

Unit 1

Research: – Definition, Meaning, Importance types and Qualities of Research; Research applications in functional areas of Business, Emerging trends in Business research. Research & the Scientific Method: Characteristics of scientific method. Steps in Research Process
Concept of Scientific Enquiry: – Formulation of Research Problem – Management Question – research Question – Investigation Question
Research Proposal – Elements of a Research Proposal, Drafting a Research Proposal, evaluating a research proposal.

Unit 2

Research design: Concept, Features of a good research design, Use of a good research design; Qualitative and Quantitative research approaches, Comparison – Pros and Cons of both approaches.
Exploratory Research Design: Concept, Types: Qualitative techniques – Projective Techniques, Depth Interview, Experience Survey, Focus Groups, Observation.
Descriptive Research Designs: Concept, types and uses. Concept of Cross-sectional and Longitudinal Research
Experimental Design: Concept of Cause, Causal relationships, Concept of Independent & Dependent variables, concomitant variable, extraneous variable, Treatment, Control group.

Unit 3

Scaling & measurement techniques: Concept of Measurement: Need of Measurement; Problems in measurement in management research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.
Attitude Scaling Techniques: Concept of Scale – Rating Scales viz. Likert Scales, Semantic Differential Scales, Constant Sum Scales, Graphic Rating Scales – Ranking Scales – Paired comparison & Forced Ranking – Concept and Application.

Unit 4

Sampling: Basic Concepts: Defining the Universe, Concepts of Statistical Population, Sample, Characteristics of a good sample. Sampling Frame (practical approach for determining the

sample frame expected), Sampling errors, Non Sampling errors, Methods to reduce the errors, Sample Size constraints, Non Response.

Probability Sample: Simple Random Sample, Systematic Sample, Stratified Random Sample, Area Sampling & Cluster Sampling.

Non Probability Sample: Judgment Sampling, Convenience Sampling, Purposive Sampling, Quota Sampling & Snowballing Sampling methods. Determining size of the sample – Practical considerations in sampling and sample size, sample size determination.

Unit 5

Data Analysis: Editing, Coding, Tabular representation of data, frequency tables, Construction of frequency distributions, Graphical Representation of Data: Appropriate Usage of Bar charts, Pie charts, Histogram, Leaf and stem, Candle stick, Box plots.

Bi-variate Analysis: Linear Regression Analysis: Meaning and two lines of regression; relationship between correlation and regression co-efficient, Cross tabulations, Chi-square test;

Hypothesis: Qualities of a good Hypothesis –Framing Null Hypothesis & Alternative Hypothesis. Concept of Hypothesis Testing – Logic & Importance.

Test of Significance: Small sample tests: t (Mean, proportion) and F tests, Z test, on-parametric tests: Binomial test of proportion, Randomness test; Analysis of Variance: One way and two-way Classifications, Interpretation of the given data and scenario analysis is expected for appropriate managerial decision inferences to be drawn.

TEXT BOOKS:

- 1) Business Research Methods, Naval Bajpai, Pearson Education 2) Research Methodology, C R Kothari, New Age International.
- 3) Research Methodology, Deepak Chawla, NeenaSondhi, Vikas Publication
- 4) Business Research Methods by Donald Cooper & Pamela Schindler, TMGH, 9th Edition.
- 5) Business Research Methods by Alan Bryman & Emma Bell, Oxford University Press, 2ndEdition.

| Employable Skills | Measuring Tools |
|---|---|
| Ability to identify and apply the knowledge of subject practically in real life situations | Exercise Workshop Quiz Classroom Discussions |

REFERENCE BOOKS:

- 1) Methodology of Research in Social Sciences, Krishnaswamy O R, Himalaya Publishers.
- 2) Marketing Research, Paneerselvam, PHI, 2004
- 3) Research Methods for Business and Social Science, John Adams, Hafiz T A Khan, Robert Raeside, Sage Pubs, Second Edition.
- 4) Management Research Methods, Phyllis Tharenou, Ross Donohue, Brian Cooper, Monash University, Victoria, November 2007.
- 5) Research Methodology: Cases and concepts – Deepak Chawla & Neena Sondhi, Vikas, 2011.

Expected Course Outcome:

- Reader can clearly differentiate Research and management problem.
- Students can have confidence in making their own research proposal.
- Students would have a strong knowledge in preparing well structured questionnaire in all respects.
- Students would have not only theoretical/conceptual but also the knowledge in working with statistical packages.
- Reader would get the skill to convert the research into presentable article.

