Nirma University

Institute of Technology

School of Technology

Department of Information Technology

B Tech in Computer Science and Engineering

MA101 Calculus [3 1 0 4]

Learning outcomes:

On completion of the course student

CLO1: will be able to find higher ordered derivatives and hence represent function in power series of (x-a)

CLO2: will apply the knowledge of function of several variables , its derivatives in engineering problems

CLO3: will apply the knowledge of special functions(Gamma, Beta, Elliptic, Error) and its application in engineering problems

CLO4: will apply the knowledge of multiple integration and its application in engineeringproblems

Syllabus:

Unit I: Differential Calculus Review of limits, continuity and differentiability, Successive differentiation, Leibnitz theorem (without proof), Indeterminate forms, Taylor's and Maclaurin's expansion of single variable, Partial Differentiation, Total derivative, Chain Rule, Implicit function, Euler's theorem and its applications, Taylor's and Maclaurin's expansion of function of several variables, Maxima and Minima of function of several variables, Lagrange's method of undetermined multipliers, Jacobian.

Unit II: Integral Calculus Review of proper and improper integrals, Reduction formulae, Beta-Gamma functions, Error function, Tracing of curves, Rectification, Quadrature, Volume of solid of revolution, Area of surface of revolution, Double integral and evaluation, Change of order of integration, Change ofvariable, Triple integral and evaluation, Area using double integration, Volume as double and triple integration, Volume of solid by double integration.

References:

1. Thomas' Calculus(Latest edition), Pearson publication.
2. G B Thomas and R. L. Finney, Calculus and Analytic Geometry (Latest edition), Narosa Publication, Delhi.
3. James Stewart, Calculus (Latest edition), Thomson Learning.
4. B. S. Grewal, Higher Engineering Mathematics, (Latest edition) Khanna publication, Delhi.
5. Dr. K. R. Kachot, Higher Engineering Mathematics Vol I (Latest edition), Mahajan Publication, Ahmedabad.
6. Sharma and Yeolekar, Engineering Mathematics Vol. I. (Latest edition), PHI, New Delhi.

HM101 Communication Skills [2 0 2 3]

Learning Outcome:

- Students will be able to learn and understand the four major skills of Communication i.e. LSRW (Listening, Speaking, Reading and Writing).
- Students will be able to remove stage fear.
- Students will be enriched with good vocabulary and diction.
- Students' comprehension skill will be enhanced by this course.

Syllabus:

Meaning and process of communication. Non-verbal communication. Barriers to communication.

Oral Communication: Effective presentation skills, group discussion dynamics, personal interview techniques, seminar presentation.

Listening skills: Types of listening, Barriers to effective listening, tips to improve listening skills

Reading skills for better communication: Skimming & Scanning skills, reading comprehension of technical material.

Written communication: Paragraph development, business letters, curriculum vitae and job application, memorandum, technical reports and vocabulary building. Tenses, prepositions, transformation concord, affixes, one-word substitutes, idioms.

Email-etiquettes

Laboratory Work:

Laboratory work shall reinforce the theory. There will be cycles of Presentations and Group Discussion. Every presentation will follow an interactive open house session. In all, every student will give two presentations and will participate in minimum of 10 group discussions in entire semester.

References:

1. Meenakshi Raman & Sangita Sharma, Technical Communication; Principles and Practice, Oxford University Press.
2. M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Education
3. Andrea J. Rutherford, Basic Communication Skills for Technology, Person Education Asia
4. Raymond Murphy, Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers, Cambridge University Press

L	T	P	C
3	1	2	5

Course Code	CE103
Course Title	Computer Programming

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. recognize the importance and apply C language constructs in program development,
2. analyse the problem and select the most appropriate method to solve it,
3. evaluate the correctness of the developed solution.

Syllabus:	Teaching hours:
Unit I Introduction to Computers: Introduction to Computers and the Internet in Industry and Research, The Internet and World Wide Web, web Resources, Hardware and Software, Computer Organization, Programming Languages, Introduction to the C Programming Language, Typical C Program Development Environment and steps. Test-Driving a C Application in Linux, Running a C program Using GNU for debugging.	5
Unit II Introduction to Programming: Memory Concepts, datatypes, operators and expressions, Decision Making, Bitwise Operators, Flowchart, Algorithms, Pseudocode, Test-cases, Repetition Statement, Counter-Controlled Repetition, Sentinel-Controlled Repetition, Nested Control Statements. Introduction some Simple C Program, I/O handling. Programming with C: keywords, syntax and library functions, datatypes, declarative, imperative and decision statements. Control structures.	9
Unit III Functions: Math Library Functions, User defined functions, Function Call Stack and Stack frames, Passing Arguments by Value and By Reference, Scope Rules, Recursion, Recursion vs. Iteration. Arrays: Defining Arrays, Sorting Arrays, Searching Arrays, Multidimensional Arrays, Variable-Length Arrays, Passing Arrays to Functions.	10
Unit IV Pointers: Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Pointers to Functions. Introduction to dynamic memory allocation. Characters and Strings: Fundamentals of Strings and Characters, Character-Handling Library Functions, String-Conversion Functions, Standard Input/Output Library Functions for string, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library.	11
Unit V	10

Structures: Structure Definitions, Defining Variables of Structure Types, Operations That Can Be Performed on Structures, Initializing Structures, Accessing Structure Members, Using Structures with Functions
File Processing: Files and Streams, Creating a File, Reading and writing Data from a File.

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Above concepts are to be implemented in C-language atleast with emphases on logic development and debugging, 10 experiments are to be carried out.

Tutorial Work:
The tutorial work will be based on the topics covered in the syllabus. Minimum 10 tutorials should be carried out.

Suggested Readings^:

1. Deitel and Deitel , C How to Program, Pearson
2. E. Balagurusamy, 'Programming in ANSI C", McGraw Hill
3. Yashwant Kanitker, Let Us C, BPB Publications
4. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India
5. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
6. David Gries, The Science of Programming, Springer
7. Dromey R.G., How to solve it by computers, Prentice Hall of India
8. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
9. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
10. Sedgewick R., Algorithms in C, Addison Wesley
11. Schaum Ourline Series, Programming in C, , McGraw-Hill
12. E. Balagurusamy, Pointer in C, McGraw Hill

L= Lecture, T= Tutorial, P= Practical, C= Credit
^This is not an exhaustive list

W.e.f. academic year 2017 – 2018 and onwards

EE101 Elements of Electrical Engineering

Learning Outcome:

The course is designed to introduce to a novice about the fundamentals of the electrical engineering. At the end of the course, it is expected that student will be able to express the behavior of basic electrical components like resistor, inductor and capacitor under DC and AC application. The students are exposed to single-phase and poly-phase systems and circuits and shall be able to comprehend the same. The student will be able to appreciate safety requirements and usage of safety devices. The learner will be able to understand and apply the basics of electrical engineering in their respective field of engineering.

Syllabus:

Review of DC Circuits

Resistor, temperature effect on resistance, Kirchhoff's laws, solution of series-parallel and star-delta circuits, Joule's law of electric heating, relationship between various energy units, types of capacitor, charging and discharging of capacitor, fundamentals of magnetic circuits, fringing effect, series-parallel magnetic circuits, comparison between electric and magnetic circuit

Electromagnetic Induction

Faraday's laws of electromagnetic induction, concept of induced emfs, coefficient of coupling, series-parallel connection of inductors, rise and decay of current in inductive circuit, hysteresis and eddy current loss

Single-phase AC Circuits

Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits

Three-phase AC Circuits

Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, introduction to rotating vector, power measurement in three-phase circuit, solution of balanced and unbalanced systems

Domestic and Industrial Wiring

Basic domestic wiring methods, types of cable, accessories, PVC conduit and PVC casing, salient features of industrial wiring, consideration on cross sectional area and insulation strength based on voltage and current rating, design calculations, protective systems, Indian standard wiring practices

Electrical Safety and Protection

Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays

Batteries

Different types of batteries, need of batteries, charging and discharging of batteries, methods of charging

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

References:

1. Electrical Technology, Volume I – B.L.Theraja, A.K. Theraja; S. Chand & Co.

2. Basic Electrical Engineering – A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, TMH Publishing Co.
3. Elements of Electrical Engineering – U. A. Patel, Mahajan Publishing House, Ahmedabad.
4. Basic Electrical Engineering – I. J. Nagrath, TMH Publishing Co. Ltd.
5. Principles of Electrical Engg.– Vincent Del Toro, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Electric Wiring – Mr. S. Samaddar, New central book agency (P) Ltd., Calcutta.
Electrical Design Estimating and Costing – Surjit Singh, Dhanpat Rai & Sons

ME101 **Engineering Graphics** **[2 0 4 4]**

Learning Outcome:

- To develop an understanding of the fundamental principles of engineering graphics and related drawing standards.
- To familiarize with various methods of producing and presenting graphic information.
- To develop the ability to communicate graphically using traditional means and the computer aided tools.
- To develop capability to visualize and represent geometry in two dimensions and in three dimensions.
- To develop an appreciation of role of engineering graphics and modeling for various disciplines of engineering.

Syllabus:

Introduction to Engineering Drawing: Importance and Applications of Engineering Drawing for various branches of engineering, Drawing instruments, BIS Code of Practice, Lines, Lettering and Dimensioning, Scales, Basic Geometrical Construction, Sheet Layout

Engineering Curves: Equations of conic curves and cycloid and their relevance to construction. Construction of conics by Focus Directrix Method, Construction of Ellipse by Arcs of Circle Method, Parabola by Rectangle Method, Rectangular and oblique Hyperbola. Construction of Cycloid, Epicycloids and Hypocycloid. Construction of Involutes. Constructions of Archimedean spiral and helix.

Solid Geometry: Concept of Orthographic Projections and Projections of Points, Projections of straight lines inclined to one and both reference planes, Projections of Planes inclined to both reference planes, Projections of solids and sections of solid.

Developments of Surfaces by parallel line method and radial line method.

Interpenetration of Solids: Determination of lines / curves of intersection for interpenetration of Prism to prism, Cylinder to cylinder, Cylinder to cone, Cone to cylinder.

Orthographic Projections: Conversion of pictorial views in to orthographic Projections. Sectional orthographic Projections.

Isometric Projections: Conversion of orthographic views into isometric projections / views.

Computer Aided Drafting Tools: Basic Drawing Creation Tools- creating a line, circle, Arc, Donut, Ellipse, Point, Multi-Line, Polygon, Spline. Using editing tools such as Dividing and Measuring. Modifying Commands and Views- Rectangular and Polar arrays, modify using BREAK, CHAMFER, COPY, EXPLODE, EXTEND, FILLET, MIRROR, MOVE, OFFSET, PEDIT, ROTATE, SCALE, STETCH, TRIM. Adding Text to Drawings, Dimensioning Tools.

Conventional Representation: Symbols for standard machinery components such as nuts, bolts, locking devices, riveted and welded joints, foundation bolts. Symbols used in electrical, electronics and civil engineering.

Laboratory Work:
Laboratory Work will be based on the above syllabus consisting of minimum six drawing sheets.

References:
1. Engineering Drawing by N D Bhatt, Charotar publication
2. Engineering Graphics, by K. C. John, PHI Publication.
3. Fundamentals of Engineering Drawing by Warren J Luzzader and Jon M Duff, PHI publication.
4. Engineering Graphics with AutoCAD® James D Bethune, PHI Publication.
5. Engineering Drawing by Basant Agrawal and C M Agrawal, TMH Publications.
6. Engineering Drawsing by K L Narayana and Kannaiah, Scitech Publication.
7. IS SP 46 : 2003. Engineering Drawing Practices for Schools and Colleges.

HM102 **English / Foreign Language** **[2 0 2 3]**

Preamble:
World is shrinking into a global village, the knowledge of English alone is not sufficient. With the increase multiple prospects for engineers throughout the world, it is beneficial for students to gain a basic knowledge of foreign languages. This will equip them with better understating of the language that they will learn, but will also enrich their understanding of other culture and countries, thereby contributing to the world as a global citizen.
The student from vernacular medium may be offered English language while other student may choose any one of the foreign languages offered by the institution.

Learning Outcome:
By the end of this course

- Student will be able to understand and speak a new language
- Student will be more aware about the world outside
- It will add to the knowledge of culture other than their on
- Multi-Linguistic skills will equip them better communication skills too

Syllabus of English Language:
The course content will encompass following topics
Grammar

- Tenses
- Helping and Modal auxiliary verb
- Concords
- Prepositions
- Idioms
- Synonyms –Antonyms
- Confusables

Prose

- Open Window by Saki
- A Cup of Tea by Katherine Mansfield
- The Piece of String by Guy De Maupassant
- Text of Steve Jobs' Commencement address -2005
- How to be an Alien by George Mikes

Poems

- Ode to the skylark – by P B Shelley
- Where The Mind Is Without Fear - by Rabindranath Tagore.
- The Road Not Taken- Robert Frost
- On The Move - by Thom Gunn.

Methodology:
Readings, exercises, role plays, videos will be the basic tools for teaching
As the course on foreign language will be offered by different experts, depending on the availability of the experts and demand, the syllabus of the offered foreign language will be approved by the Dean time-to-time before start of the every semester.
References:

1. Leech Geoffery and Svartik Jan, 'A Communicative Grammar of English', Pearson pub.
2. Murphy Raymond, 'Grammar in Use Intermediate with Answers', Cambridge University Press
3. Selected text in the form of handouts.

CL101 **Environment and Energy Studies** **[3 0 0 3]**

Learning Outcome:

- Developing a concern for the environment and sustainability,
- Bring the awareness about various issues and challenges faced for Environment conservations
- Knowledge and understanding about types of environmental pollutions and pollutants
- Developing understanding about environmental impact assessment and environment management systems
- Bring awareness about societal issues related with environment and issues related with population growth
- Knowledge and understanding about sources, types and important aspects about energy

Syllabus:

Environment – The need of sustainability, Nature & Issues: Introduction to environment and the multidisciplinary nature of environment. Environment conservation and management as the key requirements of sustainability. Definitions, scope and importance, need for public awareness.

Environmental Pollution: Quantification of environmental pollution, various parameters and indexes. Types of environmental pollution and pollutants. Causes, effects and control measures of – Air pollution, Water pollution, Solid and e-waste management, Soil/land pollution, Noise pollution, Radioactive pollution and Thermal pollution. Role of an individual in prevention of pollution.

EMS and EIA: Introduction and basics of environmental management systems and environmental impact assessment.

Social issues and the environment: Environment ethics, issues and possible solutions. Urban problems related to energy, water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns- case study of Sardar Sarovar dam, environment protection acts.

Human population and the environment: Population growth, variation and development. Environment – Population- human health, value education.

Energy – Sources, types and important aspects: Introduction to energy sources: How energy is produced and consumed, and ways in which it impacts society and the environment. Physical understanding of issues and problems involved with the generation, storage, transport, and usage of various forms of energy in technological society. Types of energy resources as Renewable and Non-renewable energy, fossil fuels and hydropower, nuclear, solar, and wind energy, and issues related to energy conservation in everyday life. Effects of waste products associated with energy generation and usage and energy conservation measures.

References:

1. Dr. S. S. Dara and Dr. D. D. Mishra, A textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.
2. Dr. Suresh K. Dhameja, Environmental studies, S. K. Kataria & Sons
3. Robert A. Ristinen and Jack J. Kraushaar, Energy and the Environment, Wiley
4. Gilbert M. Masters, Introduction to Environmental Engineering and Science,Prentice-Hall Publications.

Anindita Basak Environmental Studies, Pearson Publications.

HM111, French Language (Foreign Language)

[2 0 2 3]

Course Learning Outcomes:

At the end of the 40 hours course, students will be evaluated on the basis of 4 competences:

- Writing (Filling forms, post cards, small emails, messages),
- Speaking (To present oneself in details, to be able to ask questions in certain given situations, Role Play),
- Written Comprehension (Small texts, post cards, messages),
- Oral Comprehension (Understanding the basic day to day conversations).

Pedagogy: Communicative and Action Oriented Approach

Supplementary:

Cultural activities of Alliance Française d'Ahmedabad.

COURSE CURRICULUM

Main guidelines

1) To introduce oneself
2) To ask information about someone
3) To count
4) To communicate in a class
5) To Greet
6) To take leave
7) To ask personal information

8) To ask politely

9) To give personal information

10) To ask the price

11) To ask about likings

12) To express about our likings

13) To talk about a city

14) To name and find out different places in a city

15) To ask and give an explanation

16) To thank and to reply

17) To write a message

18) To give impressions about a place

19) To talk about ones' activities

20) To say where we live

21) To talk about the weather

22) To fix or postpone a meeting

23) To talk briefly about oneself

24) To ask the time and the timings

25) Telephonic conversation

26) To talk about the family

27) To talk about seasons

28) To understand simple information about the weather

29) To appreciate

30) To precise the quantities

31) With relevant vocabulary and grammar points.

HM131, German Language (Foreign Language)

[2 0 2 3]

Course Learning Outcomes : On completion of the course, the student would be able to:

- understand & convey expressions associated with everyday routine and topics related to direct circumstances and common requirements in Germany (e.g. seeking and sharing personal information, handling simple conversations related to shopping, making reservations, ordering in restaurants, airports, banks, railway stations, universities and other all such public places).
- get an insight into the day-to-day socio-economic culture of Germany.
- appreciate a foreign culture and the importance of learning a foreign language.
- understand and put basic German grammar such as various types of verbs, nouns, adjectives, tenses and cases to practical & functional use.
- read, write, speak and understand elementary German and be able to hold simple, short conversations confidently.

Themes & Topics Covered:

- German Greetings & Good-bye's
- Introduction (Seeking introductions & introducing yourself thoroughly in German)
- Orientation: Learning directions & interpreting city plans (Finding your way in the city, inquiring about places, communicating with localities, making basic conversations in Post Offices, Airports, Railway Stations & public places)
- Learning Countries, States & Capitals
- Professions
- Making reservations: Hotels, Taxis & other such routine bookings
- Placing order in Restaurants & learning to find your way around routine requirements
- Learning time, dates, days of the week, numbers & occasions/festivals.

Grammar Covered:

Nouns- In depth study of nouns, with emphasis on case-specific changes

Verbs- Regular, Irregular, Helping, Separable & Modal verbs. All with their conjugations
Subjects- Nominative and accusative. Correlation between a subject & a verb
Cases- Nominative, accusative & dative. Effect of each on nouns & the corresponding changes
Articles- Definite & indefinite articles. Its impact & ultimate effect on cases
Sentences: Imperative, declarative, exclamatory & interrogative. Positive & negative sentence construction shall also be covered (e.g: "Ja", "doch", as well as " nein", "nicht" & "kein" respectively)
Concepts such as adjectives, possessive pronouns, prepositions & adverbsSentence Construction

Physics (PY102) (old syllabus)

[L T P C 2 0 2 3]

Learning outcome:

- By studying following topics of syllabus, students will be able to understand advanced topics of physics like characterization and applications of nanomaterials, various mechanisms and applications of laser and different measurement techniques of physical quantities.
- Experiments related to the syllabus will give the empirical understanding of the subject.

Physics of Nanomaterials:

Introduction to Quantum Physics: Particle in a three dimensional box, Introduction - Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials – Electrical and Magnetic properties, Structural properties (Scanning Electron Microscopy, Tunneling Electron Microscopy); Nanostructures, Carbon nanotubes – characteristics and applications, Reduction of dimensionality - Nanostructures; Nanotechnology and environment.

Lasers and Holography:

Introduction, Basics of Interaction of radiation with matter, Condition for light Amplification, Population inversion and metastable state, pumping, the principle pumping scheme: Three and Four level scheme, Construction and working of optical resonator, Optical amplifier, Applications of laser beam, Holography.

Introduction to Fiber Optics:

Introduction of fiber-optic system, Principle and construction of fiber cable, Acceptance angle and numerical aperture, Types of Optical fiber: Based on material & based on mode of propagation, Index profile, Fiber optic communication link, Fiber optic sensor, Advantages of fiber optic system.

Nuclear and Plasma Physics:

Introduction to nuclear physics, types of nuclear reactions, nuclear reaction cross sections, Radius of Gyration, particle accelerators - pinch of synchrotron radiation, nuclear fission as a source of energy, Types of nuclear reactors - Breeder reactor, power reactor, pressurized water reactor.

Basic concepts of Plasma physics - Motion of charged particle in E and B homogeneous and inhomogeneous fields, Pinch effect, Drift velocity in a gravitational field, Magnetic trapping of plasma, Van Allen radiation belt.

Physics of Vacuum Techniques and Cryogenics:

Creation of vacuum with different pumps-rotary pump, diffusion pump, Measurement of vacuum with different gauges; Need of vacuum in Plasma unit, Cryogenics - use of liquid Nitrogen and liquid Helium, Applications of cryogenics - refrigeration in space, medical applications.

Engineering of Auditorium and Ultrasonics:

Introduction, Defection due to reflection of sound, Sabine's empirical formula, Reverberation theory, Eyring's equation, Acoustical defects and their remedies, Acoustic materials, Ultrasonic waves, Piezo electric method, Properties and application of ultrasonic waves, Magnetostriction method.

Laboratory Work:

A minimum of 10 experiments based on above syllabus will be arranged.

References:

1. M N Avadhnulu and P. Kshirsagar, A Text Book of Engineering Physics, S Chand Publication.
2. T. Pradeep, Nano: The Essentials, New Central book Agency.
3. S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.
4. Modern Physics for Engineers by B. L. Theraja, S Chand Publication.

CE101 Art of Programming [3 1 2 5]

Learning Outcome:

- **Students will get acquainted with basic components and capabilities of a typical computing system.**
- Students will be able to critically think about basic problems and develop algorithms to solve, validate and verify with computing systems.
- Students will be able to identify appropriate language constructs and approach to computational problems.
- Students will be acquainted with coding standards including documentation which are required to be used for the development of effective, efficient and maintainable programs.

Syllabus:

Introduction to Computer Systems: Basic computer organisation, operating system, editor, compiler, interpreter, loader, linker, program development.

Data Storage and Operations: Various data representation techniques, data types, constants, variables, arrays, various arithmetic and logical operations in a typical programming environment.

Algorithms and Flow charting: Introduction to computer problem solving, concepts and algorithms and flow chart, tracing of an algorithms.

Algorithm to Program : Specifications, top down development and stepwise refinement as per programming environment needs. Imperative style of correct and efficient programming, introductory concepts of time and space complexities.

Loops and Controls Construct : conditional and unconditional execution. Simple versus nested controls. Various aspects of repetitive executions, iterative versus recursive programming styles, assertions and loop invariants.

Errors and Debugging: Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory.

Structured Programming: Introduction to modular approach of problem solving, concepts of procedure and functions for effective programming.

Coding Conventions: Variable naming, function naming, indentation, usage and significance of comments for readability and program maintainability.

Laboratory Work:

Above concepts are to be implemented in any High Level Programming Language (preferably C-language) atleast 10 experiments are to be carried out.

References:

1. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
2. Dromey R.G., How to solve it by computers, Prentice Hall of India
3. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
4. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
5. Sedgewick R., Algorithms in C, Addison Wesley
6. Yashwant Kanitker, Let Us C, BPB Publications
7. Schaum Ourline Series, Programming in C, , McGraw-Hill
8. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India

CY101 **CHEMISTRY** **[2 0 2 3]**

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the relevance of fundamental and applications of chemical sciences and chemistry in the field of engineering
- know the principles of green chemistry and apply the concept of green chemistry so as to reduce the pollution
- apply the core concepts in materials science to solve engineering problem

Syllabus:

Water and its Treatment: Introduction, Sources of water impurities, Hardness of water, Degree of hardness, Softening of water, Water treatment processes, Problems with boiler feed water and its treatments Specifications for drinking water (BIS standards)

Fuel: Calorific Value, Types of fuel, Selection of fuels, Analysis of coal: proximate and ultimate analysis, Flue gases: Orsat apparatus, Alternative fuels: Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Ethanol, Bio-diesel

Lubricants: Classification and functions of lubricants, Properties: lubricating oil and greases, Selection of lubricants

Polymers and Composite materials: Introduction to Polymers and Polymerization, Elastomers, classification and uses, Biopolymers: Cellulose and starch, Advanced polymeric materials, Composites: Introduction, classification and applications

Green Chemistry: Overview, Set of Principles of Green Chemistry, Industrial applications.

Engineering Materials: Adhesives:- characteristics, classification, and uses; Fullerenes:- structure, properties and applications; Nanorods:- brief introduction; Organic Electronic Materials:- introduction, types and applications; Liquid Crystals:- Introduction, classification and applications.

Overview of electrochemical systems

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. P.C. Jain and Monika Jain, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
2. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
3. S.S. Dara, Textbook of Engineering Chemistry, S. Chand and Company.
4. Mike Lancaster, Green Chemistry: An Introductory Text, Royal Society of Chemistry.
5. J.C. Kuriacose and J. Rajaram, Chemistry in Engineering and Technology, Tata Mc Graw Hill.

EE102 **Electrical Workshop Practices** **[0 0 2 1]**

Learning Outcome:
By studying this course, at the end, students will be in position to apply wiring and soldering skills in real practice while making any electronic circuit. Student will start appreciating safety device and will learn about safety measures. It is expected that student can detect faults and preliminarily repair some house hold equipments. Student will be aware of different luminaries available for lighting and their selection. Student will be exposed to basics of solar power and LED lighting.

Syllabus:
Wiring Techniques: Designing of domestic and industrial wiring, selection of wire, load calculations

Introduction to Electronic Components: Study of various electronic components like, power and signal diodes, zener diodes, BJTs, FETs, LED, LDR, Photo diode, Photo transistor, SMD components, general purpose ICs, use of bread board

Lab equipments: CRO, DC regulated power supply, function generator, multimeter, single-phase and three-phase auto-transformer (variac)

Introduction to Electrical Components: Study of different types of switches, solid state and electromagnetic relays, contactors, rheostats, different types of capacitors, resistors, variable inductor (choke) etc.

Soldering Techniques: Basics of soldering techniques, effectiveness of soldering and problem associated with soldering, general purpose board soldering.