FINANCIAL MANAGEMENT

RMB204

Course Objective

- To gain an understanding on the use of basic business financial management concepts and tools of analysis such as valuation.
- To gain an insight into various types of financing available to a firm.
- To have an understanding of various factors considered in designing the capital structure.
- To acquaint the students about key areas related to investment and Working Capital Management.
- To gain an insight into various techniques of dividend and retention ratio.

Unit I (6 Hrs)

Concept of Finance : Finance & its scope Financial Decisions, Sources of Finance Time

Value of Money ,Profit maximization vs. Wealth maximization, Functions of Finance Manager in Modern Age, Indian Financial System : Primary and Secondary Market, Concept of Risk and Return , CAPM Model.

Unit II (10 Hrs)

Investment Decision : Concept of Opportunity Cost, Cost of Debenture, Preference and Equity capital, Composite Cost of Capital ,Cash Flows as Profit and components of Cash Flows , Capital Budgeting Decisions, Calculation of NPV and IRR, Excel Application in Analyzing Projects.

Unit III(10 Hrs)

Financial Decision :Capital Structure, Relevance and Irrelevancy theory ,Leverage analysis – financial, operating and combined leverage along with its implications, EBIT EPS Analysis, Point of Indifference .

Unit IV (10 Hrs)

Dividend Relevance: Factors affecting Dividend Policy, Forms of Dividends , Types of Dividend Policies , Dividend Models :Walter and Gordon Model, Miller- Modigliani(MM) Hypothesis .

Unit V (4 Hrs)

Working Capital Management: Concepts of Working Capital and its types, Determinants of Working Capital, Adequate Working Capital, Working Capital Financing

Text Books :

- 1) Khan and Jain - Financial Management (Tata McGraw Hill, 7th Ed.)
- 2) Pandey I M - Financial Management (Vikas, 11th Ed.)
- 3) William HakkaBettner Carcello- Financial and Management Accounting(TMh-16th Ed.)
- 4)Sheeba kapil-Fundamental of financial management (Wiley,2015)

- 5) Prasanna Chandra - Fundamentals ofFinancial Management (TMH, 9th Ed.)
- 6) Bark Demazo Thampy- Financial Management (Pearson,2nd Ed.)
- 7) R P Rustagi - Financial Management(Galgotia, 2000, 2nd revised ed.)

Reference Books :

- 1.) Ravi.M Kishore – Financial Management (Taxman ,7th Ed)
- 2.) Fundamentals to Financial Mangement , Brigham & Houston, 14/e ,Cengage Learning
- 3.) Van Horne - Financial Management and Policy (Prentice hall, 2003, 12th Ed.)
- 4.) Horne Wachowicz- Fundamentals of Financial Management (Pearson,13th Ed)
- 5.) Lawrence J.Gitman – Principles of Managerial Finance (Pearson Education, 2004)

Course Outcome : After reading this course students will be able to reach the following outcomes:

1. Apply techniques to project financial statements for forecasting long-term financial needs.
2. Explain the role of short-term financial management, and the key strategies and techniques used to manage cash, marketable securities, accounts receivable and inventory.
3. Apply future value and present value concepts to single sums, mixed streams, and annuities.
4. Identify relevant cash flows for capital budgeting projects and apply various methods to analyze projects.
5. Apply techniques for estimating the cost of each component of the cost of capital and understand how to assemble this information into a cost of capital and Capital structure.
6. Explain the concept of leverage and the benefits and costs associated with debt financing.
7. Apply techniques of dividend and retention ratio .

Employable skills

| | |
|---|--|
| Understanding of financial theory to enable students to enhance corporate financing decisions | Case Study |
| Understanding major techniques used in long term corporate investment management | Excel Analysis |
| Basic insight about schemes , interest rates of various sources of finance | www.bankrate.com + Newspaper |

Management Accounting And Control

RMB205

Course Objectives:

- To have a basic understanding of various types of costs and their relevance in decision making
- To have an understanding of Marginal Costing Technique and its application in decision making
- To gain an insight into the concept of breakeven point and its applications
- To understand the concept of Variance and calculate various types of variances
- To apply the technique of budgeting in preparation of various types of budgets

UNIT I

Introduction : Nature and scope of cost Accounting and Management Accounting , Cost Accounting VS Management Accounting vs Financial Accounting and their interrelationships , Advantages and limitations of cost accounting , types of cost , Elements

of cost - Materials, Labour and overheads, Role of Cost in decision making preparation of cost sheet, Reconciliation of Cost and Financial Accounting. (8Hrs)

UNIT II

Marginal Costing : Concept of Marginal cost ,Product and period costs, Marginal costing, Absorption Costing, Marginal Costing versus Absorption Costing, Income statement under Absorption and Marginal Costing , Applications of Marginal Costing, (4Hrs)

Cost-Volume-Profit Analysis : Concept of contribution and P/V Ratio, CVP Analysis, Break even analysis, Methods of Break Even Analysis, Graphic presentation of Break Even Analysis , Margin of safety, Multi product situations , Sales mix and Break Even Point (4Hrs)

UNIT III

Budgetary Control : Concept of Budget, Budgeting and Budgetary Control, Objectives , advantages and limitations of budgetary control, essentials of effective budgeting , Types of Budget, Static and Flexible Budgeting, Preparation of Cash Budget, Sales Budget, Production Budget, Materials Budget, Capital Expenditure Budget and Master Budget, Zero Base Budgeting (10Hrs)

UNIT IV

Standard Costing and Variance Analysis: Concept of standard costs, establishing various cost standards, Concept of standard costing , Advantages and limitations of standard costing , Standard costing vs budgetary control , Variance Analysis : calculation of Material Variance, Labour Variance, and Overhead Variance, and its applications and implications. (10Hrs)

UNIT V

Neo Concepts : Responsibility Accounting : Concept and various approaches to Responsibility Accounting, Types of responsibility centres , Measuring divisional performance , Transfer Pricing : concept & importance , Method of transfer pricing , Activity Based Costing, Target Costing & Life Cycle Costing (4Hrs)

| | |
|---|---------------------|
| Employable Skills | Measuring tool |
| Ability to Prepare budget | Exercise + Workshop |
| Ability to analyse cost variance | Exercise + Workshop |
| Ability to apply CVP analysis for different decisions | Exercise + Workshop |

Expected Course outcome:

- Demonstrate an understanding of the context within which Management Accounting is used for planning and control purposes.
- Appreciate how budgets and variances are used to control and measure performance.

- Understand the use of various costing systems and techniques □□ Measure and analyse performance using appropriate variances.
- Prepare cost estimates using appropriate assumptions.
- Appreciate the impact on management information of using different costing systems and techniques.

Text Books

- Management Accounting: Text Problems and Cases, KHAN and Jain, McGraw-Hill Education 6th Edition
- Modern Cost And Management Accounting, HANIF, McGraw-Hill Education ,1st edition
- Cost and Management Accounting, M.N.Arora, Himalaya publishing house 3rd edition
- Management Accounting, Pandey IM , Vikas Publication, 3rd edition □□ Introduction to Management Accounting, Horngren et al, Prentice Hall □□ Managerial Accounting, Paresh Shah, Oxford , 2nd ed.

Production Operations and Supply Chain Management

RMB206

COURSE OBJECTIVES:

- To understand the role of Operations in overall Business Strategy of the firm.
- To understand the application of operations management policies and techniques to the service sector as well as manufacturing firms.
- To identify and evaluate the key factors and their interdependence of these factors in the design of effective operating systems.
- To familiarize the students with the techniques for effective utilization of operational resources and managing the processes to produce good quality products and services at competitive prices.

Unit –I (4 sessions) Production Concept

Difference between production and Operation Management, Productivity, Productivity measurement, Factors affecting Productivity.

Production Technology – Types of Manufacturing processes

Unit –II (6 sessions) Operation Concept

Difference between product and service, Product and service design, Characteristics of service, Classification of service, factors affecting service operations, Service capacity planning, SERVQUAL model of measuring service quality.

Unit-III (10 sessions) Material and Inventory Management

Types of production planning, process of production planning and control – Routing, Scheduling, Loading, Types of inventories, Inventory control techniques- VED, EOQ, Just-in-time (JIT).

Factors affecting Plant Location, Types of Plant layout.

Unit-IV (10 sessions)Supply Chain Management

Conceptual model of SCM, Supply chain drivers, demand forecasting in Supply Chain – Simple moving average, weighted moving average, exponential smoothing method, Supply Chain efficiency, Core and reverse Supply Chain, International Supply Chain, Aggregate planning, inbound and outbound SCM, bullwhip effect in SCM. Latest trend in Production and operation – Lean manufacturing, Agile manufacturing.