Basics of Household Electrical Equipments: rewiring / replacement of fuse, switch board layout, functioning of switch, fan regulator, tube light, electric iron, electric heater

Basic Network Communication: Types of computer network communication, network cabling

Designing of Electrical Panel : Basic design steps and criteria, selection of various components, layout of panel, ferruling, crimping, lugging, annunciation, display, mimic, meter mounting etc.

Introduction to Lighting: Study of illumination requirements, illumination units, lumen requirements, energy savers, solar power lights, LED lighting.

Introduction to DC Machine: Study of various parts of DC machine. Operation of DC machine as DC motor

Laboratory Exercise:
This shall consist of at least 10 hands-on exercises based on the above syllabus.

References:

1. Electric Wiring - Mr. S. Samaddar, New central book agency (P) Ltd., Calcutta.
2. Electrical Design Estimating and Costing- Surjit Singh, Dhanpat Rai & Sons
3. Principles and Reliable Soldering Techniques – Sengupta R., New Age International (P) Ltd.
4. Electrical Technology Vol – III – B. L. Theraja, A. K. Theraja, S. Chand Publishers., New Delhi.
5. Fundamentals of Maintenance of Electrical Equipments – K. B. Bhatia, Khanna Publishers.
6. Electronic Product Design Vol - I – Er. Mehta S. D., S. Chand Publishers., New Delhi.
7. Projects in Electrical, Electronics, Instrumentation and Computer Engineering – Dr. S. K. Bhattacharya, Dr. S. Chatterji, S. Chand Publishers., New Delhi.
8. National Electrical Code: Bureau of Indian Standards, Govt. Of India, 2011.

Operating Manuals of Various Equipments

MA201 **Linear Algebra** **[3 1 0 4]**

Learning outcomes:
On completion of the course student

CLO1. will have basic knowledge of vector space.
CLO2. will have basic knowledge of matrix algebra..
CLO3. Will able to apply the knowledge of linear algebra in solving system of linear equations.

Unit:-1. Matrix theory: Review of algebra of matrices, Rank of matrix, Inverse of matrix by Gauss-Jordan method, Solution of system of algebraic simultaneous equations, Linearly dependent and Linearly independent functions, Caley-Hamilton Theorem (without proof), eigen values and eigen vectors, Eigen values and eigen vectors of orthogonal, symmetric, skew-symmetric matrices, Hermitian matrix, skew-Hermitian matrix, Unitary matrix, Normal matrix, Algebraic and geometric multiplicity, Diagonalization, Spectral theorem for Real symmetric matrices, Application of quadratic forms.

Unit:-2. Vector space and Linear transformations: Definition of vector space, subspaces, linear combination, Linearly dependent and linearly independent vectors, Basis of vector space, Dimension, Rank-Nullity theorem (statement and verification by examples), Definition of linear transformation, types of linear transformations (Rotation, Reflection, Expansion, Contraction, Projection), Matrix of Linear transformations, Change of basis and similarity.

References:

1. David C. Lay, Linear algebra and its application, (Latest edition), Pearson publication, New Delhi.
2. E. Kreyszig, Advanced engineering mathematics (Latest edition), John Wiley.
3. H. Anton, Elementary linear algebra with applications (Latest edition), John Wiley.
4. K Hoffman & Ray Kunze, Linear Algebra, PHI, New Delhi.
5. J. P. Sharma and M. Yeolekar, Engineering mathematics, Vol-II, (Latest edition), PHI publication, New Delhi.
6. S. Kumaresan, Linear algebra - A Geometric approach (Latest edition), PHI, New Delhi.

ME102 **Mechanical Workshop Practices** **[0 0 2 1]**

Learning Outcome:

After successful completion of the course, the students shall be able to

- Acquire skills in basic engineering practice.
- Identify the hand tools and instruments.
- Gain measuring skills.
- Obtain practical skills in the trades.
- To enhance psycho motor skills and attitude.

Syllabus:

(a) Instruction / demonstration is given for each of the following shops/trades, new materials, tools and equipment used.

1. Joining process
2. Plumbing (metalic & non metalic pipe fittings)
3. Fitting /Assembly practice
4. Sheet Metal work
5. Electroplating
6. Carpentry/ Pattern Making
7. Blacksmithy
8. Painting

(b) Exercise and Term work: Each student is required to prepare simple exercises in the following so as to have a feeling of how the jobs / parts are prepared and use of tools / equipments.

1. Arc Welding / Soldering------02 Hrs
2. Fitting / Assembly.----------05 Hrs
3. Carpentry Practice ----------02 Hrs
4. Blacksmithy Practice----------02 Hrs

References:

1. Workshop Practice -I and II by H S Bawa, TMH Publication.
2. Manufacturing Processes and Workshop Practice, Hasan Ali and Khan R A, Scitech Publication
3. Mechanical Workshop Practice by K C John, PHI Publications.
4. A course on workshop technology I and II, B S Raghuvanshi, Dhanpatrai and sons.

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Course Code	CL102
Course Title	Mechanics of Solids

Course Learning Outcomes:

At the end of the course, students will be able to –

1. appraise the multidisciplinary nature of environment and sustainability
2. explain types of environmental pollution and its control measures
3. outline social issues related to environment

Syllabus: Teaching Hours: 15

Unit 1: Multidisciplinary Nature of Environment Hours: 04

Environment and its multidisciplinary nature, Ecosystems, biodiversity and its conservation, concept of sustainability, Environmental Impact Assessment, public awareness towards environmental conservation, Environmental legislation, carbon credit and carbon trading

Unit 2: Environmental Pollution, Global Warming and Climate Change Hours: 07

Types of environmental pollution and pollutants, causes, effects and control measures of – air pollution, water pollution, soil/land pollution, noise pollution, radioactive pollution. Role of an individual in prevention of pollution. Case studies on pollution, Effects – acid rain, ozone layer depletion and greenhouse effect. Sources, types and effects of waste, waste disposal and management, e-waste management

Unit 3: Social Issues related to Environment Hours: 04

Environment ethics- issues and solutions. Energy and water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns, environmental protection acts.

Self-Study:

The self-study contents will be declared at the commencement of semester.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 05 Assignments to be incorporated.

Suggested Readings:

1. Dara, S. S., & Mishra, D. D. A textbook of Environmental Chemistry and Pollution Control. S. Chand & Company Ltd.
2. Bharucha, E., Textbook of Environmental Studies, Universities Press.
3. Dhameja, S. Environmental Studies. S. Kataria and Sons.
4. Ristinen, R., &Kraushaar, J. Energy and the Environment, Wiley Publications.
5. Masters, G. Introduction to Environmental Engineering and Science. Prentice-Hall Publications.
6. Basak, A. Environmental Studies. Pearson Publications.

MA306 **Applied Mathematics** **[3 1 0 4]**

Course Learning Outcomes:
After successful completion of the course, student will be able to

- express physical phenomenon in mathematical formulation
- understand and solve differential equations
- basic knowledge of widely used Fourier transform techniques and their applications in computer and IT Engineering

Syllabus:
Fourier Series: Periodic functions, Dirichlet's conditions, Fourier series, Euler's formulae, Fourier expansion of periodic functions with period 2 Fourier series of even and odd functions, Fourier series of periodic functions with arbitrary periods. Half range Fourier series, Harmonic analysis, Applications to computer science, Application in field of Periodic Signals
Ordinary Differential Equations: Introduction, Formation of Ordinary Differential equation, First order and first degree differential equations, Linear differential equations of higher order with constant coefficients, Complimentary function, Particular integral, Method of variation of parameters, Higher order linear differential equations with variables coefficient (Cauchy's and Legendre's forms), Simultaneous linear differential equations related applications
Partial Differential Equations: Formation of partial differential equations, Directly integrable equations, Models of engineering problems leading to first order partial differential equations, Langrange's equation, Method of separation of variables and related applications
Functions of Complex Variables: Introduction to Complex number and Complex Functions, Analytical function, Cauchy – Riemann equations (Cartesian and polar forms), Harmonic functions, conformal mappings and related applications
Fourier Integrals & Fourier Transforms: Fourier integral theorem (only statement), Fourier Sine and Cosine integrals, Complex form of Fourier integral, Fourier Sine and Cosine transforms, Solution of boundary value problems using Fourier transforms, Application in the field of non periodic signals and Images.
Wavelets: Mathematical development of wavelets and their Applications. The idea behind wavelets, Application in the field of Image Processing, Application in the field of Computer engineering and Information Technology is to be covered in each topic
Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents

Tutorial Work:
Tutorial work will be based on above syllabus with minimum six term assignments (TA) to be incorporated

References:

1. K.R.Kachot, Higher Engineering Mathematics Vol I, Mahajan Publication, Ahmedabad
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley
3. B.S.Grewal, Higher Engineering Mathematics, Khanna Publisher, New Delhi
4. W.E.Boyce and R.Diprima, Elementary Differential Equation, John Wiley
5. R.V. Churchill & J.W. Brown , Fourier Series & Boundary Value Problems,McGraw-Hill
6. M.D. Raisinghania, Integral Transforms, S.Chand, New Delhi

EC321 **Basic Electronics** **[3 0 2 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to:

- understand the fundamentals of various basic semi-conductor devices and principles of analog electronics
- apply the knowledge of basic semi-conductor devices to realize the working of basic electronic circuits
- design basic electronic circuits

Syllabus:

Semiconductor Diodes: Classification of semiconductors, conductivity of semiconductors, Theory of PN-Junction Diode, Energy band structure, Diode Resistance, Transition Capacitance, Diffusion Capacitance, Junction Diode Switching Characteristics, Break-down in Junction diode, PN Diode Applications, zener diode, Varactor Diode, Schottky Diode, LED and Laser Diode.

Bipolar Junction Transistor: Construction, Biasing, NPN, PNP transistors, types of configurations, Break-down in transistors, Bias stability, methods of transistor biasing, bias compensation, heat sink

Field Effect Transistor: Construction of FET, Operation of JFET, characteristic parameters of JFET, Transfer characteristics of FET, comparison of JFET and BJT, applications of JFET, MOSFET, enhanced MOSFET, depletion MOSFET, comparison of MOSFET with JFET

Amplifiers: small signal h-parameters, Classification, Single Stage Amplifier, FET amplifier, classification based on biasing condition, multistage amplifier.

Operational Amplifier: Ideal Opamps, Opamp stages, parameters, equivalent circuits, IF-opamp, opamp applications, Bandwidth with feedback, noise, frequency response and compensation

Feedback Amplifiers: Basic concepts of feedback, effects of negative feedback, type of negative feedback connections, stability of feedback amplifiers

Principle of Oscillator: classification, condition per oscillation, RC Oscillators, Wein-Bridge Oscillators, Crystal Oscillators, wave shaping circuits

Power Supplies: Linear mode power supply, switch mode power supply

Design of electronics circuit: Design of rectifier, power supply, design of amplifier, oscillator.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

S. Salivahanan, N.Suresh Kumar and A.Vallavaraj, Electronic Devices and Circuits, TMH Publications
Bell , Electronic Devices and Circuits, PHI Publication
Malvino, Electronic Principles, McGraw Hill

CE301 **Digital Systems** **[3 1 2 5]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand and describe the basics of various digital components
- understand the principles of design of combinational logic and sequential logic circuits using basic components
- recognize the importance of digital systems in computer architecture
- design and simulate the basic digital circuits

Syllabus:

Binary Systems: Introduction, Binary numbers, Conversions, Octal, Hexadecimal Numbers, Complements, Binary Codes, Binary Storage, Registers, Binary Logic

Boolean Algebra And Logic Gates: Definition, Boolean Algebra, Theorems and Properties, Boolean Functions, Canonical and Standard Forms, other Logic operations, Digital Logic Gates, IC Logic families

Boolean Function Simplification: The Map-method, 2, 3, 4, 5 & 6 Variable Map, POS Simplification, NAND/NOR implementations don't care conditions, Tabulation method, Prime Implicants, Selection Of Prime Implicants

Combinational Logic: Introduction, Design Procedure, Adders, Subtractors, code Conversion, Analysis Procedure, Multilevel NAND/NOR Circuits, Ex-OR and equivalent functions

Combinational Logic with MSI and LSI: Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparators, ROMs Decoders, Multiplexers, PLA

Sequential Logic: Introduction, Flip-Flops, Triggering of Flip-Flop, Analysis of clocked sequential circuits, State Reduction and assignment, Flip-Flop excitation Table, design procedure, design of counters, design with state equations

Registers, Counters, Memory Unit: Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, the Memory Unit, examples of RAMs

Digital Integrated Circuits: Introduction, BJT characteristics, RTL and DTL logic. IIL and TTL Logic. ECL and MOS Logic CMOS Logic, CMOS and TTL Interface, Introduction to VSNL Systems

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. M.MorrisMano, Digital Logic and Computer Design, PHI
2. R.K.Gaur, Digital electronics and microcomputers, Dhanpati Publications
3. Malvino and Leach, Digital Principals and applications, McGraw-Hill
4. Virendra Kumar, Digital Technology Principals and Practices, New Age International
5. Holdsworth, Digital logic design, Elsevier Science.

CE303 Mathematical Foundation of Computer Science [3 1 0 4]

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand discrete mathematical preliminaries
- apply discrete mathematics in formal representation of various computing constructs
- recognize the importance of analytical problem solving approach in engineering problems

Syllabus:

Sets Theory, Propositions and Computability: Introduction, Combinations of Sets, Finite and Infinite Sets, Uncountable Infinite Sets, Mathematical Induction, Principle of Inclusion and Exclusion, Propositions and Propositional Calculation, Russell's Paradox and Non computability, Applications of these concepts in language Theory and AI.

Permutations, Combinations, and Discrete Probability: Introduction, The Rules of sum and product, Permutations, Combinations, Generation of Permutations and Combinations, Discrete Probability , Applications in Data recovery and Security.

Relations and Functions: Introduction, A relational Model for Data Bases, Properties of Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, A Job-scheduling Problem, Functions types of functions and the Pigeonhole Principle

Graphs and Trees: Basic Terminology, Multigraphs and Weighted Graphs, Paths and Circuits Shortest Paths in Weighted Graphs, Euclidian Paths and Circuits, Hamiltonian Paths and Circuits, The Traveling Salesperson Problem, Factors of a Graph, Planar Graphs, Trees, Rooted Trees, Path Lengths in Rooted Trees, Prefix Codes, Binary Search Trees, Spanning Trees and Cut-Sets, Minimum Spanning Trees

Analysis of Algorithms Time Complexity of Algorithms: A Shortest-Path Algorithms, Complexity of Problems, Tractable and Intractable Problems, Numeric Functions, Asymptotic Behavior of Numeric Functions.

Recurrence Relations and Recursive Algorithms: Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions. Use of Recurrence Relations for Analysis of Algorithms.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. C. L. Liu, Elements of Discrete Mathematics, Tata McGraw Hill
2. Tremblay, J.P. & Manohar, Discrete mathematical structures with application to computer science, McGraw Hill
3. Rosen, Kenneth L., Discrete Mathematics and its applications, McGraw Hill

CE302 **Object Oriented Programming** **[3 1 2 5]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand and describe the basic principles and constructs of object-oriented programming
- understand the significance of object oriented tools and technologies for modular development
- design, develop, execute, debug and validate programs in object oriented programming environment

Syllabus:

History and overview of Java: Creation of Java, features of Java, byte code, Evolution of Java, three OOP principles (Inheritance, Polymorphism, Encapsulation), lexical issues,

Data types, variables, Operators: primitive data types, literals, variables, type conversion and casting, automatic type promotion in expressions, type promotion rules, arithmetic operators, bitwise operators, relational operators, Boolean logical operators, Assignment operators, ternary operators, operator precedence

Arrays: one dimensional array, multi-dimensional array, alternative array declaration statements.

Control Statements: Selection statements, iteration statements, jump statements

Classes and Methods: class fundamentals, declaring objects, assigning object reference variables, adding methods to a class, returning a value, constructors, this keyword, garbage collection, finalize() method, overloading methods, argument passing, object as parameter, returning objects, access cotrol, static, final, nested and inner classes, command line arguments, variable-length arguments

String Handling: String class methods

Inheritances: Basics, member access and inheritance, super class references, Using super, multilevel hierarchy, constructor call sequence, method overriding, dynamic method dispatch, abstract classes, Object class

Packages and Interfaces: defining a package, finding packages and CLASSPATH, access protection, importing packages, interfaces (defining, implementation, nesting, applying), variables in interfaces, extending interfaces, instance of operator

Exception Handling: fundamental, exception types, uncaught exceptions, try, catch, throw, throws, finally, multiple catch clauses, nested try statements, built-in exceptions, custom exceptions (creating your own exception sub classes)

Multithreaded Programming: Java thread model, thread priorities, synchronization, messaging, Thread class, Runnable interfaces, creating a thread(s), Thread class methods, Synchronization, Inter thread Communication, volatile operators

Managing I/O: Streams, Byte Streams and Character Streams, Predefined Streams, Reading console Input, Writing Console Output, PrintWriter class, File management classes

Networking: Networking Basics, Networking classes and interfaces - (InetAddress, TCP/IP Client Sockets, URL, URL Connection, TCP/IP server Socket), Datagrams – (DatagramSocket, DatagramPacket)

Applet: Applet Fundamental, Applet Architecture, Applet Skeleton, Requesting Repainting, status window, HTML Applet tag, passing parameters to Applets,

Event Handling: various event handling mechanisms, Delegation Event Model, Events, Event Sources, Event Listeners, various classes related to event sources and event listeners

AWT: window fundamentals, creating frames, working with graphics, working with colors, working with fonts, Adding removing various controls, Layout managers, menu bars and menus

Various packages: lang, util, Collection Framework

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Herbert Schildt, Java – The Complete Reference, Tata McGraw Hill
2. Balaguruswamy, Programming with Java – A primer, Tata McGraw Hill

IT401 Communication Engineering [3 0 2 4]

Course Learning Outcome:

After successful completion of this course, student will be able to

1. understand data/signal transmission over communication media
2. recognize usage of various modulation techniques in communication
3. analyse various spread spectrum and multiplexing techniques
4. use concepts of data communication to solve various related problems

Principles of Amplitude Modulation: AM Envelope – Frequency Spectrum and Bandwidth – Modulation Index and Percent Modulation – AM Power Distribution – AM Modulator Circuits – Low Level AM Modulator – Medium Power AM Modulator – AM Transmitters – Low Level Transmitters –High Level Transmitters – Receiver Parameters – AM Reception AM Receivers – TRF – Super Heterodyne Receivers – Double Conversion AM Receivers.

Angle Modulation: FM and PM Waveforms – Phase Deviation and Modulation Index – Frequency Deviation – Phase and Frequency Modulators and Demodulators – Frequency Spectrum of Angle Modulated Waves – Bandwidth Requirement – Broadcast Band FM – Average Power FM and PM Modulators – Direct FM and PM – Direct FM Transmitters – Indirect Transmitters – Angle Modulation Vs. Amplitude Modulation – FM Receivers FM Demodulators – PLL FM Demodulators – FM Noise Suppression – Frequency Vs. Phase Modulation.

Introduction to digital modulation: Binary PSK – DPSK – Differentially Encoded PSK – QPSK – M-ary PSK – QASK –Binary FSK – MSK – GMSK – Duo binary Encoding – Performance Comparison of Various Systems of Digital Modulation.

Baseband transmission: Sampling Theorem – Quadrature Sampling of Band pass Signals – Reconstruction of Message from its Samples – Signal Distortion in Sampling – Discrete PAM Signals – Power Spectra of Discrete PAM Signals – ISI Nyquist Criterion for Distortion less Baseband Binary Transmission – Eye Pattern – Baseband M-array PAM Systems – Adaptive Equalization for Data Transmission.

Spread spectrum and multiplexing: Pseudo-Noise Sequence – DS Spread Spectrum with Coherent Binary PSK – Processing Gain – FH Spread Spectrum – Multiple Access Techniques – Wireless Communications – TDMA and CDMA – Wireless Communication Systems – Source Coding of Speech for Wireless Communications.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Simon Haykin, Digital Communications, Wiley
2. Roddy and Coolen, Electronic Communication, Pearson Education India
3. Behrouz Forouzan, Introduction to Data Communication and Networking, PHI
4. William Stallings, Data and Computer Communication, Tata McGraw Hill

5. Schweber W.L, Data Communication, PHI

CE402 **Computer Organization** **[3 1 2 5]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand and describe the basics of various architectural units of the Computer System
- apply the knowledge of combinational and sequential logical circuits to mimic a simple computer architecture
- demonstrate the simulations for basic computer operations
- recognize the importance of parallelism in computer architecture

Syllabus:

Introduction to Computer Architecture

Register transfer and Micro operations: Register transfer language -Register transfer, Bus and memory transfer, Arithmetic micro operations, Logic Micro operations, Shift micro operations and Arithmetic logic shift unit.

Instruction codes: Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory reference instructions, Input-Output and interrupt, complete computer description.

Micro programmed Control: Control Memory, Address sequencing, Microprogram example, Design of Control unit

Central Processing Unit: Introduction, General register organization, Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Reduced instruction set computer (RISC). Complex Instruction Set Computer (CISC), Comparison of RISC and CISC Parallel Processing, Pipelining, Arithmetic pipelining, Instruction pipelining, RISC pipeline, vector processing, Array processors

Computer Arithmetic: Binary Arithmetic's, Add, Subtract, Multiply, Divide, Algorithms, and Implementations Carry Look Ahead and Fast Adders.

Input Output Organization: Input output interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, Direct Memory access (DMA), Input output processor (IOP), CPU-IOP communication, Serial communication.

Memory Organization: Memory hierarchy, Main memory, Auxiliary memory, Flash memory, Associative memory, Cache memory, Virtual memory, Memory management hardware.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. M. Morris Mano, Computer system Architecture, Prentice Hall of India
2. Williams Stallings, Computer Organization and Architecture, Prentice Hall of India
3. Douglas V Hall, Microprocessors and Interfacing Programming and Hardware, Tata McGraw Hill
4. V. Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky, Computer Organization, McGraw Hill

CE406 **Computer Peripherals Workshop** **[0 1 0 1]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand basic working of various computer peripherals
- identify and compare functional mechanisms of various computer peripherals
- diagnose and resolve problems of a personal computer system pertaining to computer peripherals

Syllabus:

Working, architecture and troubleshooting of various peripherals like

Input devices: Keyboard, touch Screen input devices, Flatbed Input devices like CCD scanner, CIS scanner, Hand scanner

Output devices: CRT display monitor, Printing devices: Different types of printers, Disk and tape storage devices, HDC, FDC and CD-ROM Optical Disk

Other Input and Output Devices: Web cam, OCR, MICR, Bar Codes

References:

1. M.Radhakrishnan, D. Balasubramanian, Computer Installation and Troubleshooting, ISTE Learning Material
2. Govindarajalu, IBM Pc And Clones: Hardware, Troubleshooting And Maintenance, Tata McGraw-Hill Education.

CE403 **Data Structures** **[3 1 2 5]**

Course Learning Outcome:

After successful completion of this course, student will be able to:

- recognize the need of various data structures
- analyse various structures and their applicability
- design and implement various techniques for searching, sorting and recurrence
- identify the appropriate data structure and algorithm design method for the given application

Syllabus:

Introduction to Data Structures: Types of Data Structures, Linear & non-linear Data Structures

Linear Data Structures & their sequential storage representation: Storage Structures for arrays, stack definitions & concepts, operations on stacks, double stack, applications of Stacks-Recursion, Polish Expressions and their compilation, Queue-Representation of queue, operations on queue, priority queues, linked list-linked linear list-operation on linear list using singly linked storage structures, circularly linked list, doubly linked linear list, applications of linked linear list-polynomial manipulation.

Non Linear Data Structures: Trees-Definitions and concepts, operations on Binary Trees, Storage Representation and Manipulation of Binary Trees-Linked & Threaded, Conversion Of General Trees To Binary Trees, Sequential and other representations of trees, applications of Trees-the Manipulation of Arithmetic Expressions, Multi Linked Structures-Sparse Matrices. Graphs-Matrix representation of graphs, Breadth First Search, Depth First Search, Spanning Trees Dynamic Storage Management-Fixed Block Storage Allocation, First-Fit Storage Allocation, Storage Release, Buddy System, Garbage Collection, Compaction.

Sorting & Searching: Sorting-Notation and Concepts, Time and Space Complexity, Asymptotic behaviour, Sorting: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Tree Sort, Quick Sort, Shell Sort, Radix Sort, Address Calculation Sort, Summary of Sorting

Searching: Searching-Sequential & Binary Searching, Search Trees-Height Balanced, Weight Balance, 2-3 Trees, Tree Structures Hashing: Hash Table Methods-Introduction, Hashing Functions, and Collision-Resolution Techniques

File Structure: Definition of Record, File, Blocking, Compaction and Database, introductory overview of Database Management System, Implementation and Traders of Sequential Access, Index Sequential Access, Random Access, B-Trees, Inverted List and Multi list

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill
2. Tanenbaum, Data Structures using C & C++, PHI
3. Robert L. Kruse, Data Structures and Program Design in C, PHI
4. Mary E.S. Loomis, Data Management and file processing, PHI

SS341 **Economics for Engineers**

Course Learning Outcome (CLO):

After successful completion of the course, students will be able to

- understand the basic economic theory and economic way of thinking
- analyze macro - economic policies
- evaluate the economic efficiency in engineering projects

Syllabus

Module: - 1 MICRO ECONOMICS

Basic Economic Concepts: Meaning and understanding of basic economic concepts

Demand and Supply: Meaning and Determinants of Demand and Supply, Law of Demand and Supply, Elasticity of Demand and Supply.

Production Function: Meaning, production with one variable input, the law of variable proportion, the laws of returns to scale. Economies of Scale

Cost Function: Different types of costs, the short run and long run cost functions.

Market Structure: Meaning and characteristics of different types of market – Perfect Competition Monopoly Monopolistic Competition and Oligopoly

Module-2 MACRO ECONOMICS

Introduction to Macro Economics: Basic Macro Economic Concepts, National Income Accounting, Concepts of National Income and Methods of National Income Computation

Inflation: Meaning, types, causes, effect and remedial measures.

Money and Banking: Meaning and Functions of money, Money Supply, Commercial Banks and Central Bank-Meaning and Functions

Public Finance: Government Expenditure, Receipts, Budget and Deficits.

Self -Study: The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Books:

1. Micro Economics Robert S Pindyck, Daniel L Rubinfeld, Prem L Mehta - Pearson
2. Principles of Economics N.Gregory Mankiw, Thomson South Western , Pearson
3. Modern Economics – H.L.Ahuja – S.Chand & Company
4. Macro Economics – Rudiger Dornbush, Stanley Fisher, Richard Startz – Tata Mc-Graw-Hill
5. Principles of Macro Economics, C.Rangarajan and B.H.Dholakia, The McGraw Hill
6. Economics , Samuelson and Nordhaus, Tata McGraw Hill
7. Managerial Economics: Principles and Worldwide Applications, Dominick Salvatore, Adapted by Ravikesh Srivastava, Oxford University Press

SS342 **ICT Tools & Security** **[0 0 2 1]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- identify various modern ICT based tools and technologies
- understand features of the tools which are useful for academic/research/application development
- use ICT based tools for programme specific applications

Syllabus:

Appropriate IT security aspect as per latest vulnerabilities and appropriate number of tools are to be identified and studied as per programme specific needs, to be decided by the respective Course Coordinator and to be approved by Dean, FoTE before commencement of the course.

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Course Code	IT707
Course Name	Microservice Architecture and Programming

Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. recognize the key advantages and complexities present in microservice architectures
2. apply appropriate architectural approach for the design of microservices
3. implement microservice applications effectively with the suitable techniques and technologies

Syllabus:

Teaching Hours

Unit I **4**

Introduction to Microservices: Monolithic architecture, Distributed architecture, Web Services and Service Oriented Architecture, SOA and Microservice architecture, API Ecosystem for Microservice

Unit II **8**

Microservice Architecture Concepts: Microservice software architecture: patterns and techniques, Overall topology and core architecture components, Distributed architecture considerations, Service components and granularity, Bounded context, Data domains, Architectural characteristics, API layer design and implementation alternatives, Service discovery and registration, Best practices of microservice architecture

Unit III **7**

Managing Databases for Microservices: Distributed databases,NoSQL based systems: key-value based, document based, column based and graph databases, CRUD and CQRS concepts, Data consistency model for microservice, CAP theorem, Shared databases, Database per microservice, Scaling databases and storage services

Unit IV **7**

Transactions and Data Streaming in Microservices: Managing transactions with Sagas: choreographed, orchestrated and interwoven, Event sourcing, Transaction log tailing and polling publisher, Streaming data in microservices, Streaming SQL, Data streaming approaches with Apache Spark and Kafka

Unit V **6**

Messaging Middleware: IPC in microservice architecture, Synchronous and asynchronous messaging patterns, REST and gRPC based messaging, Service bus for commands and events, Message broker, Message queuing systems, Message driven micro service application

Unit VI **7**

Hybrid Architectures and Scalability: Service-oriented architecture and microservices architecture, Service-based architecture, Event-driven architecture for microservices, Architectural modularity, Serverlessmicroservices architecture pattern, Caching, Load balancing, Deployment strategies for scaling with containers, Virtual machines and clusters, Scaling microservices with orchestration and choreography, Circuit breaker

Unit VII **6**

Applications and Security: Microservices and DevOps, Using DevOps tools, Decomposition approaches of monolithic applications, Service testing, Service monitoring, Continuous delivery, Case studies of large scale online shopping systems, Microservice Security Principles, OAuth 2.0, Securing data at rest

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 7 experiments to be incorporated.

Suggested Readings^:

1. Sam Newman, Building Microservices: Designing fine grained systems, O'Reilly Media
2. IrakliNadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen, Microservice Architecture: Aligning Principles, Practices, and Culture, Shroff/O'Reilly
3. Susan J. Fowler, Microservices in Production, O'Reilly Media
4. Chris Richardson, Microservices Patterns With examples in Java, Manning publication
5. Morgan Bruce, Paulo A. Pereira, Microservices in Action, Manning publication
6. Vaughn Vernon, Implementing Domain-Driven Design, Addison-Wesley
7. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, Head First Design Patterns: A Brain-Friendly Guide, Shroff/O'Reilly
8. Jez Humble and David Farley, Continuous Delivery, Addison-Wesley Professional
9. Scott W Ambler &PramodSadalage, Refactoring Databases: Evolutionary Database Design, Addison-Wesley Professional
10. Cesar de la Torre, Bill Wagner, Mike Rousos, .NET Microservices: Architecture for containerized .Net applications, Microsoft Corporation

IT403 - Mini Project - I

Mini Project – I **[0 0 2 1]**

Course Learning Outcome:

After successful completion of this course student will be able to:

- acquire practical knowledge within the chosen area of technology for project development
- identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach
- contribute as an individual or in a team in development of technical projects
- develop effective communication skills for presentation of project related activities

Syllabus:

A project to be developed based on one or more of the following concepts.

Introduction to Java 2 SDK Tool Set Object Oriented paradigm, arrays, collection objects, data types, variables, functions, Wrapper Class, Object Class Inheritance, Interfaces, Abstract Class, Inner Class Exception Handling, Customization of Exception classes Event Handling, Adapter Classes Introduction To Application Programming In Java2, Creating Window Application, Writing Console Application, Use of Utility and Math Packages Introduction To Swing, MVC Architecture, Swing AWT and JFC, Writing Swing Application, Swing Components, Changing Look and Feel of Application Enhancing Application Using Clipboard, Drag and Drop, I/O Stream Enhancement, Printing, Internationalization Garbage Collection and Application Cleanup Applet and Applet Security

Network Programming, Sockets, URL Class, Internet Address Class

Java database Programming, Java.Sql Package Study, JDBC, Different Types of Drivers of JDBC

References:

1. Cay S. Horstmann, Gary Cornell, Core Java Vol I&II, Addison Wesley
2. Herbert Schildt, Java Complete Reference, Tata McGraw-Hill Education
3. Pots & Stephen, Unleashed Java 2 Platform, Sams Techmedia

MA403 Probability, Statistics and Numerical Analysis [3 1 2 5]

Course Learning Outcomes:

After successful completion of the course, student will be able to

- gain necessary prerequisite knowledge to apply concepts of Probability in Simulation and Modeling of various Computer Science problems
- apply Statistical and Numerical methods in various computer science related projects, seminars and research
- understand concepts in optimizing real world problems

Syllabus:

Basic Concepts of Probability: Reorientation, Permutations & Combinations, Definition of probability, Application of permutations and combination to Probability problems, Conditional probability, Bayes' Theorem, Markov chain, Binomial, Poisson and normal probability distributions

Statistical Computation: Measure of central tendency, Measures of Dispersion, Correlation and Regression, Linear regression, Regression coefficients, Algorithms for linear regression, Polynomial regression, Multiple regression, Curve fitting & Principle of Least squares, Sampling and Large Sample tests

Iterative Method: Motivation, errors, truncation error, rounded off error, absolute error, relative error and percentage error, Solution of algebraic and transcendental equation by bisection, False position, Secant, Newton-Raphson iteration and extended iteration methods, Rate of convergence of the iteration methods, Comparisons of iterative methods

System Of Linear Algebraic Equations: Solution of simultaneous linear equations, Gauss elimination and pivoting, III – Conditional equations and refinement of solutions, Gauss-Seidal iteration method Finite Differences and Interpolation: Finite Difference operators, Newton, Lagrange and Sterling's interpolation formulae, Chebyshev's polynomials

Numerical Differentiation and Integration: Numerical differentiation, Numerical integration by Newton-Cote's Formulae Numerical Solution of ordinary differential equations: Taylor series method, Euler's Method, Runge-Kutta method of 4th order, Milne's Predictor – Corrector method

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum six term assignments (TA) to be incorporated

Laboratory Work:

The Practical and Term work will be based on the topics covered in the syllabus Minimum 16 experiments should be carried out, Applications in the field of Computer engineering and Information Technology is to be covered in each topic.

References:

1. S.P. Gupta, Statistical Methods, S. Chand & Sons, Delhi
2. S.S. Gupta, Fundamentals of Statistics, Himalaya Publications House

3. Yogesh Jaluria, Computer Methods for Engineering, Allyn and Bacon. Inc.
4. S.C.Chapra and R.P.Canale, Numerical Methods for Engineers with Programming and Software Applications-, McGraw-Hill, New York
5. Probability, RandomVariables, Stochastic Processes – Papoulis.
6. S.D.Conte & Carl de Boor, Elementary Numerical Analysis – An Algorithmic Approach, Mc. Grwaw-Hill
7. C.E. Froberg, Introduction to Numerical Analysis, Addison Wesley

Seminar **[0 0 1 1]**

Course Learning Outcome:

After successful completion of this course, students will be able to

- develop skills like identifying needed information and retrieving useful and relevant information
- summarize information in identified field
- develop ability to communicate effectively to present technical summary

Syllabus:

During semester, candidate has to study on any advance topics under the guidance of faculty. There will be an interim presentation on the status of the study and a final presentation for evaluation will be required to be done by the candidate and candidate is required to submit his/her seminar report in bounded form for evaluation purpose. The department will announce final date of presentation.

SS561 Creativity and Innovation [2 0 0 2]

Course Learning Outcome:

By the end of this course students will be able to:

1. Understand the importance of R directed thinking complementing L directed thinking
2. Infer and discover processes and methods of creative problem solving
3. Enhance and correlate their creative and innovative thinking skills
4. Understand various disruptive innovations and techniques
5. Analyze and apply various tools of creativity to some basic problems

Syllabus:

1. INTRODUCTION:

1. Introduction to Creativity and Innovation
2. Creativity V/s. Innovation
3. Creativity as thinking skill
4. Critical Thinking V/s. Creative Thinking
5. Lateral Thinking
6. Engineering and Creativity
7. Creativity in Problem Solving

2. TOOLS FOR CREATIVITY:

1. Brain storming
2. Mind mapping
3. SWOC Analysis
4. Fishbone diagram
5. Six thinking hats
6. Borrowing brilliance
7. Da Vinci's seven principles
8. Provocation and movement
9. Examples and case studies

3. WHOLE NEW BRAIN

1. L directed thinking V/s. R directed thinking
2. From agriculture age to Industrial age to Information age to Conceptual Age
3. Need to high touch – design, story symphony, empathy, play, meaning

4. SKILLS FOR DISRUPTIVE INNOVATORS

1. Introduction
2. Associating
3. Questioning
4. Observing
5. Networking
6. Experimenting
7. Putting skills into practice
8. Case studies

5. MEDICI EFFECT

1. Introduction
2. Intersection
3. Creating medici effect

4. Making intersectional ideas happen
5. Case studies

6. TRIZ INNOVATION

1. Introduction
2. Ideality
3. Resources
4. Contradictions
5. Pattern of innnovation
6. Case studies

7. BIO MIMICRY

1. Introduction
2. Design of various products inspired by nature like Green building, bullet train, Nike Clothing, Velcro, Adhesive Tape, Turbine, self-heating plastic, friction reducing swimming suit, automated robot, screen display, deep blue

8. JUGAAD INNOVATION:

1. Introduction
2. Jugaad tactics: Seek Opportunities in Adversity, Do more with less, Think and act Flexibly, Keep it simple, Include the margin, Follow your heart.
3. Case studies

9. CASE STUDY BY IDEO DESIGN THINKING MODEL

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

1. Daniel H. Pink, A whole new mind, Pearson publication, New Delhi
2. Benyus, J.M.1997. Biomimicry:Innovation Inspired by Nature, HarperCollins,New York
3. Technical Innovation Center Inc, USA Altshuller G (1997) 40 Principles. TRIZ Keys to Technical Innovation. Technical Innovation Center Inc, USA Andrews P
4. Kelly, Tom (2001): The Art of Innovation, Lessons in Creativity from IDEO, America's Leading Design Firm, Doubleday, NY
5. Tina Seelig, Ingenius, A Crash course on Creativity Hayhouse, U.K
6. Edward de Bono, Lateral Thinking, Be more creative and productive, Penguin India
7. Edward de Bono, Teach Yourself to Think, Penguin India
8. Edward de Bono, Six Thinking Hats, Little Brown and Company
9. Jonah Lehrer, Imagine, How creativity works, Canongate, Edinburgh, London
10. John Adair, The Art of Creative Thinking, Kogan Page India, New Delhi
11. Jeff Dyer, Hall Gregersen & Clayton M. Christensen, The Innovator's DNA, Harvard Business Publishing
12. Daniel Goleman, Emotional Intelligence, Bloomsbury Publishing India P.Ltd.]
13. Howard Gardner, Five Minds for the Future, Harvard Business Review Press
14. Malcolm Gladwell, Blink: The Power of Thinking Without Thinking, Hachette Book Group USA
15. Navi Radjou, Jaideep Prabhu, Simone Ahuja, Jugaad Innovation, Wiley Publisher

Website References:

1. Ideo.com
2. Asknature.org
3. Edwdebono.com
4. Triz40.co

IT501 Data Communication Networks [3 1 2 5]

Course Learning Outcomes

After successful completion of this course, student will be able to

- understand the significance and concepts of computer networks
- conceptualize and appreciate the layered model for computer networking
- analyze concepts of communication systems for digital transmission
- identify basic protocols and design issues for layered model
- design and implement protocols related to various networking layers

Syllabus:

Introduction and use of Computer Networks, Network Hardware, Network Software, Reference Models, Example Networks and standards

Physical Layer: Basis for data communication, Digital to digital and Analog to digital conversion, transmission modes, Analog transmission: Digital to analog and analog to analog conversion.

Multiplexing and spreading techniques. Switching techniques, types of switching, structure of switch, types of switches. Guided Media and Unguided Media: Radio Frequency Allocation, frequency reuse, Error Detection & Correction, Types of Errors, Error detection techniques, Error Correction techniques, Multiple-Bit Error Correction.

Data Link Layer: Data link Layer Design Issues, Error control, Elementary Data Link Protocols, Sliding Window Protocols, example DLL protocols, Protocols Verification models

Medium Access Control Sub layer: Channel Allocation, Multiple Access Protocols, Ethernet, Data Link Layer Switching

Network Layer: Design Issues, Routing Algorithms: Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Broadcast, multicast routing, Congestion Control Algorithms, Quality of Service, Internetworking, Example protocols: IPv4 and IPv6.

Transport Layer: Transport Service Elements of Transport Protocols, UDP, TCP.

Application Layer: The Domain Name System, Electronic Mail, World Wide Web, Content delivery

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Andrew S. Tanenbaum, Computer Networks, PHI
2.Forouzan , Data Communication Networking, TMH
3.Peterson and Davie, Computer Networks, A Systems Approach, Morgan Kaufmann Publication

CE502 **Database Management Systems** **[3 1 2 5]**

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

- understand preliminaries of database management system concepts and its applications
- conceptualize and formalize relation amongst various entities of the database
- understand and design optimal way of storage and retrieval, in correlation with relational model through appropriate indexing and normalization
- create optimal query using structured query language
- understand advanced DBMS concepts like transaction processing, concurrency control and recovery

Syllabus:
Introductory concepts of DBMS: Purpose of database, Data independence, Relational Systems and others.
An Architecture for a Database System: Multi-level architecture. Mapping, database administrator, database management system, data communications manager, Client/Server architecture
An Introduction to Relational databases: Relational systems, the relational model, base tables and views, DDL, DML, DCL.
Relational Data Objects: Domains and Relations: Domains, Relations, kinds of relations, Relations and predicates, Relational databases
Relational Data Integrity: Candidate Keys and Constraints: Candidate Keys, Primary Keys and Alternate Keys, Foreign Keys and rules, Null value concept and other integrity constraints.
Relational Operators: Relational Algebra: Closure, set operations, special relational operations, algebra for update operations, Relational Comparisons. Relational Calculus: Tuple and Domain-Oriented relational calculus.
The Entity / Relationship Model: Introduction, The overall approach, an overview of the E/R model, E/R diagrams, Database design with the E/R model.
Functional Dependencies: Introduction, Basic definitions, Trivial and nontrivial dependencies, Closure of a set of dependencies, Closure of a set of attributes, Irreducible sets of dependencies.
Database Design: Introduction to normalization, Non loss decomposition and functional dependencies, Dependency preservation, first, second and third forms, Boyce / Codd normal form, higher normal forms multivalued dependencies and fourth normal form, join dependencies and fifth normal form.
Data Storage and Querying: Storage and File Structure: Overview of physical storage media, RAID. Query Processing & Query Optimization: Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, and materialized views
Transactions: Transaction concepts, transaction model, transaction atomicity and durability, serializability.
Recovery: Transaction recovery, system recovery, media recovery, two phases commit, SQL support.
Concurrency: Three concurrency problems, locking, deadlock, serializability, levels of isolation, intent locking, SQL support.
Introduction to database Security
Self-Study: To be decided by course coordinator at the beginning of semester, which will be a blend of one or more of the e-Learning Resources, Video Lectures, Online courses, tools, research material, web links etc. along with the related assessment component(s). The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.
Laboratory Work

Above concepts are to be implemented using SQL and Pl/SQL and at least 10 experiments are to be carried out.

Tutorial Work

Tutorial work will be based on above syllabus using SQL and PL/SQL with minimum 10 Tutorials to be incorporated.

References:

1. Database System Concepts by Silberschatz, Korth, Sudarshan
2. An introduction to Database Systems, C J Date, Addition-Wesley
3. Database System using Oracle by Nilesh shah, PHI.
4. Fundamentals of Database Systems, Ramez Elmasri & Shamkant B. Navathe, Addison-Wesley
5. SQL, PL/SQL by Ivan Bayross
6. Oracle9i PL/SQL programming by Scott Urman

SS562 Law for Engineers

Course Learning Outcome

By the end of the course, students will be able to

- Understand the Indian Legal System and Basics of different laws.
- Understand, explore, and acquire practical insight of legal system and its application in engineering profession.

Syllabus

Unit I

Introduction to Indian Legal System: Constitution of India, Sources of Law and Judicial system

Unit II

1. Contracts and its Elements: Employment contracts, Contract Interpretation, Service Contract, Contract of Indemnity, Law of Agency
2. Employment agreement

UNIT 3

1Legal Documentation: Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and sub-contracting

UNIT 4

1. Intellectual Property Rights (IPR): Overview
2. Trademarks, Copy Rights, Patents with special emphasis in Biotechnology Inventions, software, circuits and design
3. Protection in Foreign Countries

UNIT 5

1. Cyber Laws, E-Commerce and E-Governance

UNIT 6 Introduction to Labour Laws

1. Labour Laws: Provident Fund, ESIC, Gratuity, Bonus, Perquisites, Contract labour
2. Health, Safety and welfare of construction workers.

UNIT 7

Taxation: Income Tax, Service Tax, VAT, Excise Duty

UNIT 8

Alternate Dispute Resolution (ADR) in Domestic and International dealings

UNIT 9

Introduction to Criminal Law RTI Act

References

1. Karnika Seth, Computer Internet and New Technology Laws, Lexisnexis, First Edition 2013.
2. Prafulla C Pant, The Arbitration And Conciliation Act, 1996, Butterworths India, New Delhi.
3. Joseph Minattur, Indian Legal System, Indian Law Institute, New Delhi.
4. J. Beatson, Anson's Law Of Contract, Oxford University Press.

5. V. S. Datey , Indirect Taxes: Law And Practice, Taxmann Publications (P) Ltd, Latest Edition

6. Dr. Vinod K. Singhania And Dr. Monica Singhania , Student's Guide To Income Tax, Taxmann Publications (P) Ltd, Latest Edition.

7. S.C. Srivastava, Industrial Relations And Labour Laws, Vikas Publishing House Pvt. Ltd.

IT503

Mini Project- II [0 0 2 1]

Course Learning Outcome:
After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

Guidelines:
A project to be developed based on one or more of the following fields.
Data Structure, Low level programming, Web technology, Operating systems, Hardware Design

CE504 **Operating Systems** **[3 1 2 5]**

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

- identify basic components of operating system
- conceptualize synchronization amongst various components of a typical operating system
- understand and simulate activities of various operating system components
- correlate basic concepts of operating system with an existing operating system
- design miniature prototypes of operating system components

Syllabus:
Introduction: Evolution of operating systems, operating system services, types of operating system, different view of operating system, Review of types of I/O polled, interrupt driven and DMA.
Process Scheduling: Concepts of Process, attributes of process, process control block, data structures. Processes and threads, process status, scheduler: long term, medium term, short term scheduler, matrix of evaluation, scheduling algorithms, performance evaluation of algorithm
Inter process Communication(IPC): Need of IPC, concurrency, Race conditions, critical section, mutual exclusion problem, solution approaches, algorithmic approaches, critical region, condition for critical region, semaphore : Binary ,counting, the queuing implementation. Monitors , message passing: synchronous vs asynchronous message exchange.
Classical IPC Problems: Dinning Philosopher Problem, Sleeping Barber Problem, Reader's & Writer Problem, procedure control.
Deadlock - Deadlock problem, deadlock characterization, dealing with dead lock, deadlock prevention, deadlock avoidance: banker's algorithm for single resource & multiple resources, deadlock detection, the ostrich algorithm.
Memory Management - Paging: Principle of operation, page allocation, h/w support for paging, multiprogramming with fixed no. of task, multiprogramming with variable no. of task, segmentation, virtual memory : concept, performance of demand paging, page replacement algorithms, thrashing, locality.
Input Output Management-Principles of input/output: Input / Output devices, device controllers, direct memory access, principles of input/output s/w : goals of the input/output s/w, interrupt handler, device driver, device independent input/output software, devices as files, the inode structure and organization.
Disks- Disks arm scheduling algorithm, error handling
File Systems: file structure, file types, file access, file attributes, file operations, memory mapped files, directories: hierarchical directory system, pathnames, directory operations, file system implementation, implementing files: contiguous allocation, linked list allocation, linked list using index, Inodes, implementing directories in various operating systems. Shared files, disk space management, file system reliability, file system performance, access control.
Introduction to Multiprocessor and Distributed Operating System
Case Study of any Open Source Operating System based on above concept
Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.
Laboratory Work:
The Practical and Term work will be based on the topics covered in the syllabus. Minimum 12 experiments should be carried out.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. William Stalling, Operating System – Internals, Prantice Hall
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall
3. Peterson, Operating System Concepts, Addition-Wesley Longman Publishing Co
4. Milan Milenkovic, Operating System – Design & Concepts, Mc Graw Hill
5. Stephen Prata, Advanced Unix - A Programmer's Guide, BPB Publications
6. Yashwant Kanitkar, Unix Shell Programming, BPB Publications
7. Sumitabha Das , Unix System V.4 Concepts & Applications, Pub. TMH
8. Maurice Bach, The Unix Operating System, Prentice Hall

CE501 **Theory of Computation** **[3 1 0 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to:

- understand formal language theory and its application to computer science
- apply mathematical preliminaries to develop the basic components of language design
- design simple computational machines using the concepts of language theory
- correlate computability with formal computational machines

Syllabus:

Review of Mathematical Terms and Theory: Basic Mathematical Notations and Set Theory, Logic Functions and Relations, Language Definitions, Mathematical Inductions and Recursive definitions

Finite Automata: Deterministic and Non Deterministic Finite Automata, Ù-Transitions, Conversion from NFA to DFA, Kleene's Theorem, Regular and Non Regular Languages

CFG (Context Free Grammar): Introduction To CFG, CFG and Known Languages, Unions Concatenations and *'S Notations and CFL, Derivations of Trees and Ambiguity, Unambiguous CFG and Algebraic Expressions, Normal Forms and Simplified Forms

Pushdown Automata, CFL and NFL: Introduction To PDA, Definition, DPDA, PDA corresponding to CFG, CFG Corresponding To PDA, Introduction To CFL, Intersections and Complements of CFL, Decisions Problems and CFL

Turing Machines, Recursive Language: Model of Computation and Church Turning Thesis, Definition of Turing Machine, TM and Language Acceptors, Variations of TM, Non Deterministic TM, Universal TM, Enumerable and Language, Recursive and Non Recursive Enumerable Computation Functions, Measuring, Classifications and Complexity, Primitive Recursive Functions, Halting Problem, Recursive Predicates and Some Bounded Operations

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. John C. Martin, Introduction To Languages and Theory of Computation, TMH
2. A.V. Aho, Ravi Sethi, J. D. Ullman, Compiler tools Techniques, Addison Wesley publication

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand the basic structure of web designing technology
- apply the concepts of web technology in designing static and dynamic web pages
- design interactive web pages incorporating validation techniques

Syllabus:

Introduction to various HTML tags: Introduction to HTML, HTML Documents, HTML Structure tags.HTML Block level tags, HTML Text level tags, Different types of Lists, Nesting of lists, Linking HTML Documents, Frames, tables and forms.

Cascaded Style Sheets: What are style sheets, importance of CSS, Different approaches to style sheets, Using Multiple approaches, linking to style information in separate file, setting up style information using inline, internal and external style sheet

JavaScript: Introduction to JavaScript, JavaScript syntax, variables and their types, JavaScript operators, arrays and array methods, Control statements, built-in objects in JavaScript, Array, String, Math, Date objects, validation using JavaScript

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Deitel Deitel Nieto, Internet and World Wide Web: How To Program
2. Scott Parker, Paperback, The Web Designer's 101 Most Important Decisions Professional Secrets for a Winning Website
3. Kogent Learning Solutions Inc., Html5 Black Book : Covers Css3,Javascript,Xml,Xhtml,Ajax,Php And Jquery, Dreamtech Press

Jon DuckettPublisher, Beginning Web Programming with Html, XHTML and CSS, Wiley I

IT612 **Advanced Computer Networks** **[3 1 0 4]**

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

- understand architectures of high speed network systems of wired and wireless medium
- analyze the process of congestion and traffic management in high speed networks
- identify various factors that lead to QoS based provisioning of data on communication networks
- design networks with advanced communication requirements and features

Syllabus:

High Speed Networks: Frame Relay, ATM, X.25, Optical Carrier

Congestion and Traffic Control: Congestion control in TCP variants, Frame relay and ATM

QoS in IP Networks: Integrated Service Architecture (ISA), Distributed Service (DS), Queuing Disciplines, Resource Reservation Protocol (RSVP), Multiprotocol label Switching (MPLS)

Wireless Networks: Wireless LAN, Wireless Internet, TCP in Wireless Domain, Adhoc Wireless Networks: issues, protocols, routing, mobility, and Energy efficiency in ad-hoc network

Wireless Sensor Networks: Issues and challenges
Satellite based networks and Delay tolerant networks

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:
1. William Stallings, High Speed Networks and Internets Performance and Quality of Service, Pearson Education
2. C. Siva Ram Murthi, B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall
3. Feng Zhao, Lionidas Guibas, Wireless Sensor Networks, Morgan Kaufman.