Unit-V 6 sessions)Productivity and Quality

TQM, Deming's 14 principles, PDCA cycle - KAIZEN, Quality circles, 7QC tools, ISO 9000-2000 clauses, SixSigma, Total Productive Maintenance(TPM).

SUGGESTED READING:

1. MAHADEVAN: Operation management: Theory and Practice (PEARSON) (with MLSA)
2. Chary - Production and Operations Management (Tata McGraw-Hill, 1997, 9th Edition)
3. Bisen& Singh-Operation & Logistics Management (Excel Books)
4. R.V.Badi& N.V. Badi - Production & Operation Management (Vrinda Publications 3rd Edition)
5. Raghuram G. (I.I.M.A.) - Logistics and Supply Chain Management (Macmillan, 1st Ed.)
6. Krishnan Dr. Gopal - Material Management, (Pearson,New Delhi, 5th Ed.)
7. Adam Jr Everetl E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)

Expected Course Outcomes:

- Students will improve upon their conceptual skills, understanding and application of tools and techniques of operations management in business practices in real time.
- Students will develop understanding and application of factors in the design of effective operating systems.
- Students will understand the concept of TQM perspectives.
- Students will understand the concepts of Material Management and Supply Chain Management.

Quantitative Techniques for Managers

RMB207

COURSE OBJECTIVES

- Understand the importance of the use of OR application in decision Making environment
- To formulate LPP and Obtain Graphical Solutions & Acquire General idea of the Simplex method.
- To understand and solve transportation & assignment models.
- To know optimal sequence model and understand concepts of queuing theory.
- To identify right time for replacement of equipment and understand project management techniques

Unit I (6 Sessions)

Operations Research & Decision Making Environments Operations Research: Uses, Scope and Applications of Operation Research in managerial decision-making
.Decision-making environments:- Decision-making under certainty, uncertainty and risk situations; Decision tree approach and its applications.

Unit II (8 Sessions)

Linear Programming Problem & Transportation Problem *Linear programming:* Mathematical formulations of LP Models for product-mix problems; graphical and simplex method of solving LP problems; duality.

Transportation problem: Various methods of finding Initial basic feasible solution-North West Corner Method, Least Cost Method & VAM Method and optimal solution-Stepping Stone & MODI Method, Maximization Transportation Problem

Unit III (10 Sessions)

Assignment model & Game Theory *Assignment model:* Hungarian Algorithm and its applications, Maximization Assignment Problem.

Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point; Odds Method; Dominance Method and Graphical Method for solving Mixed Strategy Game.

Unit IV (10 Sessions)

Sequencing & Queuing Theory Sequencing Problem: Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, Two jobs and m - Machines Problems.
Queuing Theory: Characteristics of M/M/1 Queue model; Application of Poisson and Exponential distribution in estimating arrival rate and service rate; Applications of Queue model for better service to the customers.

Unit V (6 Sessions)

Replacement Problem & Project Management Replacement Problem: Replacement of assets that deteriorate with time, replacement of assets which fail suddenly. *Project Management*: Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations.

TEXT BOOK

1. R. Panneerselvam - Operations Research (PHI, 2nd Edition)
2. Sharma J K - Operations Research (Pearson, 3rd Edition)

REFERENCE BOOKS:

- 1) Apte-Operation Research and Quantitative Techniques (Excel Books)
- 2) S Kalawathy-Operation Research (Vikas IVth Edition)
- 3) Natarajan- Operation Research(Pearson)
- 4) Singh & Kumar—Operation Research(UDH Publisher edition 2013)
- 5) Taha Hamdy - Operations Research - An Introduction (Prentice-Hall, 9th edition) 6) Vohra - Quantitative Techniques in Management (Tata McGraw-Hill, 2nd)
- 7) Kothari - Quantitative Techniques (Vikas 1996, 3rd Edition).