CE653 **Advance Data Structures** **[3 1 0 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- realize the importance of various data structures from application perspective
- apply the knowledge of data structures for real-time applications
- optimize the working algorithm to solve the given engineering problem efficiently
- design algorithms for various engineering applications

Syllabus:

Elementary Structures: Stack, queue, double-ended queue, dynamic allocation of nodes, shadow copies of array based structures

Search Trees: Models of Search Trees, Properties and transformations, height of search tree, basic find, insert and delete, returning from leaf to root, dealing with non-unique keys, queries for keys in an interval, Building optimal search trees, converting trees to lists, removing a tree

Balanced Search Trees: Height balanced and weight balanced trees, (a,b) and B-trees, Red Black Trees and Trees of almost optimal height, Top Down rebalancing for Red Black Trees, Trees with constant update time at a known location, Finger trees and level linking, trees with partial rebuilding, Splay Trees, Skip Trees, Joining and Splitting Balanced Search Trees

Tree Search for Set of Intervals: Interval Trees, Segment Trees, Trees for union of intervals, trees for sums of weighted intervals, trees for interval-restricted maximum sum queries, orthogonal range trees, higher dimensional segment trees, other systems of building blocks, range counting and semi group model, kd – trees and related structures

Heaps: Array based heaps, heap ordered trees and half ordered trees, Leftist Heaps, Skew heaps, Binomial heaps, Changing keys in heaps, Fibonacci heaps, heaps of optimal complexity, Double ended heap structures and multidimensional heaps, heap related structures with constant time updates

Union – Find and related structures: Union – Find, Union Find with copies and dynamic segment trees, list splitting, Problems on root directed trees, maintaining a linear order

Data Structure Transformations: Making structures dynamic and persistent

Data Structures for Strings: Tries and compressed tries, Dictionaries allowing errors in queries, Suffix Trees, Suffix arrays

Hash Tables: Basic Hash Tables and Collision resolution, Universal families of Hash Functions, Perfect Hash Functions, Hash Trees, Extendible Hashing, Membership Testers and Boom Filters

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 12 tutorials to be incorporated.

References:

1. Peter Brass, Advanced Data Structures, Kindle Edition
2. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Computer Science Press
3. Sartaj Sahni, Data Structures, Algorithms and Applications in C++, D. Universities Press

IT682 **Business Analysis and Optimization** **[3 1 0 4]**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the internal factors that impact the business strategy
- understand the external factors that impact the business strategy
- understand optimization principles that guide effective allocation of resources

Syllabus:
Introduction to Business Analysis: Need for and purpose of business analysis, Understanding Competitive Forces – Porter's Five Force Model, Corporate Strategy, Creating and sustaining business model
Business Process Change: Role of process and process change initiatives, Software Solutions
Project Management: Project Design, Project Evaluation Methods, Payback Period Method, Average Rate of Return Method, Net Present Value (NPV) Method and Internal Rate of Return (IRR) Method
Financial Analysis: Link between business strategy and finance, Cost of Capital, Supply of Capital , Capital Rationing
Information Technology: Principles of E-Business, E-Business Applications in Up-Stream Supply Chain E-Business Applications in Down Stream Supply Chain, E-Business Application in Customer Relationship Management – CR
Optimization: Introduction to Decision Science, Genetic Approach in Evolutionary Solver, Linear Programming Models, Non-Linear Programming Models, Data Envelopment Analysis, Integer Programming
Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.
Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Malcom Eva, Keith Hindle, Craig Rollaston, Business Analysis, Kindle Edition
2. Donald Yeaton, John Cadle, Business Analysis – BCS Edition, The Charter Institute for IT
3. Ken Baker, Optimization Modelling and Spreadsheets, John Wiley and Sons, 2011

IT662 **Cloud Computing** **[3 1 0 4]**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the hardware, software concepts and architecture of cloud computing
- contrast the key technical and commercial issues concerning cloud computing versus traditional software models
- realize the importance of virtualization technology in support of cloud computing
- explore the issues related to cloud computing

Syllabus:
Introduction: Cloud Computing in a Nutshell, Layers and Types of Clouds, Desired Formats of Cloud, Cloud Infrastructure Management, Challenges and Risks.

Virtualization: Virtualization of Computing, Storage and Resources.

Cloud Services: Introduction to Cloud Services IaaS, PaaS and SaaS.

Software as a Service (SaaS): Evolution of SaaS, Challenges of SaaS Paradigm, SaaS Integration Services, SaaS Integration of Products and Platforms, Business – to Business Integration B2Bi Services

Infrastructure As a Services (IaaS): Introduction, Background & Related Work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in a Cloud Context.
Platform As a service (PaaS): Integration of Private and Public Cloud, Technologies and Tools for Cloud Computing, Resource Provisioning Services.
MapReduce Programming models and Implementations: Introduction, Map Reduce Programming Model, Major Map Reduce Implementations for the Cloud, Map Reduce Impacts
Migrating into a Cloud: Cloud Services for Individuals, Cloud Services Aimed at the Mid- Market, Enterprise Class Cloud Offering, Introduction to File System & Hadoop.

Management and Monitoring: Accounts Monitoring, User profiles in Cloud, Resource Allocation and Pricing in Cloud.

Security: Introduction, Cloud Storage: from LANs to WANs, Technologies for Data Security in Cloud Computing, Security Concerns, Legal issues and Aspects, Securing the Private and Public Cloud Architecture.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.
Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Rajkumar Buyya, James Broberg,Andrzej M Goscinski, Cloud Computing: Principles and Paradigms, Wiley publication
2. Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media.
3. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication
4. John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises, Recursive Press

IT632 **Computer Graphics and Visualization** **[3 1 0 4]**

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

- understand various aspects of computer graphics
- realize the working of basic drawing and rendering algorithms in 2D and 3D
- design and create components in 2D and 3D
- understand various aspects of computer visualization

Syllabus:
Introduction in to graphics. History and classes of graphics output devices (vector and raster graphics, 3D displays) Graphics pipeline, video processor, bit map, look up table, bitblt operations, basic picture coding
Color models (RGB, HLS, CMYK, CNS, CIE), Color Mapping, Dithering, windows and desk top metaphor display elements and layout, visual feedback Line generation algorithms, circle generation algorithm, fonts generation, area filling, anti-aliasing
Parametric curves and surfaces, 3D model reconstruction from 2D images
Coordinate systems in 2D and 3D graphics, homogeneous coordinates, affine transformations, viewing transformations, frame to window mapping, line and polygon clipping
Projections, viewing transformations, perspective transformation, 3D clipping. Culling, hidden points, lines and surfaces elimination (painter and depth buffer algorithm)
Polygonal B-objects representation, basic topology, Euler formula, constructive solid geometry, volumetric models. Explicit and implicit curves and surfaces.
Special modeling (particle systems, fractals, iterative functions)
Key frame animation, morphing, camera animation, scripts, articulated bodies, inverse kinematics, soft body and natural phenomena animation
Lighting and Generalized Lighting Models. Flat, Gourard and Phong shading, environment, texture and bump mapping, introduction to Ray-tracing, Ray-casting, Global Illumination
Virtual Reality history, VR classes, stereoscopy, collision detection, visibility calculation, level of detail, image based virtual reality
Introduction to Scientific Visualization and simulation. Basic functions in visualization vector fields, tensors, flow data, scalar field, high maps, volumes, iso-surfaces.
Introduction to Information Visualization, visualization process, graph visualization, multi-variate data visualization, visualization metaphors
OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.
Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Ed. Angel, Dave Shreiner, Interactive Computer Graphics, Addison-Wesley
2. Angel, Interactive Computer Graphics: A Top-Down Approach with OpenGL, E. Addison Wesley.
3. Sumanta Guha, Computer Graphics through OpenGL, from theory to experiments

4. Wright, OpenGL Super Bible
5. Angel, OpenGL : A Primer by Edward Paperback
6. Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics by James D Foley, Addison-Wesley
7. Donald Hearn and Pauline Baker, Computer Graphics – Openl GL Version, Pearson Education.
8. F.S. Hill, Computer Graphics Using OpenGL, Pearson Education.

CE633 **Data Mining** **[3 1 0 4]**

Course Learning Outcomes:

After successful completion of this course, student will be able to:

- identify the key processes of data mining, data warehousing and knowledge discovery process
- understand the basic principles and algorithms used in practical data mining and their strengths and weaknesses
- apply data mining techniques to solve problems in other disciplines in a mathematical way

Syllabus:

Introduction Motivation and importance, different kinds of data, data mining functionalities, classification of data mining systems, major issues in data mining

Data Preprocessing Data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation

Data Warehouse and OLAP Technology Multidimensional data model, data warehouse architecture, data warehouse implementation

Data Cube Computation and Data Generalization Efficient methods for data cube computation, attribute oriented induction

Mining Frequent Patterns, Associations and Correlations: Basic concept, efficient and scalable frequent itemset mining methods, mining various kind of association rules, from association mining to correlation analysis, constraint-based association mining

Classification and Prediction Classification vs. prediction, Issues regarding classification and prediction, Classification by decision tree induction, Bayesian classification, rule-based classification, classification by backpropagation, support vector machines, associative classification, lazy learners, linear regression, nonlinear regression, accuracy and error measures, evaluation the accuracy of a classifier or predictor, ensemble methods

Cluster Analysis Types of data in cluster analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods, density-based methods, grid-based methods, model-based clustering methods, clustering high dimensional data, outlier analysis.

Current Problems in Machine Learning

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Jiawei Han and Micheline Kamber, Data mining: Concepts and Techniques, Morgan Kaufmann Publishers.
2. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 2005, ISBN: 0-12-088407-0.
3. Hand, Mannila, and Smyth., Principles of Data Mining, MIT Press, 2001, ISBN: 026208290X.
4. Berry and Linoff, Mastering Data Mining, Wiley, 2000. ISBN: 0471331236.
5. Delmater and Hancock, Data Mining Explained, Digital Press, 2001. ISBN: 1555582311.

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand need of complexity analysis of the algorithm
- analyze and formalize behavior of algorithms in different scenarios
- identify and evaluate suitable data structure to solve a problem effectively and efficiently
- compare and evaluate various problem solving approaches based on algorithmic complexity with respect to relevant applications

Syllabus:

Elementary Algorithmic: Efficiency of Algorithms, Average & worst-case analysis, Elementary Operation

Analysis Techniques: Empirical, mathematical, Asymptotic analysis and related unconditional and conditional notations**.**

Analysis of Algorithms: Analyzing control structures: sequencing, "For" loops, Recursive calls, "While" and "repeat" loops, using a barometer, Amortized analysis

Solving Recurrences: Intelligent guesswork, Homogeneous recurrences, Inhomogeneous Recurrences, Change of variable, Range transformations, Master Theorem, Recurrence Tree

Data Structures: Heaps, Binomial heaps, Disjoint set structures

Greedy Algorithms: Graphs: Minimum spanning trees-Kruskal's algorithm, Prim's algorithm, Graphs: Shortest paths

Divide-and-Conquer: Multiplying large integers, Binary search, sorting: sorting by merging, quick sort, finding the median, Matrix multiplication, Exponentiation

Dynamic Programming: Making Change, The principle of optimality, The Knapsack Problem, Shortest path, Chained matrix multiplication, Approaches using recursion, Memory functions.

Branch and Bound, Backtracking: Design of some classical problems using branch and bound and Backtracking approaches.

Brief Overview of NP theory, dealing with higher bounds of computing problems through approximation algorithms.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, PHI
2. Gilles Brassard & Paul Bratley, Fundamentals of Algorithmic, PHI.

Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekharan, Fundamentals of Computer Algorithms, Galgotia.

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Course Code	CE671
Course Title	Internet of Things

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. explain the components of IoT Architecture and platforms of IoT ecosystem,
2. identify types of data analytics and data visualization tools as per the need of the problem,
3. design and implement edge type networks,
4. apply analytics and transform data to draw meaningful conclusions.

Syllabus:	Teaching Hours:
Unit I	6
Introduction to IoT: Basics of IoT, Evolution of IoT, IoT and related terms, Business Scope	
Unit II	9
Elements of IoT: Basic Architecture of an IoT Application Sensors & Actuators, Edge Networking (WSN), Gateways, IoT Communication Model – WPAN & LPWA	
Unit III	12
Communication and Connectivity Technologies: Big Data Analytics, Data Visualization, IoT Platforms	
Unit IV	12
Concerns and Future Trends: Different Players of IoT, Security Concerns and Challenges, Future Trends, Standards	
Unit V	6
Applications based on IoT: DIY (Do It Yourself) kits, IFTTT (If This Then That) applications for IoT and other apps	

Laboratory Work:

Above concepts are to be implemented using related tools/technologies and at least 10 experiments are to be carried out.

Suggested Readings ^:

1. Phuong Vo.T.H, Martin Czygan, Getting Started with Python Data Analysis, PACKT Publishing
2. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, O'Reilly Media
3. 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley
4. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers
5. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann
6. Internet of Things with Python, Gaston C. Hillar, Packt Open Source

2IT444 - Introduction to Mainframes

Evolution of Mainframe hardware: Overview of Computer Architecture -Classification of Computers - micro, mini, mainframes and super computer - Mainframe computer - key features - benefits - Evolution of Mainframes - Different hardware systems
Mainframes OS and Terminology: Operating systems on mainframes, Batch processing vs. online processing - mainframe operating system. - evolution - concepts of Address space, Buffer management - Virtual storage - paging - swapping - Dataset management in mainframes
z/OS and its features: Z-operating system (Z/OS) - Virtual storage - Paging process - storage Managers - Program execution modes - Address space - Multiple virtual system(MVS) , MVS address space, Z/OS address space - Dataset - sequential and partial dataset - Direct access storage device(DASD) -Access methods - Record formats - Introduction to virtual storage access methods(VSAM) - Catalog - VTOC
Introduction to JCL: Introduction to Job Control language - Job processing - structure of JCL statements - Various statements in JCL - JOB statement - EXEC statement - DD statement - JCL procedures and IBM utility programs.
COBOL Programming 1

- Introduction – History, evolution and Features, COBOL program Structure, steps in executing COBOL
- Language Fundamentals – Divisions, sections, paragraphs, sections, sentences and statements, character set, literals, words, figurative constants, rules for forming user defined words, COBOL coding sheet.
- Data division – Data names, level numbers, PIC and VALUE clause, REDEIFNES, RENAMES and USAGE clause
- Procedure Division – Input / Output verbs, INITIALIZE verb, data movement verbs, arithmetic verbs, sequence control verbs.

COBOL Programming 2

- File processing – Field, physical / logical records, file, file organization (sequential, indexed and relative) and access mode, FILE-CONTROL paragraph, FILE SECTION, file operations.
- File handling verbs – OPEN, READ, WRITE, REWRITE, CLOSE.
- Table processing – Definition, declaration, accessing elements, subscript and index, SET statement, SEARCH verb, SEARCH ALL verb, comparison.
- Miscellaneous verbs – COPY, CALL, SORT, MERGE, STRING, UNSTRING verbs.

Overview of DB2:

- Introduction to DB2 – System Service component, Database Service component, Locking Service component, Distributed Data Facility Services component, Stored Procedure component, catalogs and optimizer
- DB2 Objects and Data Types - DB2 Objects Hierarchy, Storage groups, Database, Table space, Table, Index, Clustered index, Synonyms and aliases, Views, Data Types.
- DB2 SQL programming – Types of SQL statements, DCL, DDL, DML, SPUFI utility.
- Embedded SQL programming – Host variable, DECLGEN utility, SQLCA, single/multiple row manipulation, cursors, scrollable cursors.

Mainframe Application Development guidelines: COBOL coding standards, relation between a COBOL file handling program and JCL, Different types of ABEND codes, COBOL-DB2 program pre-compilation, DBRM (Database Request Module), Application plan/packages, program execution methods (EDIT JCL, foreground and background modes).
Practical Work: Minimum 10 experiments to be carried out based on the theory contents
Textbooks:

1. MVS JCL, Doug Lowe, Mike Murach and Associates
2. Gary DeWard Brown, JCL Programming Bible (with z/OS) fifth edition, Wiley India Dream Tech, 2002.

3. z/OS V1R4.0 MVS JCL Reference found online at http://www-1.ibm.com/support/docview.wss?uid=pub1sa22759706
4. z/OS V1R1.0 MVS JCL Reference found online at http://publibz.boulder.ibm.com/cgibin/bookmgr_OS390/ BOOKS/iea2b600/CCONTENTS
5. COBOL - Language Reference, Ver 3, Release 2, IBM Redbook.
6. COBOL - Programming Guide, Ver 3, Release 2, IBM Redbook.
7. Nancy Stern & Robert A Stern, "Structured Cobol Programming", John Wiley & Sons, New York, 1973.
8. M.K. Roy and D. Ghosh Dastidar, "Cobol Programming", Tata McGraw Hill, New York, 1973.
9. Newcomer and Lawrence, Programming with Structured COBOL, McGraw Hill Books, New York, 1973.
10. Craig S Mullins, DB2 Developer's Guide, Sams Publishing, 1992.
11. Gabrielle Wiorkowski & David Kull, DB2 Design & Development Guide, Addison Wesley, 1992.
12. C J Date & Colin J White, A Guide to DB2, Addison Wesley.
13. IBM Manual: DB2 Application Programming and SQL guide.
14. IBM Manual: DB2 SQL Reference.
15. DB2 Version 7 Information Center found online at http://publib.boulder.ibm.com/infocenter /db2v7luw/index.jsp

CE621 **Java Technologies** **[3 0 2 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- describe and interpret the basics of Java technologies
- apply the concepts of java technologies to design interactive applications
- demonstrate applications of java technologies for developing secured distributed applications

Syllabus:

Introduction to Swing: MVC Architecture, Swing AWT and JFC, Writing Swing Application, Swing Components, Changing Look and Feel of Application, Enhancing Application Using Clipboard, Drag and Drop, I/O Stream Enhancement, Printing, Internationalization

Java database Programming: Java.Sql Package Study, JDBC, Different Types of Drivers of JDBC

Java 2 Enterprise Edition Overview, J2EE multi-tier architecture, J2EE Design pattern and frameworks,

Java Servlet Programming and Web Development: HTTP request, HTTP response, Directory structure of web application, Servlets and CGI, container responsibilities, servlet life cycle, Get and Post Requests, Deployment Descriptor, various names for servlet referencing, Request and Response Objects, Request forwarding, Servlet init parameters, Servlet Request parameters, context parameters, Servlet Listeners, various servlet attributes and its scopes,

Conversational States: Java beans, databases, Session management

Cookie management, Servlet Filters

Java Server Pages: Servlet and JSP, JSP directives, JSP scripting elements, JSP action elements,

Introduction to Struts Programming, Struts Architecture, Configuring Struts components, Executing Struts

Introduction To Distributed Applications, Distributed Application Architecture, Introduction To RMI, and CORBA

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Bryan Basham;Kathy Sierra;Bert Bates, Head first Servlets and JSPs, O'Rilley Media
2. Ivan Bayross, Sharanam Shah, Cynthia Bayross and Vaishali Shah, The Team X (SPD), Java Server Programming for professionals, The X Team/Shroff Publishers

Black Book, Java Server Programming, Dreamtech Press

CE651 **LAMP Technologies** **[3 0 2 4]**

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

- understand the importance of open source technologies
- describe and interpret the basics of LAMP technology
- correlate the Linux, Apache, MySQL and PHP for building an application
- design and develop applications using open source technologies

Prerequisites: Students must have strong fundamentals of programming and OOP concepts

Syllabus:

Introduction to LAMP Technology: Characteristics and Advantage of LAMP, Installation and Configuration of LAMP stack. Understanding of Apache Web Server, Understanding and setting of various configuration files of LAMP stack.

MySQL: Introduction to MySQL, Creation of MYSQL database, Creating tables, Implementation of DDL and DML queries on MYSQL database. phpmyadmin to manage MySQL database. MySQL database administration.

PHP Programming fundamentals: Understanding syntax and variables of PHP, Control statements and functions, passing information between PHP pages, String Handling, arrays, improving PHP/MySQL efficiency

Object Oriented programming with PHP : What Is Object-Oriented Programming?, Basic PHP Constructs for OOP, Advanced OOP Features, Introspection Functions, Gotchas and Troubleshooting, OOP Style in PHP, Advanced Array Functions, String and Regular Expression Functions, Handling Session and Cookies in PHP

File Handling: Understanding PHP File Permissions, File Reading and Writing Functions, Filesystem and Directory Functions, Network Functions, Date and Time Functions

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Steve Suehring, Tim Coverse, Joyce Park, PHP MYSQL Bible, John Wiley & Sons
2. Timothy Boronczyk, Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Beginning PHP6, Apache, MySQL Web Development, Wiley

CE623 **Machine Learning** **[3 1 0 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to:

- understand machine learning concepts and range of problems that can be handled by machine learning
- compare and parameterize different learning algorithms
- apply the machine learning concepts in real life problems

Syllabus:

Introduction: Theory and practices in machine learning

Supervised Learning: Decision trees, Bayesian Decision theory, Parametric Methods, Multivariate methods, Dimensionality Reduction

Unsupervised Learning: Clustering, Nonparametric Methods, Linear models for regression, Linear models for classification

Kernel Methods: Support Vector Machine, Sparse kernel machines, Graphical Models, Mixture models and EM, Approximate Inference, Sampling Methods.

Reinforcement learning: Q Learning, Non deterministic rewards and Actions.

Evolutionary computing: Genetic Algorithms, Genetic Programming

Evaluation Techniques: The PAC and mistake bound learning frame work VC dimension, Minimum description length principle.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 5 tutorials to be incorporated.

References:

1. T.M. Mitchell, Machine Learning, McGraw-Hill.
2. Ethern Alpaydin, Introduction to Machine Learning, MIT Press.
3. Duda R.O. and Hart P.E., Pattern Classification and Scene Analysis, John Wiley & Sons, NewYork
4. Chris Bishop. Pattern Recognition and Machine Learning, Springer.
5. N. Cristianini and J. Shawe-Taylor, “An Introduction to Support Vector Machines”, Cambridge Univ. Press

IT602 **Mini Project- III** **[0 0 2 1]**

Course Learning Outcome:

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

Guidelines:

A project to be developed based on database management at the back end and any other application development at the front end. Main focus of this project must be on effective database design.

CE661 Mobile Application Development Technologies [3 0 2 4]

Course learning Outcomes:

After successful completion of this course, student will be able to

- understand the building blocks of mobile applications
- apply various tools and technologies to conceptualize the variety of mobile applications
- design and develop the data centric applications for mobile devices

Syllabus:

Introduction: Introduction to Mobile Computing, Introduction to Mobile application development technologies, development Environment, Issues of Mobile application development, Installing Phone Gap, its tools, setting up multiple development environments for different platforms. Building and Debugging on Multiple Platforms, Mobile Web to Mobile Applications.

Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools, Generic UI Development. Mobile Design Patterns.

User Interfaces: Designing the Right UI for Mobile Devices, Text-to-Speech Techniques, Multichannel and Multimodal UIs, UI Design Patterns, Working with XUI, Working with User Interface with JQuery mobile.

Mobile application Development Components: Application, Activity, Intents and Services Managing a Cross-Platform Codebase, HTML5 APIs and Mobile JavaScript CSS3: Transitions, Transforms and Animation.

Storing and Retrieving Data: Synchronization and Replication of Mobile Data, Storing and retrieving data from SQL Lite, Working with a Content Provider, Reading and Writing to Contacts, using the Contacts APIs from PhoneGap to work with the user's native contacts list of their mobile device.

Communications via Network and the Web: Communications Model, Android Networking and Web Telephony, Wireless Connectivity and Mobile Apps, Android Telephony.

Notifications and Alarms: Performance and Memory Management, Android Notifications and Alarms.

Graphics: Performance and Multithreading , Graphics and UI Performance , Android Graphics, Android Multimedia, Accessing Device Sensors, Accessing Camera, Data and Files, working with Videos, Images and Audio with PhoneGap. PhoneGap Plugins for different Mobile OS platform.

Mobility and Location Based Services: Working Offline Sync and Caching in Phone Gap Packaging and Deploying Apps, Performance Best Practices, Android Field Service App.

Security and Hacking: Active Transactions, More on Security, Preventing Hacking of latest mobile Devices.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Reto Meier, Professional Android 4 Application Development, Wrox Publication
2. B.M. Harwani, Android Programming Unleashed, Sams Publishing
3. Greg Nudelman, Android Design Patterns: Interaction Design Solutions for Developers, John Wiley & Sons
4. Wei-Meng Lee, Beginning Android 4 Application Development, Wrox Press

IT652 **Network Security and Encryption** **[3 1 0 4]**

Course Learning Outcome:
After successful completion of the course, student will be able to

- understand the concepts related to the basics of network security like cryptography
- deduce the mechanisms to be employed while trying to satisfy any of the security service
- apply the concept of security services and mechanisms from the application developers and network administrator's perspective

Syllabus:
Overview: Services, Mechanisms, Attacks, OSI Security Architecture, Model for Network Security
Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography
Symmetric Ciphers: Block Ciphers and the Data Encryption Standard, Confidentiality using Symmetric Encryption
Asymmetric Ciphers: Public Key Cryptography and RSA, Elliptic Curve cryptography, Key Management; Other Public Key cryptosystems
Integrity: MAC, Hash Functions and Digital Signatures
IPSec: Architecture of IPSec, Encapsulating Security Payload, Authentication Header

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 5 tutorials to be incorporated.

References:
1. William Stallings, Cryptography and Network Security Principles and Practices, PHI
Basic Cryptanalysis Field Manual, Aegean Park

IT601 **Software Engineering** **[3 0 2 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to:

- understand various phases of software development lifecycle
- analyze the requirements systematically and develop the model using standard tools and methodologies
- apply key aspects of software engineering processes for the development of a complex software system
- develop a quality software project through effective team-building, planning, scheduling and risk assessment
- keep abreast of current trends in the area of software engineering

Syllabus:

Software process and lifecycle: Software Product, Software Processes, Study of different process models, Project Management Concepts, Planning and Scheduling, Team organization and people management.

Software requirement engineering: Software requirements, extraction and specification, Feasibility Studies, Requirements Modeling, object oriented analysis.

Design Concepts: Object oriented design, Architectural design. Component level Design, User Interface Design, Distributed Systems Architecture, Real Time Software Design, User Interface Design, Pattern Based Design.

Risk Management: Metrics and Measurement, Estimation for software projects, software configuration management, Maintenance and Reengineering

Software Testing: Unit testing, integration testing, black box and white box testing, regression testing, performance testing, object oriented testing.

Verification and validation of Software: Software Inspections and Audit, Automated Analysis, Critical systems validation Software Quality Assurance, Quality Standards, Quality Planning and Control, Various Quality models.
Overview of recent trends in Software Engineering, Security Engineering, Agile Methods, Service Oriented Software Engineering, Aspect Oriented Software Development.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Software project covering various software development methodology techniques will be implemented using CASE tools

References:

1. Ian Sommerville, Software Engineering, Addison – Wesley
2. Roger Pressman, Software Engineering A Practitioners Approach, McGraw Hill Publication
3. Rajib Mall, Fundamentals of Software Engineering, Prentice Hall of India
4. Ivar Jacobson, Object Oriented Software Engineering A use case Approach, Pearson

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Course Code	**IT706**
Course Title	**Advanced Networking and Communication Protocols**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to,

1. comprehend the network performance and congestion control methods
2. demonstrate the knowledge of modern networking concepts and data center network architecture
3. apply the suitable multi-server approach as required for the application development
4. design network applications with suitable communication protocols to support specified set of functionalities

Syllabus:

Teaching Hours

Unit I 6

Network Concepts and Congestion Control: Networking Principles, Network elements, Performance of networks, Router architecture and switching fabric in routers, TCP congestion control, Analysis of TCP, QoSand fairness, Traffic shaping and congestion control in TCP

Unit II 6

Sockets and Threaded Servers: Socket address structure, Various arguments and functions for sockets, TCP/UDP client server applications, Basic thread functions, Client server application using threads, Web client and simultaneous connections, Iterative, concurrent and multi-threaded servers, Mutual exclusion

Unit III 5

IPv6 and Lightweight IP Stack: Need of µIP, I/O processing and packet forwarding, Buffer management and API for µIP, Protocols implementations for µIP, IPv6 addressing, Anycast and mulicast with IPv6, IPv4 and IPv6 interoperability

Unit IV 5

Data Center Networking: Data center architectures, Data center congestion control, Queuing and traffic patterns, Data center network protocols, End host architectures, ECMP and load balancing, Multipath TCP, DCTCP, Deadline-aware DCTCP, Low latency protocols for data center

Unit V 4

Software Defined Networking: Data Plane, Control Plane, Application Plane, Controller design, Virtualization, OpenFlow protocol for SDN, Network Function Virtualization

Unit VI 11

Application Integration Styles, Communication Protocols and Data Representation: Remote methods with SOAP and REST based Web Service,Micro services, gRPC, WebSocket, CoAP, Zeroconf, CoAP Discovery and SSDP, Dynamic streaming over HTTP, Real Time Streaming Protocol, Message bus and AMQP, MQTT, Data Representation,ProtoBuf, XML, EXI,

JSON and secured tokens, CBOR and secured tokens, Authorization with OAuth

Unit VII 8

Case Studies: Backbone of Internet, Internet exchange points and BGP, Large scale data centers, Peer-to-peer systems, Content Delivery Networks, Multimedia networks, Video streaming networks, Content Centric Networks, Li-Fi, Blockchain Technology, Cognitive radio networks

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work: Laboratory work will be based on above syllabus with minimum 8 experiments to be incorporated.

Suggested Readings:

1. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, Pearson
2. William Stallings, Foundations of Modern Networking (SDN, NFV, QoE, IoT and Cloud), Pearson
3. Hans W. Barz, Gregory A. Bassett, Multimedia Networks: Protocols, Design and Applications, Wiley
4. Jean-Philippe Vasseur, Adam Dunkels, Interconnecting Smart Objects with IP: The Next Internet, Morgan Kauffmann
5. RajkumarBuyya, MukaddimPathan and Athena Vakali, Content Delivery Networks, Springer
6. W. Richard Stevens, UNIX Network Programming, Addison-Wesley Professional
7. William Stallings, High-speed networks and Internets – Performance and Quality of Service, PHI
8. Relevant research papers for the topics

IT7D4 **Agile Software Development** **[3 0 2 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand the background and driving forces for taking an Agile approach to software development
- understand the business value of adopting Agile approaches and development practices
- use Test Driven Development with unit tests
- apply design principles, refactoring, version control and continuous integration to achieve Agility
- perform testing activities within an Agile project

Syllabus:

Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

Agile Frameworks: Introduction to Agile frameworks like Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, roles – Product Owner, Master, Team, case study, Tools for Agile project management

Boehm's Cockburn levels

Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

Agile Software Design and Development : Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control

Industry Trends: Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Robert C. Martin, Agile Software Development, Principles, Patterns and Practices, Prentice Hall
2. Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson
3. Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison Wesley
4. Alistair Cockburn, Agile Software Development: The Cooperative Game, Addison Wesley
5. Mike Cohn, User Stories Applied: For Agile Software, Addison Wesley

2IT421 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS [3 0 2 4]

Introduction to Artificial Intelligence- Overview and importance of AI

Knowledge Representation and Issues: General concepts, definition and importance of knowledge, knowledge based system, representation, organization, manipulation and acquisition of knowledge.

Problems, Problem Spaces and State Space Search- The AI Problems, the Underlying Assumption, What is An AI Techniques, the Level of the Model, Criteria For Success, Some General References, One Final Word. Defining the Problems As a State Space Search, Production Systems, Production Characteristics, Production System Characteristics, and issues in the Design of Search Programs

Predicate Logic- Facts in Logic, Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution.

Representing Knowledge Using Rules- Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Semantic Nets, Frames

Search and Control Strategies- Uninformed (Blind) and informed search, DFS, BFS, Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-First Search, A*, Problem Reduction, AO*, Constraint Satisfaction, Means End Analysis

Reasoning- Symbolic Reasoning under Uncertainty, Non-monotonic Reasoning, Statistical Reasoning

Game Playing- Minimax Search, Adding Alpha-Beta Cutoffs

Uncertain Knowledge and Reasoning- Probability and Bayes' theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer theory.

Expert System- Introduction, Architecture, Types of Expert Systems.

Knowledge Acquisition- General concepts, Neural Networks, Learning automata, Genetic Algorithm, ACO, Fuzzy Logic

Machine Learning- Supervised and unsupervised Learning, Reinforcement Learning, Hidden Markov Models

Text Books-

1. "Artificial Intelligence"
   Elaine Rich and Kevin Knight (2nd Edition), Tata McGraw-Hill
2. "Artificial Intelligence – A Modern Approach" Stuart Russell and Peter Norvig

IT7C4 **Big Data Analytics** **[3 0 2 4]**

Course Learning Outcomes:
After successful completion of this course, student will be able to

- understand the need to integrate structured, semi-structured and unstructured data.
- understand the significance and challenges of big data.
- handle big data using different tools and frameworks.
- apply big data techniques for useful business analytic applications.
- analyze and design algorithms for mining the data from large volumes.

Syllabus:
Introduction to Data Analytics Nature of Data, Types of Digital Data, Classification of Digital Data, Structured Data, Semi-Structured Data, Unstructured Data, Characteristics of Data.
Introduction to Big Data: Evolution of Big Data , Definition of Big Data, Challenges of Conventional Systems, Intelligent Data Analysis, Challenges of Big Data Analytic Processes and Tools, Analysis vs Reporting, , Statistical Concepts: Sampling Distributions, Re-Sampling, Statistical Inference - Prediction Error.
Introduction to Big Data Analytics: Big Data Analytics, importance of Big data analytics, Sudden Hype Around Big Data Analytics, Classification of Analytics, Top Challenges Facing Big Data, Kind of Technologies to meet the Challenges Posed by Big Data, Data Science, Role of data scientist, Terminologies Used in Big Data Environment
The Big data technology landscape : NoSQL, Types of No SQL databases, SQL Vs No SQL, why No SQL, Introduction to MongoDB, Data Types in MongoDB, CRUD, Practice examples, Apache Cassandra, Features of Cassandra, CRUD, Practice examples
Hadoop: Introducing Hadoop, comparisons of RDBMS and Hadoop, Distributed Computing Challenges, A Brief History of Hadoop, Hadoop Overview, Business Value of Hadoop, Hadoop Distributors, Hadoop Distributed File System, Processing Data with Hadoop , Introduction to Map reduce, working of Map reduce, Hadoop YARN , Hadoop Ecosystem, HDFS, Hadoop in the Cloud, Case Studies: Real Time Sentiment Analysis and Stock Market Predictions
Frameworks: Applications on Big Data Using Pig and Hive, Data Processing Operators in Pig, Hive Services, HiveQL, Querying Data in Hive, Fundamentals of HBase and ZooKeeper, IBM Info Sphere Big Insights and Streams, Visualizations, Visual Data Analysis Techniques, Interaction Techniques, Systems and Applications, Jasper Report using Jasper Soft

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 8 experiments to be incorporated.

References:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer
2. Tom White, Hadoop: The Definitive Guide, Third Edition, O'reilly Media
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill Publishing
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press
5. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & sons

6. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons
7. Da Ruan, Guoquing Chen, Etienne E.Kerre, GeertWets, Intelligent Data Mining, Springer
8. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications
9. Michael Minelli, Michele Chambers, Ambiga Dhiraj, Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications
10. Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications

Seema Acharya and Subhashini C, Big Data and Analytics, Wiley India

IT794 **Compiler Construction** **[3 0 2 4]**

Course Learning Outcome:

After successful completion of this course, student will be able to

- understand the functionalities of various compilation phases
- apply language theory concepts in various phases of compiler design
- design and develop a miniature compiler

Syllabus:

Overview of the Translation Process, Lexical Analysis, Hard Coding and Automatic Generation Lexical Analyzers

Parsing Theory: Top Down and Bottom Up Parsing Algorithms, Automatic Generation of Parsers

Error Recovery: Error Detection & Recovery, Ad Hoc and Systematic Methods

Intermediate Code Generation: Different intermediate Forms, Syntax Directed Translation Mechanisms and Attributed Mechanisms and Attributed Definition.

Run Time Memory Management: Static Memory Allocation and Stack Memory Allocation Schemes, Symbol Table Management.

Code Generation: Machine Model, Order of Evaluation, Register Allocation and Code Selection.

Code Optimization: Optimization of basic blocks, Flow Graphs and Data Flow Analysis, Code Improving Transformations.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

- Alfred V. Aho, Monica S. Lam, Ravi Shethi, Jeffrey D. Ullman, Compilers, Principles, Techniques and Tools, Pearson Education.
- Keith D Cooper & Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publisher Inc. San Francisco,USA.

Jean Paul Trembly & Paul G Sorenson, The Theory and Practice of Compiler Writing, McGraw-Hill computer science series

IT784 **Data Compression** **[3 0 2 4]**

Course Learning Outcomes:

After successful completion of this course, student will be able to

- understand the importance of data compression and its effect on data.
- study different compression techniques
- apply suitable compression techniques for different types of data.

Syllabus:

Introduction: Compression Techniques, Modeling and Coding

Mathematical Preliminaries for Lossless Compression: Overview, Introduction to Information Theory, Models, Coding

Huffman Coding: Overview, the Huffman Coding Algorithm, Minimum Variance Huffman Codes, Adaptive Huffman Coding, and Applications of Huffman Coding

Arithmetic Coding: Overview, Introduction, Coding a Sequence, Generating a Binary Code, Comparison of Huffman and Arithmetic Coding, Applications

Dictionary Techniques: Overview, Introduction, Static Dictionary, Adaptive Dictionary, Applications

Mathematical Preliminaries for Lossy Coding: Overview, Introduction, Distortion Criteria, Models

Scalar Quantization: Overview, Introduction, The Quantization Problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization

Vector Quantization: Overview, Introduction, Advantages of Vector Quantization over Scalar Quantization

Transform Coding: Overview, Introduction, the Transform, Transforms of Interest, Discrete Cosine Transform, Quantization and Coding of Transform Coefficients, Application to Image Compression JPEG, Application to Audio Compression

Wavelet Based Compression: Image Compression, Embedded Zero tree Coder, Set Partitioning in Hierarchical Trees, JPEG 2000

Advanced Techniques: MPEG-1, MPEG-2, MPEG-4, standards for image and video compression, speech and audio encoding (PCM, DPCM, ADPCM, GSM, MP3), Sparse auto encoders

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References :

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann,Harcourt India Publication
2. Mark Nelson, The Data Compression Book, BPB Publications

2IT422 - DATA ENGINEERING [3 0 2 4]

Introduction to Machine Learning: Well posed learning problems, Design of learning system, perspective and Issues in Machine Learning, Concept Learning and General to Specific Ordering, Decision Tree Learning, Artificial Neural Networks, Evaluating Hypotheses, Bayesian Learning, Computational Learning Theory, Instance Based Learning, Genetic Algorithm, Learning Set of Rules, Analytical Learning, Reinforcement Learning

Introduction of data mining: data mining, importance of data mining, types of data, data mining functionality, classification of data mining

Data Warehouse & OLAP Technology for Data Mining: definition of data warehouse, Multidimensional data modal, data warehouse Architecture & implementation

Data Preprocessing: Data Cleaning Integration and transformation, data reduction, discretization, Concept hierarchy generation.

Concept Description: Characterization and comparison: What is concept description, data generalization and summarization based characterization, analytical characterization, mining class comparison, mining descriptive statistical measures in large databases.

Mining Association rules in large database: Association rule mining, mining single dimensional Boolean association rule from transactional database, mining multilevel association rule from transactional database.

Classification & Prediction: Definition of Classification & Prediction, issue regarding Classification & Prediction, Classification by decision tree induction, Bayesian Classification by Back propagation, Classification based on concept from Association rule mining, prediction, classifier accuracy.

Cluster analysis: Definition of cluster analysis, types of data in cluster analysis, a categorization of major clustering methods.

Building Blocks: Warehouse Architecture - Foundation, Federated and Tiered; server Architecture - single SMP and MPP, and the DBMS- Relational, Super Relational, Multidimensional and Object Relational.

Laboratory Work:
The practical and Term work will be based on the topics covered in the syllabus.
Minimum 10 experiments should be carried out.

Text Books/Reference Books:

1. Data mining concepts and Techniques by Jiahei Han & Micheline Kamber.
2. Machine Learning by Tom M. MITCHELL - Mc Grew Hill
3. Data Warehousing, Data Mining and OLAP: Architecture and Technology, Alex Bersoi & Stephe,Smith,
   McGraw- Hill
4. Data Warehousing, Mettison, McGraw- Hill.
5. An introduction to Building Data Warehouse, PHI Publication.

6. Oracle: Data Warehousing, Michael Corey and Michael Abbey, McGraw-Hill.
7. Building, Using, and Managing the Data Warehouse, Ramon Barquin & Herbert Edelsteiin,Prentice-Hall.

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Course Code	**IT7F4**
Course Title	**Deep Learning**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

- understand how deep neural networks work and how to train them,
- analyze state-of-the-art applications of deep neural networks to problems in different domains,
- apply deep neural networks to solve problems in machine learning.

Syllabus	Teaching Hours
UNIT 1: Review of Visual Perception and Artificial Neural Networks Overview of Computer Vision, Preprocessing Images for Recognition, Feature Engineering for Conventional Image Classification, K-Nearest Neighbor, Linear Classification, Gradient Descent, Feed Forward Neural Network, Backpropagation, Unstable Gradient Problem	6
UNIT 2: Convolutional Neural Networks Introduction to Deep Supervised Learning, Convolution & Pooling, Dropout, LeNet, AlexNet, ZFNet, VGGNet, GoogleNet, ResNet and other State-of-the-art CNNs	8
UNIT 3: Transfer Learning Transfer Learning Scenarios, Applications of Transfer Learning, Transfer Learning Methods, Fine Tuning and Data Augmentation, Related Research Areas,	4
UNIT 4: Convolutional Neural Networks in Action for Computer Vision Semantic Segmentation, Object Detection, Instance Segmentation, Feature Visualization and Inversion, DeepDream and Style Transfer, Highway Networks, Image Recognition, Real Time CNN, Stereo Siamese Networks, Depth from Single Image, Image Generation, Domain Adaptation	12
UNIT 5: Review of other Deep Neural Networks Auto Encoders, Recurrent and Recursive Neural Networks, Boltzmann and Restricted Boltzmann Machine	7
UNIT 6: Practical Deep Learning and Case Studies Various Frameworks such as DIGITS, TensorFlow, Caffe and Theano, 2-3 Case Studies based on the Latest Developments in the Field	8

Laboratory Work:

Above concepts are to be implemented using deep learning programming framework through either project work or around 5 experiments.

Suggested Readings ^:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press
2. Adam Gibson, Josh Patterson, Deep Learning, O'Reilly Media, Inc.
3. Duda, R.O., Hart, P.E., and Stork, D.G., Pattern Classification, Wiley.
4. Theodoridis, S. and Koutroumbas, K., Pattern Recognition. Academic Press
5. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence
6. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press.
7. Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning, Springer
8. Koller, D. and Friedman, N. Probabilistic Graphical Models. MIT Press
9. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer

IT702 **Information Retrieval Systems** **[3 0 2 4]**

Course Learning outcome:
After successful completion of this course, student will be able to

- understand the concepts and various components of Information Retrieval (IR) systems
- identify design and evaluation parameters for information retrieval systems
- apply theoretical foundations for development of IR systems
- develop practical skills to handle and design IR systems

Syllabus:
Overview: Overview of IR Systems and Architecture of information retrieval systems.
Document Representation: Statistical Characteristics of Text, Basic Query Processing. Data Structure and File Organization for IR.
Retrieval Models: Similarity Measures and Ranking, Boolean Matching, Vector Space Models, Probabilistic Models, Automatic Indexing and Indexing Models
Search and Filtering Techniques Relevance Feedback, User Profiles, Collaborative Filtering Automatic classification, Document and Term Clustering, Document Categorization Heuristic classification
Machine Learning and other Techniques in IR: Naive Bayes Methods, Support Vector Machines, Neural Networks, Genetic Algorithms, Symbolic Learning Indexing and storage issues, Information visualization and usage pattern analysis IR Systems and the WWW, PageRank and Hyperlink Analysis, Search Personalization N-Grams in Information Retrieval, Agent-based Information Retrieval
Multimedia and Multilingual IR: Models and Languages Cross-Language and Multilingual Information Retrieval, Retrieval from noisy documents Performance Evaluation of Information Retrieval Systems
Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

- D.A. Grossman, O. Frieder, Information Retrieval: Algorithms and Heuristics, Springer
- W.B. Croft, J. Lafferty, Language Modeling for Information Retrieval, Springer
- G. Kowalski, M.T. Maybury, Information Storage and Retrieval Systems, Springer
- Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, The MIT Press
- B. Croft, D. Metzler, T. Strohman, Information Retrieval in Practice, Pearson Education

IT704 **Minor Project** **[0 0 4 2]**

Course Learning Outcome:

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- report project related activities effectively to peers and mentors

Syllabus:

The student(s) shall carry out project based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit project report based on the work.

IT7A4 **Network Programming** **[3 0 2 4]**

Course Learning Outcomes

After successful completion of this course, student will be able to

- understand the concepts of socket programming
- develop multi-threaded TCP/UDP client-server programs
- design applications based on web services
- develop distributed applications based on RPC, CORBA

Syllabus:

Introduction: Client-server example, Protocol independence, Error handling, Test networks and hosts
The transport layer: UDP, TCP, TCP connection establishment and termination, Port numbers and concurrent servers, Buffer sizes and limitations, Standard Internet services

TCP and UDP sockets: Socket address structure, various arguments and functions for sockets, TCP/UDP client-server examples

Name and address conversion: Domain Name System, Various functions and options for name and address conversion

IPv4 and IPv6 interoperability: IPv4 client with IPv6 server, IPv6 client with IPv4 server
I/O functions: Various functions for send and receive on sockets, Sockets and standard I/O, TCP for transactions

Broadcasting and Multicasting: Broadcast addresses, Unicast vs. Broadcast, Multicast addresses, Multicast vs. Broadcast on LAN, Broadcast on WAN.

Threads: Basic thread functions, TCP echo server using threads, Thread-specific data, Web client and simultaneous connections, Mutual exclusion

Remote Procedure Calls: RPC features, XMLRPC, stateless and statefull servers, applications
CORBA: Object oriented middleware and its architecture, The CORBA Component Model, CORBA Object Services, Application design with CORBA

Web Services: Web services stack, WS Specifications, SOAP, UDDI, Workflow process, Web services deployment

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Above concepts are to be implemented and at least 10 experiments are to be carried out.

References:

1. W. Richard Stevens, UNIX Network Programming, Addison-Wesley Professional
2. Judith M. Myerson, The Complete Book of Middleware, CRC Press
3. G. Andrews, Foundations of Multithreaded, Distributed, and Parallel Programming, Addison Wesley
4. Dimitri P. Bertsekas and John N. Tsitsiklis, Parallel and Distributed Computation: Numerical Methods, Athena Scientific
5. V. K. Garg,, Concurrent and Distributed Computing in Java, John Wiley & Sons
6. Bob Quinn and David Shute, Windows Sockets Network Programming, Addison-Wesley Advanced Windows Series

7. Michael J. Donahoo and Kenneth L. Calvert, TCP/IP Sockets in C: Practical Guide for Programmers, Morgan Kaufmann Practical Guides

IT701 Network Protocols [3 1 - 4]

Course Learning Outcomes

After successful completion of this course, student will be able to

- understand basic architecture of TCP/IP protocol suite and its comparison with OSI model
- understand the concepts of internetworking and issues related to routing protocols.
- describe and analyse the functions and operation of each protocol
- appraise the syntax and semantics of the various Protocol Data Units for each protocol
- design and implement network architecture using simulators.

Syllabus:

Introduction: Networking Technologies, Protocol Architecture, Internet standards and administration, IPX, NETBUI, OSI, TCP/IP

IP Layer Functionality: Internet Protocol Versions- IPv4 and IPv6, IPv4 address, IP Routing - RIP, RIP ng, OSPF, BGP, Design issues and study of ARP, ICMP, Mobile IP

Transport Layer Functionality: TCP stack, TCP traffic monitoring performance issues, Real time issues in TCP/IP, TCP/IP Networks over long delay Networks like Satellite, Quality of Service implementations, UDP, TCP, SCTP.

Application Layer: Application Level protocols design issues, DHCP, DNS, TELNET, FTP and TFTP, HTTPS, SMTP, SNMP, LDAP, protocols

Security: IP network engineering, IP Security, Firewall Engineering, Protocols and issues,

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Forouzan, Behrouz A. TCP/IP Protocol Suite, McGraw-Hill
2. James F. Kurose and Keith W. Ross, Computer Networking A Top Down Approch Featuring the Internet, Pearson Education.
3. N. Doraiswami and Dan Harkins, IPSec The New Security Standard for the Internet,Intranets, and Virtual Private Networks, Prentice Hall.
4. Andrew S. Tanenbaum, Computer Networks PHI Publication

IT705 **Open Source Development Lab** **[0 0 2 1]**

Course Learning Outcomes:

After successful completion of this course, student will be able to

- understand basics of various open source Content Management System
- study various open source packages and databases
- use and develop open source packages to contribute in open source community

Laboratory Work:

Laboratory work will be based on topics mentioned below :

Content Management System (CMS): Installation and configuration of open source CMS for various administrative tasks; use CMS for various tasks such as website Design, online magazine, publication, Learning Management System, Blog, etc.

Python: Introduction, Working with Data, Program Organization, Functions, Modules and Libraries, Classes and Objects, Iterators and Generators, Text and I/O Handling

Perl: Introduction, Understanding Scalar values, Basic Operators and control flow, List and array variables, regular expression, subroutines, Hash, connecting with MySQL database

Version Control: Introduction, need of version control, initialization of repository, viewing of history, undo and redo changes, clone repository, push and pull changes.

SS701 Organizational Behaviour [3 1 0 4]

Course Learning Outcomes (CLO):

After studying the course the students will be able to:

1. Analyze and evaluate performance behavior at individual, group and organizational levels.
2. Develop the ability to lead and motivate others to succeed.
3. Develop critical analytical skills that will help them diagnose situations pertaining to human behavior and generate effective solutions for the same.
4. Understand and apply principles of organizational dynamics relating to systems, culture, structure and change processes

Syllabus

I. Introduction to Organizational Behaviour

1. Concept of Organizational Behaviour (OB)
2. History , Nature and scope of OB
3. Key elements in OB
4. Inter-disciplinary contribution to OB
5. Managerial Roles

II. Individual Behaviour, Values & Personality

1. Concept of Individual Differences
2. Values commonly studied across culture
3. Fundamentals and Determinants of Personality
4. Big Five Dimensions
5. Personality Traits

III. Learning & Perception

1. Fundamentals of Learning
2. Learning Theories - Classical Conditioning Theory, Operant Conditioning Theory, Social Learning Theory
3. Behavior Modification
4. Definition of Perception, Perceptual Process, Common Perceptual Errors

IV. Motivation

1. Basic concept of Motivation
2. Theories of Motivation – Maslow,Herzberg's Two Factor Theory, ERG, McClelland , Equity and Vroom's Expectancy Theory

V. Leadership

1. Introduction
2. Leadership Theories - Trait Theories, Behavioral Theories and Situational Theories

VI. Group Dynamics

1. Defining and classifying groups
2. Stages of group development
3. Group Properties – Roles, Norms, Status, Size and Cohesiveness
4. Group Decision making

VII. Managing Change in Organization

1. Definition, Forces of Change,
2. Causes for Resistance to Change, Overcoming Resistance to change
3. Lewin's Change Model

VIII Organizational Culture

1. Meaning, Strong Culture vs. Weak Culture
2. Creating & sustaining Culture

3. Socialization

IX. Conflict, Power & Politics

1. Nature & types of conflict, Causes and outcome of conflict
2. Responses to conflict
3. Bases of Individual Power
4. Organizational Politics

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

1. Robbins, S.P.Judge, T.A. &, Sanghi, Seema. (2010). *Organizational Behavior*, Pearson.
2. Pareek, U.(2011).*Understanding Organizational Behavior*, Oxford University Press.
3. Luthans,F.(2006).*Organizational Behaviour*, Tata McGraw Hill.
4. Sekaran,U. (1989).*Organizational Behaviour: Text and Cases*, Tata Mc Graw Hill
5. Kreitner, R. &Kinicki, A.(2012). *Organizational Behavior*, McGrawHill/Irwin
6. Davis,K. &Newstorm, J.W. (1989).*Organizational Behaviour*, Tata McGraw Hill
7. Slocum,J.W&Hellreigal, D. (2010).*Fundamentals of Organizational Behaviour*, Cengage Learning.