Course Outcomes

- Be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- To formulate linear programming problem and to find optimal solution by graphical simplex method
- Be able to build and solve Transportation Models and Assignment Models also to solve game theory problems by understanding pure and mix strategies.
- To assign optimal sequence of difference jobs on different machines and develop understanding of queuing theory concepts.
- To implement replacement of equipments at right time and able to implement project management concepts like CPM, PERT to reduce cost and time.

| Employable Skills | Measuring Tools |
|--|---|
| Ability to identify and apply the knowledge of subject practically in real life situations | Exercise Workshop Quiz Classroom Discussions |

Legal Aspects of Business

RMB208

Course Objectives

1. To provide basic understanding of law of contract, Law of agency, Bailment & Pledge
2. To provide basic requirements of Negotiable Instruments Act, Law of Insurance and Law of Partnership for the purpose of conducting business
3. To impart basic provisions of Companies Act concerning incorporation and regulation of business organizations
4. To create an awareness about important legislations namely Sale of Goods Act, Consumer Protection Act, Factories Act having impact on business.
5. To appraise the students on the leading practical application oriented case studies – relevant and updated and analyzing case laws in arriving at conclusions facilitating business decisions.

Course Outcomes

Upon successfully completing the course, candidates should be able to:

1. Acquire a sound understanding of the legal aspects of the law affecting businesses
2. Explain the principles of Indian Business Law and Company Law
3. Develop reasoning abilities by applying the principles of law in the business environment
4. Appraise the legal environment of the organization and develop suitable strategies.
5. Analyse a given business context using basic understanding of the applicable Acts and develop a suitable operational framework.

Course Credits **3**
Contact Hours **36 Hrs**

Unit- 1 (8 hrs)

Indian Contract Act 1872: Law of Contract: Definition, essentials and types of contracts, offer – definition and essentials, acceptance – definition and essentials, consideration – definition and essentials, exceptions to the rule, no consideration, no contract, doctrine of privity of contract, capacity of parties, free consent, quasi contract, legality of object, performance of contract, termination of contract, remedies for breach of contract. Law of Agency: Essentials, kinds of agents, rights and duties of agent and principal, creation of agency, termination of agency

Unit 2 (8 hrs)

Negotiable Instruments Act 1881, Nature and characteristics of Negotiable instruments, kinds of negotiable instruments – promissory notes, bills of exchange and cheques. Parties to negotiable instruments, Negotiation, presentment, discharge and dishonour of negotiable instruments

Law of partnership: Definition, essentials of partnership, formation of partnerships, kinds of partners, authorities, rights and liabilities of partners, registration of partnership, dissolution of partnership firm.

Unit 3 (7hrs)

Companies Act 2013: definition, characteristics and kinds of companies, steps in formation of company. Memorandum of association, articles of association, prospectus. Directors: appointment, power, duties and liabilities, meeting and resolutions: types of meetings. Auditor: appointment, rights and liabilities. modes of winding up of a company.

Unit 4 (6 hrs)

Sale of Goods Act 1930: Essentials, sale v/s agreement to sell. Condition v/s warranties, rights of unpaid seller.

Consumer Protection Act 1986: Objectives, definition, consumer protection council and state consumer protection council.

Unit 5 (7 hrs)

The Information Technology Act, 2000

Definition, Digital Signature, Electronic Governance, Attribution, Acknowledgment and Dispatch of

Electronic Records, Sense Electronic Records and Sense Digital Signatures, Regulation of Certifying

Authorities, Digital Signature Certificates, Duties of Subscribers, Penalties and Offences.

The Right to Information Act, 2005

Right to know, Salient features of the Act, obligation of public Authority, Designation of Public Information officer, Request for obtaining information, Duties of a PIO, Exemption from disclosure of information, Partial disclosure of information, Information commissions, powers of Information Commissions, Appellate Authorities, Penalties, Jurisdiction of courts.

Suggested Readings

1. Kuchhal M.C. - Business Law (Vikas Publication)
2. Gulshan S.S. - Business Law Including Company Law (Excel Books)
3. N D Kapoor – Elements of Mercantile Law – Sultan Chand-2014
4. Dr Avatar Singh- Principles of Mercantile Law, Eastern Book Company 2014
5. Nandan Kamath- Law relating to Computer, Internet and E-Commerce (A Guide to cyber Laws), Universal Law Publishing Co. Ltd. New Delhi, 2012.

6. Relevant Acts

EMPLOYABLE SKILLS

| Skill | Measurement tool |
|---|---------------------------------------|
| Understanding of fundamentals of the legal aspects of the law affecting businesses. | Presentations, Quiz |
| Understanding of principles of Indian Business Law and Company Law. | Group assignment, Case study analysis |
| Develop reasoning abilities for applying law principles. | Group assignment, Case study analysis |
| Develop a suitable legal operational framework. | Quiz, Debate, Case study analysis |