2IT434 : System Framework and Architecture [3 0 2 4]

Introduction: Introduction to the .NET Framework, Overview of ASP.NET, Visual Studio .NET and, .NET-Based Languages,Working with Forms and Controls: Creating an ASP.NET Web Application Project, Creating Web Forms, Using Server Controls, Master Pages, Using Code-Behind Pages, Event Procedures and Web Server Controls, Using Validation, Page Validation, usage of skins and themes.

Memory management and other issues: Usage of caching, Page output cache, Data caching based on control/parameter, setting cache duration, expiring cache, Exception Handling, Working with collections and generics, Garbage collector and collection process, using System.GC class, Automatic disposal of objects with using blocks, Multithreading

ADO.Net: Overview of ADO.NET, Introduction to Using ADO.NET, .NET Framework data providers, Data Binding, Connecting to the Database, Accessing Data with DataSets, Displaying a DataSet in a List-Bound Control, Using Multiple Tables, Accessing Data with DataReaders, Disconnected operations with Data tables and Data sets, Connection pooling, Working with LINQ.

XML and .Net: Overview of XML Architecture in ASP.NET, XML and the DataSet Object, Working with XML Data, Using the XML Web Server Control, Reading XML Data, Transforming, and Displaying XML, Nested Data, Overview of Stored Procedures, Calling Stored Procedures

Security and Interoperability: Security Overview, Code-Based and Role-Based Security, Working with Windows-Based and Forms-Based Authentication, Security with session object, COM interoperability, .Net and COM, Mashaling, Using COM component from .Net client, Using .Net component from COM client

State management and Deployment: States – page level, user level, application level, website level, Application and Session Variables, Cookies and Cookieless Sessions, Storing Session Variables in a Database, Cleaning the session state, Configuring an ASP.NET Web Application, Deploying an ASP.NET Web Application, Web Application, Types of Assemblies, Private vs. Shared assemblies, Creating and placing strongly named assemblies.

Practical Work:

Minimum 10 practical has to be conducted based on the above syllabus

Text/References:

1. ASP.NET 3.5 Step by Step, George Shepherd,MS Press
2. **ASP**.**NET 3.5 Unleashed**, Stephen Walther, ISBN: 0672330113, Sams Publication
3. Sams Teach Yourself ASP.NET 3.5 in 24 Hours, Scott Mitchell, Sams Publication
4. Programming Microsoft® ASP.NET 3.5, Dino Esposito, ISBN: 9780735625273, MS Press
5. Advanced Programming using Visual Basic 2008, Bradley and Millspaugh, McGraw Hill
6. Beginning ASP.NET 3.5: In C# and VB, Imar Spaanjaars, ISBN: 978-0-470-18759-3, Wrox Beginning ASP.NET 3.5 in C# 2008, Second Edition, Wrox Publication

IT7B4 **Web Security** **[3 0 2 4]**

Course Learning Outcomes:
After successful completion of the course, students will be able to

- understand security related issues and controls in web – based systems and applications
- understand the design issues for developing secured networked systems and applications
- evaluate web-based system with respect to its security requirement

Syllabus:
Introduction: WWW, Vulnerabilities, Threats and Counter Measures, Generic Security Model

HTTP Security: User Authentication, authorization, access control in general, organizations run Web, Basic Authentication, Digest Access Authentication, and Certificate based authentication, Server Configuration

Proxy Servers and Firewalls: Static Packet Filtering, Dynamic Packet Filtering or Stateful inspection, Circuit level gateways, Firewall Configurations, Network Address Translation, Configuring Browser

Cryptographic Techniques: Cryptographic Hash Functions, Secret Key Cryptography, Public Key Cryptography, Digital Envelopes, Protection of cryptographic Keys, Generation of pseudo-random bit sequences, Legal Issues

Internet Security Protocols: Network access layer security protocols, Internet layer security protocols, Transport Layer security protocols, Application layer security protocols

SSL and TLS Protocols: TLS Protocol, SSL and TLS Certificates, Firewall traversal

Certificate Management and Public Key Infrastructures: Public Key Certificates, IETF PKIX WG, Certificate Revocation, Certificates of WWW

Authentication and Authorization Infrastructures: Microsoft .NET passport, Kerberos based AAIs, PKI-based AAIs

Electronic Payment Systems: Electronic Cash Systems, Electronic checks, Electronic Credit Card payments, Micropayment Systems

Client Side Security: Binary Mail attachments, Helper applications and plug-ins, Scripting Languages, Java Applets, ActiveX Controls, Security zones, Implications for firewalls

Server Side Security: CGI, Server APIs, Fast CGI, Server Side includes, ASP, JSP

Privacy Protection and Anonymity Services: Early work, Cookies, Anonymous Browsing, Anonymous Publishing, Voluntary privacy standards

Self-Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.
Laboratory Work:
Laboratory work will be based on above syllabus with minimum 8 experiments to be incorporated.

References:

1. William Stallings, Cryptography and Network Security, Pearson
2. Oppliger, Rolf. Security Technologies for the World Wide Web. Artech House.
3. Garms, Jess and Daniel Somerfield. Professional Java Security. Wrox.
4. Preston Gralla. How Personal & Internet Security Works. Publisher Que.

IT754 **Wireless Networks** **[3 0 2 4]**

Course Learning Outcomes

After successful completion of this course, student will be able to

- understand the key concepts and techniques of wireless and mobile communications
- understand the architecture and applications of current and next generation wireless networks
- apply concepts of wireless networks in design of adhoc networks and sensor networks

Syllabus:

Introduction: Applications and need for wireless network, wireless transmission, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, medium access control, SDMA, TDMA, FDMA, CDMA.

Wireless LAN: Basics, system architecture, protocol architecture, physical layer, MAC layer, management functions, WLAN standards, IEEE802.11e, Bluetooth – standards, protocol stack and layers, Bluetooth security

Telecommunication systems: Cellular network basics, GSM- System architecture, radio interface, protocols, handover, localization, security, data service, DECT, TETRA, UMTS and IMT-2000, LTE.

Mobile Network Layer: Mobility, Mobile IP – registration, agent discovery, tunneling, IEEE802.15.4

Mobile Transport Layer: Traditional TCP, issues with mobility, TCP improvements- I-TCP, MTCP, Snoop TCP etc, TCP over 3G network.

Advanced topics: Wireless Ad-hoc networks, issues and challenges, routing in WANET, Wireless sensor network – characteristics, applications and architecture.

Discussion on emerging industry standards such as 4G Cellular, IEEE 802.11p

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Above concepts are to be implemented and at least 10 experiments are to be carried out.

References:

1. Jochen Schiller, Mobile Communications, Pearson Education
2. C. Siva Ram Murthy and B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall.
3. T. Rappaport, Wireless Communications – Principles and Practice, Prentice Hall
4. William Stallings, Wireless Communications and networks, Pearson / Prentice Hall
5. Dharma Prakash Agrawal & Qing-An Zeng, Introduction to Wireless and Mobile Systems, Cengage Learning
6. Andrea Goldsmith, Wireless Communications, Cambridge University Press

IT801	Major Project	[0 0 30 21]

Course Learning Outcome:

After successful completion of the course, student will be able to

- use various tools and techniques to study existing systems
- critically analyse existing systems, thereby select and justify parameters to be improved
- start and manipulate proposed engineering solution as per industry / research / societal need
- achieve precision in uses of the tools related to their experiments/fabrication
- reorganize and refine various components of technology to optimize the resources at large
- appraise the potential of technology for scalability and wide spectrum of applications
- report project related activities effectively to peers, mentors and society
- follow and value health, safety and ethical practices during project

Syllabus:

The major project shall be based on the recent trends in technology, system/process analysis, construction/fabrication/production techniques, design methodologies etc. The student(s) shall carry out a comprehensive project at relevant Academic/R&D/Industrial organization based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit comprehensive project report based on the work.

CH001 Air Pollution Control Techniques

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the fundamentals of air pollution, the major collection mechanism and equipments/instruments for a given gaseous or particulate pollutants
- select and apply the most appropriate air pollution control system
- understand the fundamentals of indoor and odour pollution
- understand different methods for controlling emissions from stationary and mobile sources
- apply the concept of air pollution control engineering to the professional society and general public

Syllabus:

Introduction to Air Pollution : Air pollution in India and the world, sources and classification of airpollutants, global concern of air pollutants, effects of air pollutants.

Meteorological Aspects of Air Pollution: Temperature lapse rates and stability, meteorological factors influencing air pollution, plume behavior, dispersion of air pollutants and estimation of plume rise.

Sampling and Measurement of Air Pollution: Types of pollutant sampling and measurement, ambient air sampling, stack sampling, analysis of air pollutants.

Source Correction Methods: Raw material change, process change, equipment modifications.

Particulate Control Techniques: Collection efficiency, particulate control equipments like gravity settling chambers, cyclone separator, filters, electrostatic precipitator, wet scrubbers.

Control Technologies for Gaseous pollutants: Scrubbers, absorption and adsorption, control of specific gaseous pollutants like SO_x, NO_x.

Control of Volatile Organic Compounds: Environmental significance of organic compounds and its control.

Odor and Its Control Techniques: Sources and characteristics of odor, measurement and control of odor.

Indoor Air Pollution: Indoor air pollutants and its effect, factor influencing indoor air quality, controlof indoor air pollutants.

Air Pollution Legislation and Regulations: Air quality criteria and emission standards.

Control of Air Pollutants from Various Sources like Stationary and Mobile source

Recent Trends in Air Pollution Control Techniques

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questionswill be asked from self study contents.

References:

1. Richard W. Bouble, Donald L. Fox, D. Bruce Turner, Arthur C. Stern, Fundamentals of Air Pollution, Academic Press.
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International.
3. M N Rao, H V N Rao, Air Pollution, Tata McGraw Hill.
4. J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, I. K. International.

5. S. C. Bhatia, Textbook of Air Pollution and its Control, Atlantic Publishers & Distributors.
6. R. K. Trivedy, P. K. Goel, An Introduction to Air Pollution, BS Publications.

HS016 Applied Literature

Course Learning Outcome

Students completing this subject will:

- be able to explore the importance of textual traditions in shaping responses to other places, peoples, cultures;
- gain a knowledge and understanding of the social, political and intellectual forces contributing to imperial, third world and migrant writing;
- develop a knowledge and appreciation of the subject matter, styles and narrative conventions

Syllabus

Non-fictional Prose Works (Excerpts)

New Branded World by Naomi Klein
From the Gutenberg Elegies: The Fate of Reading in the Electronic Age by Sven Birkets
Decolonising the Mind by Ngugi wa Thiong'o
Idea of India by Sunil Khilnani
Wings of Fire by APJ Kalam

Poems

Night of the Scorpion by Nissim Ezekiel
Little Red-Cap, by Carol Ann Duffy Hunger
by Jayanta Mahapatra
The Dacca Gauzes by Agha Shahid Ali
The Howl by Allen Ginsberg
If you forget me by Pablo Neruda
Still I rise by Maya Angelou
If by Rudyard Kipling
"Hope" is the thing with feathers by Emily DickinsonAll You
who Sleep Tonight by Vikram Seth
The Unknown Citizen by W. H Auden
Song of Myself, I, II, VI & LII by Walt Whitman

Short Stories

Short Story: "Seventeen Syllables" by Hisaye YamamotoShort
Story: "The Gift of the Magi" by O. Henry

Criticism

Towards a Feminist Poetics by Elaine Showalter

Movies

The Prestige
To Sir, With Love The
Namesake Sherlock –
TV seriesTroy
Jobs

References:

1. Widdowson, Peter. *Literature.* London: Routledge, 1999.
2. Miller, J. Hillis. *On Literature: Thinking in Action*. London: Routledge, 2002.
3. Mulhern, Francis, *Culture/Metaculture*. London: Routledge, 2000.
4. During, Simon, *The Cultural Studies Reader*. London: Routledge, 1993.
5. Leitch, Vincent B. *The Norton Anthology of Theory and Criticism*. Norton: New York, 2001.

Stam, Robert; Alessandra Raengo, *A Companioin to Literature and Film*. Blackwell: Oxford, 2004.

HS014/ 2HS014 Banking & Finance

Objective:

To understand the various concepts of banking and financial system

Indian Financial System:

The Financial System, Nature, Evolution and Structure, the Functions of Financial Intermediaries, Financial Instruments, the Role of Financial System in Economic Development, the Indian Financial System. The Origin and Growth of Banking of Banking, Functions of Commercial Banks,, Banking in the New Millennium.

Banker Customer Relationship: Types of Accounts, Types of Relations, KYC Norms, Banker – Customer relationship, Rights and Duties of Banker/ Customer, Importance provisions of NI Act

Sources &Uses of Funds: Bank Balance sheet, Sources & Uses of Funds in a Bank. Form of Balance Sheet of Banking Companies. Different Schedule under Banking Regulation Act. – Provisioning norms of CRR & SLR

Deposit Management: Importance of Deposit, Types of Deposit in India, USA & Europe. NRI Deposits, Cost of Deposit & its impact on Profitability, concepts of Fixed & Floating Rate of Interest, Deposit Insurance.

Cheques: Special Features Negotiability, Validity, Crossing & Endorsement.

Cash Management: Importance of Cash Management issues, Cash at Counter, Vault & CurrencyChest.

Lending Activities : Lending activity, Basic requirements for lending.

Credit Policy: Need for Credit Policy, Components of Credit Policy, Credit Policy Pursued by the Government, Bench Marks Exposure Norms, Credit Culture.

Retail Banking: Basics of Retail Banking, Forms of Retail Banking and Emerging issues

Corporate Banking: The nature of corporate banking, Developments in corporate banking, Consortium finance, Multiple banking arrangements, and Loan syndication

Feebased Services: Feebased Services L/C,B/G, Subsidary services, Bancassurance, Demat Account, Safe Deposit Locker , Mutual Funds, Merchant Banking Activities – Management of Public issues, Reasons, Eligibility norms, Regulatory framework, Marketing of issues, Post issue activities

Plastic Money: Different types of plastic money, Concept of a credit card, Distinction between Credit card, Charge card and Debit card, Mechanics of a credit card transaction, Credit card as an augmented retail financial product, Credit card business in India, The merging scenario CRM, (AWB, ATM, Mobile Banking Internet Banking) Delivery Channels (Payment & settlement services)

Reference Books:

1. Management of Banking & Financial Services - Paul, Justin / Suresh, Padmalatha. Pearson –2007
2. Financial Institutions and Markets, 4th e Bhole, LM. Tata McGraw Hill 2004
3. Indian Financial System, Theory and Practice, 4th e, Khan, M Y. Tata McGraw Hill 2004

ME004 Cryogenics [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. describe various methods to produce low temperature and phenomena at cryogenic temperature.
2. understand the working principle of different cryogenic refrigeration and liquefaction system.
3. understand the functions and working principles of insulations and various low temperature measuring and storage devices.
4. understand the application of cryogenic technology in engineering research and industry.

Syllabus:

Low Temperature Properties – Mechanical, thermal, electrical and magnetic properties of engineering materials, properties of cryogenic fluids.

Gas Liquefaction Systems – Thermodynamically ideal system, Joule Thomson effect adiabatic expansion, simple, pre-cooled and dual pressure Linde Hampson systems, Claude system, Kapitza system, Heylandt system, other liquefaction system using expanders, comparison of liquefaction systems, liquefaction systems for hydrogen and helium

Cryogenic Refrigeration Systems – Ideal isothermal and isobaric source systems, Joule Thomson systems, pre-cooled Joule Thomson system, expansion engine system, Philips refrigerator, G M refrigerator, Pulse Tube refrigerator.

Measurement Systems for Low Temperatures – Temperature, pressure flowrate and liquid level measurement at low temperatures.

Cryogenic Fluid Storage – Basic storage vessel, construction of storage vessels for oxygen, hydrogen, nitrogen, helium, safe devices, drawing of the vessel.

Insulations – Gas filled powder and fibrous, vacuum, evacuated powder and fibrous, multiplayer insulations, mechanism of thermal insulation, apparent thermal conductivity, and selection of insulation

Cryogenic Fluid Transfer Systems – Different types of transfer lines, process of cryogenic transfer, components of transfer lines.

Application of Cryogenic Systems – Super-conducting bearing, motors, super-conducting magnets, space technology, blood and tissue preservation, cryo probes used in cryo surgery.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. R.F. Barron,Cryogenics systems, Mc Graw Hill Publication.
2. T.Flynn, Cryogenic Engineering, Springer Publication

2CE005 **Data Structures** **[3 1 0 4]**

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

- realize the importance of various data structures from application perspective
- apply the knowledge of data structures for real-time applications
- optimize the working algorithm to solve the given engineering problem efficiently
- design algorithms for various engineering applications

Syllabus:
Elementary Structures: Stack, queue, double-ended queue, dynamic allocation of nodes, shadow copies of array based structures
Search Trees: Models of Search Trees, Properties and transformations, height of search tree, basic find, insert and delete, returning from leaf to root, dealing with non-unique keys, queries for keys in an interval, Building optimal search trees, converting trees to lists, removing a tree
Balanced Search Trees: Height balanced and weight balanced trees, (a,b) and B-trees, Red Black Trees and Trees of almost optimal height, Top Down rebalancing for Red Black Trees, Trees with constant update time at a known location, Finger trees and level linking, trees with partial rebuilding, Splay Trees, Skip Trees, Joining and Splitting Balanced Search Trees
Tree Search for Set of Intervals: Interval Trees, Segment Trees, Trees for union of intervals, trees for sums of weighted intervals, trees for interval-restricted maximum sum queries, orthogonal range trees, higher dimensional segment trees, other systems of building blocks, range counting and semi group model, kd – trees and related structures
Heaps: Array based heaps, heap ordered trees and half ordered trees, Leftist Heaps, Skew heaps, Binomial heaps, Changing keys in heaps, Fibonacci heaps, heaps of optimal complexity, Double ended heap structures and multidimensional heaps, heap related structures with constant time updates
Union – Find and related structures: Union – Find, Union Find with copies and dynamic segment trees, list splitting, Problems on root directed trees, maintaining a linear order
Data Structure Transformations: Making structures dynamic and persistent
Data Structures for Strings: Tries and compressed tries, Dictionaries allowing errors in queries, Suffix Trees, Suffix arrays
Hash Tables: Basic Hash Tables and Collision resolution, Universal families of Hash Functions, Perfect Hash Functions, Hash Trees, Extendible Hashing, Membership Testers and Boom Filters
Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:
Tutorial work will be based on above syllabus with minimum 12 tutorials to be incorporated.
References:

1. Peter Brass, Advanced Data Structures, Kindle Edition
2. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Computer Science Press
3. Sartaj Sahni, Data Structures, Algorithms and Applications in C++, D. Universities Press

2EC005 DIGITAL SYSTEM DESIGN [3 - - 3]

MSI & LSI circuits and their Applications: Introduction, Examples of Useful Digital Circuits, Arithmetic Circuit, Comparators, Multiplexers, Code Converters, Wired Logic, Practical Aspects of Wired Logic and Bus Oriented Structures.
Sequential Machines: Types of sequential Machines: Mealy and Moore Machine, Counter Design Using Sequential Machines, State Reduction, Multimode Counters, Sequence Detectors, Timing and Triggering Consideration, Clock Skew.
System Controllers: Use of MSI Decoders and MSI Multiplexers in system Controllers, ROM, PROM, PLA in System Controllers, Concepts of a Programmable System Controller, RTL Description of Simple Machine, Design From RTL description. Hardware Description Languages (HDL), HDL based design; Introduction to data path and control path synthesis;
Asynchronous Finite state machine: Asynchronous Analysis, Design of Asynchronous Machines, Cycles and Races, Hazards, Essential Hazards Considerations of technology; testability and fault-tolerance in design.: Architecture of FPGA and CPLD & its Programming.

Text/Reference Books:
1. William I. Fletcher - An Engineering Approach To Digital Design, PHI
2. C. Roth, Digital System Design Using VHDL, Thomson Publication

CL001 **Disaster Risk Management** **[3 0 0 3]**

Course Learning Outcome:
After successful completion of the course, student will be able to

1. develop understanding about concept of risk, vulnerbility and disasters
2. select and apply tools & techniques for disaster risk assessment
3. comprehend role of Engineers from various Engineering branches for disaster risk management
4. develop ability for contributing to resilient societies through skills, methods and tools pertaining to disaster risk management

Syllabus:
Introduction to Disaster Risk Management (DRM): Concept, Types of Disasters, Linkages between Disasters and Development, Importance & Significance of DRM.
Risk and Vulnerability: Risk, Vulnerability, Risk Assessment, Disaster Risk Modelling; Emerging Risks due to Development, Climate Change Adaptation, etc.
Disaster Risk Management: Phases, Mitigation, Preparedness, Prevention, Response, Relief and Recovery, Humanitarian Assistance, DM Institutional Framework, Incident Command System, Disaster Management Plan,
Community Based Disaster Management (CBDM): Concept of CBDM, Community Health and Safety, Do's and Don'ts before, during and after disasters.
Disaster Communication: Disaster Communication, Early Warning and Disaster Monitoring, Role of GIS and Remote Sensing in Disaster Risk Management.
Role of Enginners from various branches in Disaster Risk Management: Use of Skills, Methods, Tools and Techniques for understanding the challenges and determining solutions for DRM and Climate Change Adaptation.
Disaster Risk Management Programmes: DRM Programmes, Practices and Case Studies.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- Sahni Pradeep, Ariyabandhu Madhavi Malalgoda, Disaster Risk Reduction in South Asia, PHI Learning Pvt.Ltd.
- Sinha Prabhas C., Disaster Relief: Rehabilitation and Emergency Humanitarian Assistance, SBS Publishers.
- Wisner Ben, Blaikie Piers, Cannon, Terry & Davis, Ian, At risk natural hazards, people's vulnerability and disasters, Routledge.
- Singh R.B. (Ed.), Natural Hazards and Disaster Management Vulnerability & Mitigation, Rawat Publications.
- Blodgett Robert & Keller Edwards, Natural Hazards: Earth's processes as hazards disasters and catastrophe, Pearson Prentice Hall

HS006/2HS006 Element of Marketing Management

Objective: To acquaint the engineering students with the basic concept of marketing management.

Marketing: Concept of marketing, core marketing concepts, importance and scope of marketing,company orientation towards market place

Product: Product and product mix, importance of product, product objective, product strategyplanning for new product

Market Environment: Demographic, Economic natural, Technical, Political, legal, social culturalConsumer Buying Behaviour: Influences on buyer behaviour, buying decision process,
Market segmentation – levels, pattern and procedure

Distribution channels : Importance and factors of distribution channels, typs of channels, channels of distribution – consumption good, industrial goods, nature and type of retailers Function and type of wholesalers, selecting distribution, channels

Pricing: Nature and Importance of pricing, objectives of pricing. Considerations in price determination approaches to pricing.

Promotion: Promotion and its elements, objectives of promotion, promotion mix

Market research: Nature and scope, process of market research, uses and limitations

Text/Reference Books:

1. Marketing Management – Philip Kotler, PHI
2. Marketing Management – Rajan Saxena, TMH
3. Organization and management – R.D. Agrawal, TMH

EC002 Embedded Systems [3 0 0 3]

Course Learning Outcomes:

After successful completion of the course, the students will be able to

- understand the structure of an embedded systems, their characteristics, design requirements and applications
- ability to identify the tools and techniques for embedded system hardware design
- ability to identify tools and techniques for software of embedded system
- understand operation of Real Time Operating System
- understand Device Drivers and their role in Embedded System design

Syllabus:

Introduction: Embedded Systems overview, characteristics of embedded systems, applications, common design metrics, design challenges, Processor technology, IC technology, Design Technology, Types of Embedded systems, Hardware and software units of embedded systems, examples of embedded systems

Processors: General purpose processors, their basic architecture, operations, Superscalar and VLIW architectures, application specific system processors, digital signal processors, ARM processor, selecting a microprocessor

Embedded Programming: Embedded software development Tools and Languages

Real Time Operating Systems: Operating System introduction, Real Time Operating System (RTOS), RTOS functions, RTOS processor scheduling models, task prioritization, context switching, multitasking, inter task communication, event management, locking mechanism, interrupt handling, case study: RTx51 tiny RTOS

Device Drivers: Introduction, their functions, architecture, types, and implementations

Networks for Embedded Systems: Distributed embedded architecture, I2C, CAN, SPI, USB Bus

Embedded System Design: System design techniques, design methodologies, requirement analysis, specifications, system analysis and architecture design, Quality assurance, design example

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Raj Kamal, Embedded systems Architecture, Programming and Design, TMH
2. Wayne Wolf, Computers as components Principles of embedded computing system design, Morgan Kaufmann
3. Frank Vahid, Tony Givargis, Embedded system design: A unified Hardware/Software introduction, Wiley publishers

Shibu K V, Introduction to Embedded Systems, TMH

HS001/2HS001 Entrepreneurship Development

Objective:

To acquaint the engineering students with the basic concepts of Entrepreneurship with an effort to develop entrepreneurial skill amongst the students.

Entrepreneurship : Definition and structure. Entrepreneurial culture, the concept of Entrepreneurship. Entrepreneurial Traits: Entrepreneurial Skills, Qualities and Characteristics of an Entrepreneur, Nature and Importance of entrepreneurs. Entrepreneurship as a career choice. Contribution of entrepreneurs to the Development of the Nation.

Entrepreneurial Development : entrepreneurial Environment, Meaning and Process of entrepreneurial Development. Entrepreneurial Development Training, Importance, Objectives and Methods of Training.

Project Management : Search for Business Idea, Concept of Project and classification. Project Identification and Formulation. Project Design & Network Analysis. Project Report, Project Appraisal.

Financial Analysis : Investment Process, Break even analysis, Budget and Planning Process.

Sources of Finance : Sources of Development Finance, Financial Institutions.

Establishing a small scale Industry: Location, Steps of Setting up a Small Scale Industry, Selection ofOrganization.

Marketing Environment : Marketing Segmentation, Market Research, Market Planning.

Text/Reference Books:

1. A handbook for New entrepreneurs by EDI, Published by Oxford University Press.
2. Dynamics of Entrepreneurial Development and Management – Vasant Desai, HimalayaPublishing House
3. Entrepreneurship Development – Dr. Y.P. Hathi, Dr. Rupesh Vasani, Mahajan Publishing

L	T	P	C
2	0	2	3

Course Code	2CE003
Course Title	Internet and Web Technologies

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

- understand the architecture of web based applications and underlying technologies
- design an efficient web based applications using appropriate web technologies
- develop web based application using appropriate scripting languages

Syllabus:	Teaching Hours:
Unit I Internet Structure, Protocols and Access: Internet Protocol Model overview, Internet Addresses, Internet Protocol, Transport Layer, Upper layer Protocols, Internet Access, Internet Applications, About World Wide Web ,Future of Internet and Internet related applications WWW and Web Servers, IIS Configurations and settings, Apache Configuration, Introduction to PWS, Planning a Website. XHTML: Introduction, Forms, Internal Linking, Image Maps, meta, frameset	7
Unit II Cascaded Style Sheet: Inline styles, Embedded Style Sheets, Linking Style Sheets, Text Flow and Box Model. JavaScript: Introduction, Control Structures, Functions, Arrays, Objects.	8
Unit III Dynamic HTML: Object Model and Collection, Event Model, Filters and Transitions, Data binding and Tabular Data Control. XML: XML namespaces, DTDs and schemas, DOM , SAX, XSL, SOAP.	5
Unit IV ASP: Introduction, ASP Objects, FSO, Data Access Object. Building Interactive Animation: Working with Flash and Dream Weaver	6
Unit V Wireless Internet and m-business: Introduction to Wireless Internet, WAP, m-business. e- business and e-commerce. E- Business Models, Building an e-business Application, e-marketing, Security	4

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. Deitel Deitel Nieto, Internet and World Wide Web: How to Program, Pearson Education
2. Minoli, Internet and Intranet Engineering, McGraw Hill Education

INTRODUCTION TO ACCOUNTING [HS003]

Objective

To understand the various concepts of financial and cost accounting

Financial Accounts :

Accounting equation, Journal, Cash book, Ledger, Trial Balance, Profit & Loss Account, balance Sheet

Cost Accounts :

Cost classification (direct cost, indirect cost, variable cost, fixed cost) Prime cost, conversion cost, full cost, Cost - Volume – Profit Analysis, Absorption costing, activity based costing, budgetary control, standard costing.

Reference Books:

Accounting for Managers by Jawaharlal TMH
Accounting Principles by Anthony & bn Reece, AITB

ME001 Robotic Engineering [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- apply the concept of robotics to select the type of manipulator best suitable to the application
- formulate the mathematical relations for kinematic analysis of robotic manipulator.
- integrate the structural design, actuator selections, drive system, sensor and control system necessary to implement a robot in a specific job task

Syllabus:

Robot technology:

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components

Robot motion analysis and control:

Robot arm kinematics, Forward & inverse kinematics solutions, Trajectory design.

Langrange-Euler formulation, Newton-Euler formulation, Generalized D'Alembert equation of motion, robot arm dynamics.

Actuators and sensors in Robot- AC/DC motors, stepper motors and servo motor, direct drive robot, Hydraulic and pneumatic systems.

Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors, External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

Robot programming & languages.

Types of End Effectors and Design

End effectors , Classification , Force analysis and Gripper design.

Introduction to Mobile robots, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall
2. Mittal and Nagrath , Robotics & Control , Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi

4. M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata McGraw Hill Education Pvt. Ltd
5. Ashitava Ghoshal, Robotics Fundamental Concepts & Analysis, Oxford University Press.

L	T	P	C
3	0	2	4

Course Code	CE006
Course Title	Operating Systems

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. illustrate basic components of operating systems
2. comprehend the mechanism of operating Systems to handle processes, memory and file management
3. demonstrate competence in recognizing and using operating system features

Syllabus:

Teaching Hours:

Unit I **3**

Overview of Computer System and Operating System: Elements of computer system, operating system objectives and functions, evolution of operating systems

Unit II **18**

Process Description and Control: Process states, process description, process control, process management, Uniprocessor scheduling, multiprocessor and real-time scheduling, case study

Unit III **3**

Threads: Processes And Threads, Symmetric Multiprocessing, Micro kernels

Unit IV **8**

Concurrency: Mutual exclusion and synchronization, deadlock and starvation, case study

Unit V **10**

Memory Management and Virtual Memory: Memory management requirements, partitioning, paging, segmentation, virtual memory, case study

Unit VI **3**

I/O Management and Files: I/O devices, organization of I/O functions, OS design issues, I/O buffering, disk scheduling, disk cache , file management, security aspects in OS, case study

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. William Stallings, Operating Systems, PHI.
2. Silberschiltz, Galvin and Greg Gange, Operating System, Willey India.
3. Sumitabha Das, Unix Concepts and Applications, TMH Publications.
4. Yashvant Kanetkar, Shell Programming, BPB.
5. A.S.Tannenbaum, Modern Operating Systems, TMH Publications.
6. Kernighan, the UNIX Programming Environment, Pearson
7. Maurice Bach, The Unix Operating System, Prentice Hall

L = Lecture, T = Tutorial, P = Practical, C = Credit

^ this is not an exhaustive list

IC002 Programmable Logic Controller

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the fundamental principles of Programmable logic controller, I/O modules
- develop the ability to design program using standard programming technique
- develop and design an application orientated project using PLC

Syllabus:

Introduction: Definition, advantages and Importance of PLC, Evolution history of PLC, Architecture and block diagram.

PLC hardware : Types of PLC, CPU unit architecture, Input/Output devices and interfacing, Hand held programming terminals, Industrial computer and monitors,

PLC operation: Ladder logic, Logic functions, Wiring diagaram

PLC Programming: Basic relay instructions, timer-counter instructions, comparison, data handling, input-output instructions, sequencer instruction

PLC applications and case studies.

Self Study:

The self study contents will be declared at the commencement of semester.Around 10% of the questions will be asked from self study

References:

1. Webb and Reis, Programmable Logic Controllers, Principles and Applications.
2. Mitra and Gupta, Programmable Logic Controllers and Industrial Automation an Introduction.

2ME011 RENEWABLE ENERGY SOURCES [3 – – 3]

Solar energy, extra terrestrial and terrestrial radiations, radiation geometry, variation of insolation and its measurement, computation of solar radiation on horizontal and tilted surfaces, solar flat plate collectors, their configuration, material of construction and general characteristics, concentrating collectors, receiver systems, heliostat, optical losses, types of solar energy storage, solar energy applications.

Wind energy, analysis of wind speeds, different types of wind turbines, use of meteorological data for site selection, materials of construction, performance characteristics, and applications
Biomass, energy plantation, biomass gasifiers, types, construction of biogas plants, scope and future
Tidal, wave and ocean thermal energy conversion plants, geothermal plants, magneto hydrodynamic plants, fuel cells, use of non-conventional fuels, bio fuels and their applications

Text/Reference Books:

1. Solar Energy by S. P. Sukhatme & J K Nayak
2. Non-conventional Energy Sources by G. D. Rai

ME011 RENEWABLE ENERGY SOURCES [3 - - 3]

Course Learning Outcome:

After successful completion of the course, student will be able

1. To understand the importance of Renewable Energy Sources in the present era.
2. To describe various methods for power generation by using different type of Non-conventional and renewable energy sources.
3. To apply the knowledge of converting energy resources like solar, wind , biomass, tidal, wave, ocean thermal, and geothermal energy for power generation.
4. To understand the working and applications of fuel cells and usage of bio-fuels.

Syllabus:

Energy scenario of India and World, Need of Renewable Energy sources

Solar energy, extra-terrestrial and terrestrial radiations, radiation geometry, variation of insolation and its measurement, computation of solar radiation on horizontal and tilted surfaces, solar flat plate collectors, their configuration, material of construction and general characteristics, concentrating collectors, receiver systems, heliostat, optical losses, types of solar energy storage, solar energy applications.

Wind energy, analysis of wind speeds, different types of wind turbines, use of meteorological data for site selection, materials of construction, performance characteristics, and applications

Biomass, energy plantation, biomass gasifiers, types, construction of biogas plants, scope and future

Tidal, wave and ocean thermal energy conversion plants, geothermal plants, small hydro plants, magneto hydrodynamic plants, fuel cells, use of non-conventional fuels, bio fuels and their applications

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Reference Books:

1. Non-conventional Energy Sources by G.D.Rai, Khanna Publishers
2. Renewable Energy Resources by John Twidell and Tony Weir, Taylor and Francis
3. Solar Energy Utilization by G.D.Rai, Khanna Publishers
4. Solar Energy by S P Sukhatme, Tata McGraw Hill Education Private Limited

EC001 Satellite Communication [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand principle, operation and working of various sub systems of satellite
2. apply communication techniques for satellite applications
3. learn about various earth stations
4. understand role of satellite in various applications

Syllabus:

Overview of Satellite Systems: History, basic definition, present status, future trends

Orbital Mechanics and Launchers: Orbital Mechanics, Kepler's three laws of planetary motion, Orbital Perturbations, Launches and Launch Vehicles, Orbital effects in Communications System performance

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power system, Equipment Reliability and Space Qualification

Satellite Link Design: Transmission theory, noise temperature, noise figure, G/T ratio for the earth stations, link design case study

Multiple Access Techniques: Digital Modulation Techniques, Frequency division multiple access-FDM/FM/FDMA, calculation of SNR, overdeviation & companding FDM/FM/FDMA, Time Division Multiple Access – channel, frame structure & design, Synchronization & timing Code Division Multiple Access- spread spectrum transmission & reception, estimating channel requirements Fixed assignments, Demand assignment, random access, practical example Multiple Access with on board processing

Earth Station Technology: Types of earth station, Earth station architecture, Earth station design considerations

Satellites for Communication: Geo stationary orbit satellite systems, non GEO systems- LEO & MEO systems, satellite mobile services, direct satellite broadcast, very small aperture terminal, case study

Applications of Satellites: Remote sensing satellites, Weather forecasting satellites, Navigation satellite, Scientific satellite, Military Satellite

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. A.K.Maini, Satellite Communication, Wiley
2. T.Pratt, Satellite Communication, Wiley
3. Dennis Roddy, Satellite Communication, Wiley

HS005- TECHNICAL WRITING [3 - - 3]

Objective: To enable students to improve their writing skills. The programme will also aim at improving their knowledge of English Language with reference to its grammar and vocabulary.

An introduction to technical writing
Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing.
Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics.
Audience recognition and involvement: High tech
audience, low-tech. audience, sexist language.
Memorandum: Objectives, difference between memos, letters and emails. Criteria and format for writing and memos.
Technical description: Criteria and process.
Technical instructions for user's manual
Report Writing: Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report.
Letter- writing: Business letters, Job-applications, Resume.
Précis writing
Writing a technical paper.
Technical Documentation.

Text/Reference Books:

1. Technical writing – process and product -Sharon J. Gerson - Steven M. Gerson, (Person Education Asia).

2. Basic Communication Skills for Technology,Andrea J. Ratherford, (Person Education Asia)

3. Technical Communication: Principles and Practice,Meenakshi Raman, Sangita Sharma(Oxford Uni. Press)

EC003 Wireless Sensor Network [3 0 0 3]

Course Learning outcomes:
After successful completion of the course, the students will be able to

1. understand Wireless Sensor Networks concepts, principles and applications
2. understand communication protocols and standards utilized in Wireless Sensor Networks
3. analyze protocols used in various types of Wireless Sensor Networks
4. identify appropriate techniques, standards and tools for Wireless Sensor Network hardware design

Syllabus:
Introduction of Wireless Sensor Networks: Introduction to adhoc networks, Sensor Network Technology- Hardware and Software, Applications of Sensor Networks, sensor network architectural elements, challenges in sensor network design
Wireless Transmission Technology and Systems: Bluetooth; IEEE 802.11; ZigBee; Radio-frequency identification (RFID)
Medium Access Control Protocols for Wireless Sensor Networks: Fundamentals of MAC Protocols, Performance Requirements, Types of MAC protocols - Schedule-Based and Random Access-Based Protocols,
Routing Protocols for Wireless Sensor Networks: Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks - Flooding and Its Variants, LEACH, Power-Efficient Gathering in Sensor Information Systems, Directed diffusion, Geographical routing
Transport Control Protocols for Wireless Sensor Networks: Traditional Transport Control Protocols- TCP, UDP; Feasibility of Using TCP or UDP for wireless sensor networks, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols- CODA (Congestion Detection and Avoidance), ESRT (Event-to-Sink Reliable Transport)
Middleware for Wireless Sensor Networks: Wireless Sensor Networks Middleware Principles, Middleware Architecture, Existing Middleware-MiLAN (Middleware Linking Applications and Networks)
Network Management for Wireless Sensor Networks: Network Management Requirements, Network Management Design Issues, Example of Management Architecture: MANNA, Naming, Localization Issues
Operating Systems for Wireless Sensor Networks: Operating System Design Issues, TinyOS – case study

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

- Kazem Sohraby, Daniel Minoli, Taieb Znati, Wireless Sensor Networks, Technology, protocols, and applications, Wiley
- Edgar H. Callaway, Wireless Sensor Networks: Architectures and Protocols, CRC Press
- Anna Hac, Wireless Sensor Network Design, Wiley
- Holger Karl, Andreas Willig, Protocols and Architectures for Wireless Sensor Networks, Wiley.

L	T	P	C
3	0	0	3

Course Code	2EE002
Course Title	Electrical Power Utilisation and Safety

Course Outcomes (COs):

After successful completion of the course, student will be able to:

1. infer the importance various parameters in electrical system
2. suggest and apply suitable electric heating, welding, refrigeration and air conditioning for a system
3. analyze and design illumination scheme, electrification, earthing system and protection system for an application

Syllabus: **Teaching Hours: 45**

Unit-1: Electric Heating and Welding **08**

Advantages of electric heating, resistance heating, types of furnaces, induction heating, types of induction furnaces, dielectric heating, types of welding- arc and resistance

Unit-2: Refrigeration and Air Conditioning **06**

Introduction to refrigeration and air-conditioning, principles of a refrigerator, domestic refrigerator, electrical circuit of refrigerator, need of voltage regulator, water cooler, air conditioner, thermo-electric refrigeration, air purification, central air conditioning systems

Unit-3: Illumination Scheme **07**

Basic terms used in illumination scheme, Electric lamps, Recommended levels of illumination, types of lighting schemes, design of lighting schemes, factory lighting, street lighting, F]flood lighting

Unit-4: Electrical Installation, Estimating and Costing **08**

Types of load, Load assessment, Electrical supply systems, Wiring systems, Permissible voltage drops and conductor size calculations, Estimating and costing for residential and commercial service connections (single phase and three phase)

Unit-5: Power Factor **05**

Effects of power factor, causes of low power factor, disadvantages of low power factor, methods of improving power factor, most economical power factor.

Unit-6: Electrical Safety, Earthing System and Protective Devices **11**

Electrical shock mechanisms, factors influencing the electric shock, body current thresholds (tolerable body current limit), thevenin's concepts and accidental equivalent circuits (step and touch potentials), protection against electric shock, purpose of earthing, IS rules for earthing of electrical installations, factors governing the resistance of earth electrode, methods of

earthing, measurement of earth resistance, methods of reducing earth resistance, fuse, miniature circuit breakers (MCB) and earth leakage circuit breakers (ELCB)

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. E. Openshaw Taylor, Utilisation of Electrical Energy, Universities Press.
2. H. Partab, Art and Science of Utilisation of Electrical Energy, Dhanpat Rai & Co.
3. J. B. Gupta, Utilization of Electric Power and Electric Traction, S. K. Kataria & Sons, New Delhi.
4. G. C. Garg, Utilization of Electric Power and Electric Traction, Khanna Publishers, Delhi.
5. R. K. Rajput, Utilisation of Electrical Power, Laxmi Publications (P) Ltd., New Delhi.
6. N. V. Suyranarayana, Utilisation of Electric Power Including Electric Drives and Electric Traction, New Age Publishers, New Delhi.
7. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S. K. Kataria & Sons, New Delhi.
8. Dr. J. G. Jamnani, Elements of Electrical Design, Mahajan Publishing House

L	T	P	C
2	1	2	4

Course Code	2CE339
Course Title	Analysis and Design of Algorithms

Course Outcomes:

At the end of the course, students will be able to –

1. Comprehend notion of algorithmic complexity and logic of fundamental algorithms
2. Apply fundamental algorithms in real life problem solving
3. Identify and evaluate suitable data structures to solve a problem effectively and efficiently.

Syllabus:

Teaching Hours

Unit I **2**

Elementary Algorithmic: Efficiency of Algorithms, Average & worst-case analysis, Elementary Operation

Unit II **4**

Analysis Techniques: Empirical, mathematical, Asymptotic analysis and related unconditional and conditional notations

Analysis of Algorithms: Analyzing control structures: sequencing, "For" loops, Recursive calls, "While" and "repeat" loops, Amortized analysis

Unit III **4**

Solving Recurrences: Intelligent guesswork, Homogeneous recurrences, Inhomogeneous Recurrences, Change of variable, Range transformations, Master Theorem, Recurrence Tree.

Unit IV **7**

Data Structures: Heaps, Binomial heaps, Disjoint set structures.

Greedy Algorithms: Graphs: Minimum spanning trees-Kruskal's algorithm, Prim's algorithm, Graphs: Shortest path algorithms.

Unit V **8**

Divide-and-Conquer: Multiplying large integers, Binary search, sorting: sorting by merging, quick sort, finding the median, Matrix multiplication, Exponentiation, approaches using recursion, Memory functions.

Dynamic Programming: Principles of optimality, Various applications using dynamic programming.

Unit VI **5**

Branch and Bound, Backtracking: Design of some classical problems using branch and bound and Backtracking approaches.

Randomized and Approximation Algorithms: Design of some classical problems using Randomized and Approximation Algorithms.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus with minimum 10 experiments to be incorporated.

Tutorial Work:

Tutorial work will be based on the above syllabus with minimum 10 tutorials to be incorporated.

Suggested Readings^:

1. Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, PHI
2. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekharan, Fundamentals of Computer Algorithms,Galgotia.
3. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill
4. Karumanchi, Narasimha, Data Structures and Algorithms Made Easy, CareerMonk Publications.

UEIP001 **Cosmetic Technology**

Learning Outcomes:

After successful completion of the course student will be able to :

- Acquire comprehensive knowledge about the various raw materials used in cosmetic formulations
- Create and develop cosmetic formulations
- Analyze the cosmetic formulations for evaluating its efficacy and safety
- Understand the regulatory guidelines related to cosmetic formulations

Theory (Detailed Syllabus)

1. Introduction: The scope, historical background and present status of herbal cosmetics.
2. Classification of Cosmetics.
3. Raw materials used for formulation of skin care and hair care cosmetics: Source and description of raw materials of natural origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations.
4. Formulation and analysis of cosmetics: hair care, skin care and oral care products.
5. In vitro and in vivo models for efficacy testing for various cosmetic products.
6. Regulatory guidelines: Complaince of Drug & Cosmetic Act 1940 with reference to provisions for packaging and labelling (Rule 150 A, schedule S), permitted colors, flavors etc. BIS guidelines for cosmetic products and raw materials.

Total Lectures: **45**

Books Recommended:

1. Sagarin Edward, Cosmetic Science and Technology Vol. I, II, III , Wiley India Pvt. Ltd., Canada, 1992
2. Sharma P.P., Cosmetic Formulation, Management and Quality Control, Vandana Publications Pvt. Ltd., Vandana Publications, Delhi, 2010
3. Paye M, Barel A.O., Maibach H.I., Handbook of Cosmetic Sciences, Informa Press, Tylor and Fransis, LLC, 2006
4. Panda H., Herbal Cosmetics Handbook, Asia pacific Business press, 2004
5. Veermeer B.J., Cosmeceuticals: Drugs vs. Cosmetics, Marcel Dekker, Editors: Peter Elsener, Howard I. Maibach, Marcel Dekker Inc., New York, 2000.

COURSE NAME: DRUG LAWS

Learning Outcomes:

After successful completion of the course, the student will able to

- Understand the significance and relevance of Pharmaceutical laws in India related to manufacturing, sale, import and export of drugs and cosmetics.
- Apply knowledge of laws in manufacturing of narcotic drugs, psychotropic substance, alcoholic preparations, etc.
- Analyze invention and process for determining its suitability for patent filing.
- Evaluate and estimate drug pricing procedure in India.

Theory (Detailed Syllabus)

L	P	C
3	-	3

1 **Introduction to Drugs & Pharmaceutical Industry**
Classification of Drugs and Cosmetics, types of Pharmaceutical Industries. Importance of Legislations in Pharmaceutical sector

2 **Drugs and Cosmetics Act 1940, and its Rules 1945**
Act and rules related to manufacturing, labeling, packing, sale, import and export of drugs and cosmetic products.

3 **Narcotic Drugs and Psychotropic Substances Act, 1985 and Rules**
Act and rules for controlling the production of opium, manufacturing, sale, import and export of narcotic drugs and psychotropic substances. Powers to make search, seizer and arrest.

4 **Medicinal and Toilet Preparations (Excise Duties) Act, 1955 and Rules**
Act and rules related to licensing, manufacturing, sale, warehousing & export of alcoholic preparations at bonded and non-bonded laboratories.

5 **Patent (Amended) Act 2005**
Introduction to intellectual property rights (IPR), types of patents, procedures for grant of patent, term and revocation of patent, patent agent.

6 Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 & Rules

7 An overview of Pharmaceutical Policy Act 2002, Drug (Price Control) Order 1995 and National Pharmacy Pricing Authority (NPPA) of India

Note: The teaching of all the above acts should cover the latest amendments, administrative duties and powers, offences and penalties, case studies.

Total Lectures: 45

Books Recommended :

1 Official Acts published in Gazettes of India by Govt. of India.
2 Malik Vijay, Law relating to Drugs and Cosmetic, 19th edition, 2008, Eastern Book Company, Lucknow
3 Jain N.K., Pharmaceutical Jurisprudence, 6th edition, 2005, Vallabh Prakashan, Delhi
4 Mithal B.M., A Textbook of Forensic Pharmacy, 10th edition, 2002, Vallabh Prakashan, Delhi
5 Kokate C.K., Gokhale S.B., Textbook of Forensic Pharmacy, 1st edition, 2006, Pharma Book Syndicate, Hyderabad
6 Suresh B., Forensic Pharmacy: Pharmaceutical Jurisprudence, 11th edition, 2007, Birla Publications India, Delhi
7 Gandhi N., Popli H., Pharmaceutical Jurisprudence, 1st edition, 2006, C. B. S. Publishers & Distributors, Delhi

UEIM004 Elements of Management

Course Objectives

- To familiarize the students with the Management Discipline.
- To understand the role of a manager in managing people and organizational activities.

Learning Outcomes

At the end of the course, students will be able to:

1. Understand the major functions of management viz. Planning, Organizing, Leading and Controlling,
2. Describe the interrelationship among the various functions of Management
3. Develop a general management perspective, and

Syllabus

Module 1: NATURE & EVOLUTION OF MANAGEMENT

- Meaning & Scope of Management
- Management a Science and/or Art?
- Management Vs Administration
- Management as a Profession
- Evolution of Management Thought
- Early Classical Approaches – Scientific Management, Administrative Management, Bureaucracy
- Neo-Classical Approaches – Human Relations Movement, Behavioural Approaches
- Modern Approaches – Quantitative Approach; Systems Approach; Contingency Approach
- Management Process
- Functional Areas of Management
- Global Applications
- Management Practices in India

Module 2: MANAGERIAL ROLE & EXTERNAL ENVIRONMENT

- Role of Managers
- Mintzberg's Ten Managerial Roles
- Functions of Various Levels of Management
- Managerial Skills
- External Environment of the Organization & Its Impact on Organizational Operations
- Globalization and Business Environment

Module 3: PLANNING AND ORGANIZING

Planning

- Planning: Meaning, Need & Importance
- Planning Process
- Types of Plans; Objectives,Policies, Procedures and Methods

- Nature and Type of Policies
- Types of Planning; Advantages & Limitations
- Forecasting: Need & Techniques

Organizing

- Division of Work
- Departmentation; Definition; Departmentation by Function, Territory, Product/Service, Customer Group; Matrix Organization
- Line & Staff; Span of Control
- Authority; Delegation of Authority; Centralization & Decentralization; Formal and Informal Organizations

Module 4: Coordination and ControlCoordination

- Need for Coordination
- Types and Techniques or Coordination
- Coordination Process
- Coordination Characteristics
- Coordination: Advantages and Limitations
- Distinction between Coordination and Co-operation

Controlling

- Concept of Controlling
- Types of Controls
- Design of Control Process
- Control Methods – Financial; Budgetary; Operational; Quality; Information Systems & Control
- Responsibilities of Managers

Module 5:Current Trends in Management

- Managing Diversity
- Technology Management
- Capability Development
- Management of Family Owned Businesses
- Relevance of Management to Modern Industries and Government
- Management Lessons from Indian Ethos

Suggested Readings

1. Stoner, J. A. F. & Freeman, R. E. Management, (6th Ed). Prentice Hall, 1995.
2. Prasad, L. M. Principles and Practice of Management. (7th Ed). Delhi: Sultan Chand & Sons. 2008.
3. Drucker, P. The Practice of Management. Elsevier Ltd. 1955, Reprint 2007.
4. Hampton, D. R. Contemporary Management. (2nd Ed). McGraw Hill. 1981, Reprint 2008.
5. Tripathi, P. C. & Pandey, P. N. Principles of Management . (5th Ed). New Delhi: Tata McGraw Hill. 2012.
6. Koontz,H., Weihrich, H. & Aryasri, R. Principles of Management. Tata McGraw Hill. 2004.

NIRMA UNIVERSITY
INSTITUTE OF LAW

University Elective Course
Academic year 2015-16

Energy and Law

Teaching Hours: 45 Credit: 3

I Introduction

Energy has become one of the most essential needs of our lives. It is critical in the process of evolution, growth and survival of human beings and also in the socioeconomic development of a nation. The economy of the nation is dependent on abundant and uninterrupted supply of energy in all sectors, particularly electricity. It has become as a 'strategic commodity'. Most of the countries do not meet its current energy requirements and it is believed that the energy demand will manifestly increase in the future. It is expected that the worldwide energy demand will be doubled by 2050. Thus it becomes a great concern for most of the countries how they will satisfy their huge rising energy demand. This energy demand should also be met in an environmentally friendly way. Meeting energy demands is not only aimed at achieving economic growth but is also aimed at alleviation of poverty, unemployment and to meet other goals. Every country, therefore, undertakes a strategic plan to meet its energy demands, and to address the energy poverty and also the environmental effects of energy growth. With wide variety of sources available to chose from, the outcome is really complex as the problems that come to the fore-front makes the analysis of the subject even more interesting to ponder upon the challenges that this basic need of life throws upon us.

II Course Learning Outcomes

After the completion of the course the students will be able to:

1. Identify the challenges that legal regulations face in specific sectors in terms of consumption, production and conservation of energy
2. Classify the role and responsibility of the various stakeholders to conserve and preserve energy using tools of audit and management
3. Analyze the impact of the consumption of energy by the stakeholders in context of societal norms

III SYLLABUS

0. **Energy from Non- renewable sources (Coal, oil and natural gas)**

A. The goal that India seeks to achieve is to secure availability of coal to meet the demand of various sectors of the economy in an eco-friendly, sustainable and cost effective manner. This unit seeks to study as to why coal is such an important sector under energy law regime and how is the production of this non-renewable source of energy regulated? What do we understand by the

concept of power generation? What are the main components of a thermal power plant and what sort of an effect does this energy production and use have on the climate?

How are coal blocks allocated? Discussion as to their allocation procedures and existing discrepancies with lessons to be learnt from the past scams will be explored in the light of the Coal Mines (Nationalisation) Act, 1973 and the most recent Coal Mines (Special Provisions) Bill, 2014. The coal mining industry is not free from hazards and it has been claimed by the ministry that the coal mine safety legislation in India is one of the most comprehensive and pervasive statutory framework for ensuring occupational health and safety. Directorate-General of Mines Safety (DGMS) under the Union Ministry of Labour & Employment (MOL&E) is entrusted to administer these statutes. It is through this unit, it will be studied that whether or not the statutes framed under the Mines Act, 1952; Mine Rules, 1955, and Coal Mine Regulation, 1957 have effective provisions as to mines safety and occupational health?

B. The Petroleum and Natural Gas Regulatory Board Act, 2006 establishes the Petroleum and Natural Gas Regulatory Board to regulate the various activities in the production chain of petroleum products and natural gas. This Unit studies the need for Oil and Natural gas as a source of non-renewable energy and the alternatives that are available to this energy source. How the energy resource is generated and made available for consumers? Whether or not the laws relating to this energy source are adequate to address the issues relating to the pricing of oil and regulation of prices in the domestic market in accordance to the prices fluctuation in the international market? How does the Government of India make provisions for subsidies in this sector?

References:

1. J.P. Longwell, E.S. Rubin, J. Wilson, *Coal: Energy for the future*, 21 Progress in Energy and Combustion Science 4, 269–360 (1995)
2. Mark Z. Jacobson and Gilbert M. Masters, *Exploiting Wind Versus Coal*, 293Science 5534, 1438 (2001)
3. P.V. Zedrwitza and A. Steinfelda, *The solar thermal gasification of coal; energy conversion efficiency and CO2 mitigation potential*, 28 Energy, 441–456 (2003)
4. Thomas Thielemanna, Sandro Schmidta, J. Peter Gerlinga, *Lignite and hard coal: Energy suppliers for world needs until the year 2100: An outlook*, 72 International Journal of Coal Geology 1, 1–14 (2007)

STATUTES

1. The Coal Mines (Nationalization) Act, 1973
2. Notification dated 22/6/2010 from website of Central Board of Excise and Customs regarding levy of Clean Energy Cess on raw coal, lignite and peat w.e.f. 1.7.2010
3. The Coal Mines (Special Provisions) Bill, 2014
4. Coal Mines (Conservation & Development) Amendment Rules, 2011 and CM(C&D) Second Amendment Rules, 2011
5. Colliery Control Rules, 2004
6. Oil Industry Act, 1974
7. Petroleum Rules, 1976
8. The Oil Fields Act, 1948
9. The Petroleum Act, 1934

1. **Nuclear energy**

Nuclear energy is being seen as the new-age source of energy. But the issue that exists here is regarding the determination of the fact that whether the potential danger of nuclear power plant is ignored by India to find a shortcut to meet its energy demand when it does not have effective laws to regulate the atomic energy sector?

How did the nuclear energy come to be used for civil purposes? What are the international atomic energy agencies? Do they effectively regulate the civil uses of nuclear energy? How has the past disasters and accidents been instrumental in framing stricter safety norms both in the international and domestic levels? What are the causes and effect of Indo-US nuclear deal? What are the factors that led to the enactment of Civil Liability for Nuclear Damage Act? Is this Act exhaustive, effective and constitutionally valid? How effective is atomic energy laws in India? Whether foreign direct investment should be encouraged in the atomic energy sector? What is the concept of power generation and thermo-nuclear fusion versus fission reaction in terms of nuclear energy?

References:

1. Saurabh Bhattacharjee, *Looking through the prism of international environment and human rights law- International Civil Nuclear Liability Law and a call for Indian exceptionalism*, 3 Int.J. Nuclear Law 4 (2012)
2. K. Konoorayar, Vishnu and V.S. Jaya, *Atomic Energy Law in India: An Analysis*, 1 KLRI Journal of Law and Legislation, Seoul, (2011)
3. Elli Louka, *Nuclear Weapons: Justice and the Law*, Edward Elgar Publishing Limited, Massachusetts, U.S.A (2011)
4. Prashant Hosur, *Indo-US Civilian Nuclear Agreement, 65 Int'l J. 437, (2009-2010)*

STATUTES

1. Atomic Energy Act, 1962
2. Civil Liability for Nuclear Damage Act, 2010
3. Atomic Energy (Factories) Rules, 1996.
4. Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987
5. IAEA Handbook on Nuclear Law (2003)
6. *IAEA Nuclear Safety Review for the year 2013, Doc GC(57)/INF/3 (July 2013)*

2. **Hydropower**

Hydropower is considered to be a very viable source of energy. However, due to uncertain monsoons in a country like India, there is a growing concern as to the reliability on hydropower as a source of energy. It has been seen that most of the potential is in Himalayan States as river-based projects and in other States on irrigation canals. The small hydropower programme is now essentially private investment driven. Projects are normally economically viable and private sector is showing lot of interest in investing in it. Through this unit a number of aspects in relation to hydropower would be analysed.

How can hydropower plants be classified and what are their functions? What are the main components of hydropower plants? What is the concept of power generation with respect to hydropower plants? How do hydro turbines function and what are its governing principles?

Do the laws relating to hydro power generation effectively deal with the issues relating to rural electrification? What is the solution to soil conservation and environment management which are

impacted as a consequence of such hydropower generation? What are the infrastructural challenges to building hydropower projects?

References:

1. D. S. Subrahmanyam, *Status of Electric power generation in India with special emphasis on Hydropower expansion*, 01 INTERNATIONAL JOURNAL OF RENEWABLE ENERGY AND ENVIRONMENTAL ENGINEERING 01, ISSN 2348-0157, October 2013, IJREEE 010107 (2013)
2. S.C. Bhattacharya and Chinmoy Janaa, *Renewable energy in India: Historical developments and prospects*, 34 ENERGY 8, 981–991(2009)
3. Himanshu Nautiyal, S.K. Singal, Varuna, Aashish Sharma, *Small hydropower for sustainable energy development in India*, 15 RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 4, 2021–2027 (May 2011)

STATUTES

1. Electricity Act, 2003

3. Solar energy

What is meant by Radiation geometry? What are the various solar thermal applications, in the light of flat plate collector, air heaters, power generation etc.? What are the theories and applications surrounding solar photo-voltaic power generation: theory and applications? What are the legal challenges in the tariff structure? Is solar energy 'actually' clean?

References:

- "E-book: Ministry of power, coal and new renewal energy" (January 22, 2015)http://mnre.gov.in/file-manager/UserFiles/ministry%20of%20power,%20coal%20and%20new%20renewal%20energy%20ebook%20english%20virsion/index.html#page/14.
- World Bank Report (2010) "Unleashing the potential of Renewable Energy in India"
- "Implementing National Solar Mission in India Need for an effective Legal and Institutional Response: Policy and Legal Recommendations" available from *www.boell-india.org*last visited on 24th January, 2015
- Donald Zillman and Raymond Deeny, *Legal Aspects of Solar Energy Development*, Ariz. St. L.J. 25, (1976)
- Steven E. Ferrey, *Solar Banking: Constructing New Solutions to the Urban Energy Crisis*, 18 HARV. J. ON LEGIS. 483 (1981)

4. Wind energy

Tapping into the huge potential of wind by setting up infrastructure can be considered to make it one of the most favourable source of energy. Though present in abundance but in order to get the right amount of energy from this source requires one to first answer some pertinent issues. What is/are the source(s) of wind formation? What are the Site selection parameters to harness this form of energy? In case of innovation how does one seek protection for the

'novelty'? How to overcome issues in financing and set cost-efficient standards? What is the regulatory compliance with respect to Renewable Purchase Obligations?

References:

- Salvus Capital Advisors Pvt. Ltd and Sustainable Development Department, New Delhi Investment in Indian Wind Energy Sector: A research report(January 25, 2015) available at *www.salvuscapital.com/iiwes.pdf*.
- Global Wind Energy Council India Wind Energy Outlook 2012(January 25, 2015) *www.wisein.org*
- P R Krithika and Siddha Mahajan Background paper *Governance of renewable energy in India: Issues and challenges* TERI-NFA Working Paper Series No.14, (2014)
- Ernest Smith, *Wind Energy: Siting Controversies and Rights in Wind* 1 ENVTL. & ENERGY L. & POL'Y J. 281 (2005-2007)

5. Energy from biomass and biogas

Considered to be as one of the cleanest forms of fuels this source of energy is converted into the using different processes of biomass conversion. In the process *gasifiers* are used and plants have to set up for the same. This source of energy though is widely accepted but has suffered from the typical mindset that people have and also the stiff competition that it faces from the other sources. What are the tariff issues and role of Renewable Energy Certificates? Do these create conflicts? How can Open Access prevent the Legal Wrangle in the power generation under the Electricity Act, 2003? Does the use of this fuel have a positive impact upon climate change?

References:

- P.R. Shukla, *Biomass Energy in India: Policies and Prospects*(January 24, 2015) www.decisioncraft.com/energy/papers/ecc/re/biomass/bpi.pdf
- John Cobb, *Mitigating the Unintended Consequences of Biofuel Tax Credits*, 49 HARV. J. ON LEGIS. 451 (2012)
- Sarah M. Hayter, *Climate Change Mitigation with Renewable Biomass: Shifting Legal Incentives away from Electricity and Towards Cogeneration*, 31 Miss. C. L. Rev. 429 (2012-2013)

6. Geothermal energy

What are Geothermal resources? How can power be generated from the use of geothermal energy? How are tariffs and incentives regulated in this sector?

References:

- India Geo-thermal Energy (January 23, 2015) available at http://www.eai.in/ref/ae/geo/geo.html last visited on
- Ingvar B. Fridleifsson, *Status of Geothermal Energy amongst the World's Energy Sources* (January 24, 2015), https://pangea.stanford.edu/ERE/pdf/IGAstandard/EGC/szeged/O-7-03.pdf
- Peter Bayer *et al,International legal status of the use of shallow geothermal energy*, RENEWABLE AND SUSTAINABLE ENERGY REVIEWS 14 2611–2625 (2010)
- John Brooks, *Legal Problems of the Geothermal Industry*, 6 NAT. RESOURCES J. 511 (1966)

- L. Rybach, *Geothermal energy: sustainability and the environment*, 32, GEOTHERMICS, pp. 463– 470, (2003).
- Sukanta Roy and Harsh Gupta, *Geothermal Energy: An Overview*, (23January, 2015) www.environmentportal.in/files/file/geo%20energy.pdf

7. Preserving Energy: Energy Audit and Management

Though this whole idea seems to be a bit astonishing as to why should we conserve energy when there are so many sources available but the reason for the conservation is two-fold: save one's own cost and save unwanted depletion of sources. The Ministry of Power through its agency Bureau of Energy Efficiency has taken up the task to sensitize the need of conservation of energy and highlighted the various standards and procedure that is required to be followed in conserving energy through its models of audit and reporting. Integrated Resource Planning is one of the said methods which suggests such a step in this direction. But can the success found in US in adopting this model, be repeated here? Also given the various models of auditing and with the lack of compulsion or incentives, does the role of the authorities become less predominant and rather passive? What is the role of corporations and industries in conserving energy? Is climate change an inevitable process?

References:

- Ruth Hillary, *Environmental Auditing: Concepts, Methods and Developments*, 2, Issue 1, INTERNATIONAL JOURNAL OF AUDITING, 71–85, (1998).
- Angelina Liang, *Shedding Light: The Role of Public Utility Commissions in Encouraging Adoption of Energy Efficient Lighting by Low-Income Households*, 38 COLUM. J. ENVTL. L. 333 (2013)
- Odile J. Lim Tung, *Appraisal of the Energy Efficiency Regulatory Framework in Mauritius*, 31 J. ENERGY & NAT. RESOURCES L. 425 (2013)
- Amanda R. Carrico, *Energy and Climate Change: Key Lessons for Implementing the Behavioral Wedge*, 2 GEO. WASH. J. ENERGY & ENVTL. L. 61 (2011)
- Edward A. Finklea and Mary P. Treiber, *Residential Energy Conservation Measures: A Penny Saved Is a Penny Earned*, 11 ENVTL. L. 639 (1980-1981)

V Additional References

1. P. C. Sharma Power Plant Engineering, (7th ed.) (2002).
2. V.L. Patel and R.N. Patel., Fluid Power Engineering, (3rd ed.) (2007).
3. D.S. Kumar, Fluid Mechanics and Fluid Power Engineering, (6th ed.) (1998).
4. S P Sukhatme and J K Nayak, Solar Energy, (3rd ed.) (2008).
5. Parag Diwan and A.C. KherEnergy Law and Policy, (2008 ed.)
6. Chhatrapati Singh *et al*, Towards Energy Conservation Law, (1989 ed.)
7. Asian Development Bank, Energy Infrastructure: Priorities, Constraints and Strategies for India, (2009 ed.)
8. Ministry of New and Renewable Energy Government of India and UNDP (India) Bioenergy in India

UEIM007 Fundamentals of Financial Management

Course Title: Fundamentals of Financial Management

Credit Hours: 4.0

Course Objectives

1. To provide students with the basic understanding of financial management in an organizational context
2. To help them understand the working of financial markets
3. To enable them to use spreadsheets to perform financial analysis

Learning Outcomes

At the end of the course, students shall be able to:

1. Understand the significance of financial management to firm performance
2. Identify the variables important to making financial decisions
3. Perform primary investment decision analysis
4. Describe sources of funds and their costs
5. Perform basic financial analysis using spreadsheets

Syllabus

Module 1: Basics of Financial Management

1. Introduction to Financial Management
2. Role and Functions of the Finance function
3. Time Value of Money
4. Basics of Risk and Return

Module 2: Financial Markets and Instruments

1. The Financial System
2. Introduction to Financial Markets and Instruments
3. Sources and Cost of Capital

Module 3: Major Financial Decisions

1. The Investment Decision
2. The Funding Decision
3. The Distribution of Profit Decision

4. Introduction to Working Capital Management
5. Managing Risk

Module 4: Using Spreadsheets in Finance

1. Introduction to Financial functions in Spreadsheets
2. Spreadsheet Application Exercises

Suggested Readings

1. Chandra, P. (2010). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
2. Khan, M. Y. & Jain, P. K. (2012). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
3. Pandey, I. M. (2011). Essentials of Financial Management. New Delhi: Vikas Publishing House.
4. Ross, S., Westerfield, R. & Jordan, B. (2012). Fundamentals of Corporate Finance. New Delhi: Tata McGraw Hill.
5. Rustagi, R. P. (2011). Financial Management: Problems & Solutions. New Delhi: Taxmann.

Wachowicz J. M. & Van Horne, J. C. (2009). Fundamentals of Financial Management. New Delhi: PHI Learning

UEIL007 Forensic Science and Law

Teaching Hours: 45 Credit: 3

I INTRODUCTION:

The functioning of a criminal justice system depends on the principle of proving the guilt beyond reasonable doubt. It is believed that punishment should be awarded only when there is substantial proof that the person being convicted has an established guilt in the matter concerned. For this purpose, evidence is generated that provides for the involvement of a person in a particular act. Evidence is the arena wherein the concept of forensic science comes into play. Forensic science is that branch of science which provides practical application of scientific technology to investigate criminal or legal matters. The Indian Criminal Justice system is an adversarial system which means there are two parties, and both of them present their cases and the court decides the case on the basis of evidenceprovided by the parties. Forensic science is resorted to for the purpose of attaining a lead as to involvement of the person in question or for that matter identification of any other person who may have been involved. This course tries to analyse involvement of forensic science in criminal justice system with relate to Quality in Forensic Science, Importance of crime scene, Preservation of crime scene. Issue of admissibility, the increasing role of scientific technique, admissibility standards for expert evidence, to name a few.

II COURSE LEARNING OUTCOME:

After the completion of the course the students will be able to:
1 Understand and describe the underlining concepts of forensic science2 Identify and articulate the emerging issues in forensic evidence.
3 Analyse the benefit and cost of using new scientific technique in criminal investigation. 4 Evaluate the issues relating to admissibility of forensic evidence in a court of law.

III SYLLABUS:

Scene of crime and sight of Law

This unit examines a number of critical issues associated with the collection of forensic evidence at thecrime scene such as quality in Forensic Science, importance of crime scene, preservation of crime scene. Exploring these areas by keeping in mind that the crime scene is one of the most crucial aspects of an investigation and that the scene of the crime is where collection of forensic evidence begins.

Proved beyond doubt? Scientific Technique in Criminal Investigation

This unit examines the science of DNA identification, Brain finger printing, Lie Detector Test, Narco Analysis Test and its use during criminal investigations and in criminal proceedings, including criminal trials, appeals and post-conviction proceedings. This unit try to analyse the main benefits and costs of the increasing role of scientific technique in the criminal justice system with special emphasis to India and the challenges of these technologies in future.

Scientific Evidence in Court of Law

Development of scientific and technical expert testimony in the complex and technical issues has flooded the judicial system, the question of its reliability and admissibility has also plagued the courts and engendered much debate. This unit try to analyse the issue of admissibility which has attracted the attention of countless commentators and the offered arguments supporting greater or lesser barriers to the admissibility of scientific expert evidence.

Need for caution: Problematizing Pitfalls

This unit discusses *Daubert*in a new context, using the Indian case of *State of Maharashtra v. Sharma* as an example of how unreliable, questionable evidence can penetrate the courtroom when admissibility standards for expert evidence do not keep it at bay. This unit also analyses *Daubert* against the backdrop of rapidly emerging technologies and highlights the fact that courts can expect to confront increasing amounts of technical expert evidence in the future.

Scientific race and legal pace: struggle of catching up

In addition to the conventional areas of study mentioned in the above units, this unit tries to explorethe field of forensic science which constantly expands to include many additional areas of expertise include analyses of bloodstain pattern interpretation, forensic engineering, forensic cyber technology, and criminal personality profiling, forensic economics, forensic photography, forensic radiology, and forensic accounting. Further this unit also tries to understand emerging specialty known as forensic security with which today's loss prevention manager must become quite familiar if he or she is to successfully respond to the growing challenge of premises liability for negligent security litigation facing today's businesses, corporations, and commercial/ residential landlords from a broader perspective.

IV REFERENCES:

1. Henry C. Lee, *Forensic Science and the Law*, 25 CONNECTICUTLAW REVI*EW* (1117-1125) (1993).
2. Michael J. Saks & Jonathan Koehler, *The Individualization Fallacy in Forensic Science Evidence,* 61, VANDERBILT LAW REVIEW(pp199-219) (2008).
3. John I. Thornton, *Uses and Abuses of Forensic Science*, Vol. 69 AMERICAN BAR ASSOCIATION JOURNAL(pp 289-292) (1983).
4. Foster William L, *Expert Testimony- Prevalent Complaints and Proposed Remedies*, 11(3), HARVARD LAW REVIEW(pp169-186) (1897)
5. Alldrige Peter, *Forensic Science and Expert Evidence*, 21(1), JOURNAL OF LAW AND SOCIETY(pp 136-150) (1994).
6. Brigham John C., *What is Forensic Psychology, Anyway*? 23(3), LAW AND HUMAN BEHAVIOUR(pp 273-298) (1999).
7. Diamond Bernard L., *Inherent Problems in the Use of Pre-trial Hypnosis on a Prospective Witness,* 68(2), CALIFORNIA LAW REVIEW (pp 313-349) (1980).
8. Tovino Stacey A., *Imaging Body Structure and Mapping Brain Function: A Historical Approach*, Vol.33, AMERICAN JOURNAL OF LAW AND MEDICINE (pp 193-228) (2007).
9. Lyndia D., Johnson, *Guilty or Innocent-Just Take a Look at My Brain: Analysing the Nexus between Traumatic Brain Injury and Criminal Responsibility.* Vol. 37 (1): SOUTHERN UNIVERSITY LAW REVIEW. (pp 25-40) (2009).

10. Danielle, Andrewartha , *Lie Detection in Litigation: Science or Prejudice (article).* Vol.15(1):PSYCHIATRY PSYCHOLOGY AND LAW.(pp 88-104) (2008).
11. Robbert L. Collins, *Improved Crime Scene Investigation*, ‚JOURNAL OF CRIMINAL LAW,CRIMINOLOGY AND POLITICAL SCIENCE.
12. Whitman Glen, Koppl Roger, *Rational Bias in Forensic Science*, 9, OXFORD JOURNAL:LAW, PROBABILITY & RISK. (pp 69-90) (2010)
13. Williams John F, *Trace Evidence.* 49, THE JOURNAL OF CRIMINAL LAW, CRIMINOLOGYAND POLICE SCIENCE. (pp 285-288) (1958).
14. Kingston Charles R., *Application of Probability Theory in Criminalistics,* 60, JOURNAL OFAMERICAN STATISTICAL ASSOCIATION. (pp 70-80) (1965).
15. Rao Dr. G.V., *DNA Testing: Mere match is not conclusive proof unless statistics corroborate*,118, CRIMINAL LAW JOURNAL (October 2012)
16. Gupta Mohit, *Digital Forensics*, *Hacking and its Role in Crime Investigations,* MEDICOLEGAL UPDATE (pp98-100)
17. Celine Weyermann, Olivier Ribaux, *Situating forensic traces in time*, JOURNAL OF THEFORENSIC SCIENCE SOCIETY SCIENCE AND JUSTICE, 52, (pp68-75) (June 2012).
18. John W. Bond, *The value of fingerprint evidence in detecting the crime,* INTERNATIONALJOURNAL OF POLITICAL SCIENCE AND MANAGEMENT Vol.11 (77-82)
19. Stan Brown and Sheila Willis, *Complexity in Forensic Science,* Vol.(1:4), FORENSIC SCIENCEPOLICY AND MANAGEMENT: AN INTERNATIONAL JOURNAL (pp 192-198) (2010).
20. Roach Kent, *Forensic Science and Miscarriage of Justice: Some lessons from ComparativeExperience*, Vol.50*,* JURIMETRICS, (pp 67-92) (2009)

Reference Books:-

1. MAHENDRA SINGH ADIL, SCENE OF CRIME- CRITICAL ROLE AND USAGE OF SCENEOF OCCURRENCE IN TRIAL,(Capital Publishing House, Delhi.)
2. GROSS'S CRIMINAL INVESTIGATION, (5th Edition, Universal Law Publishing Co. 3rd IndianReprint, Delhi) (2008).
3. SHARMA B.R., SCIENTIFIC CRIMINAL INVESTIGATION, (Universal Law Publishing Co.,Delhi) (2006).
4. K. MATHIHARAN AND AMRIT K PATNAIK, MODI'S MEDICAL JURISPRUDENCE ANDTOXICOLOGY, (23rd Edition, Lexis NexisButterworths).
5. EDWARD HUESLE, .FIREARMS AND FINGERPRINTS, ESSENTIALS OF FORENSIC SCIENCE*,* (1st Indian Edition, Viva Books Private Limited, New Delhi) (2007)
6. MAX M HOUCK, TRACE EVIDENCE, ESSENTIALS OF FORENSIC SCIENCE-(1st IndianEdition, Viva Books Private Limited, New Delhi) (2007).
7. JYOTIRMOY ADHIKARY, DNA TECHNOLOGY IN ADMINISTRATION OF JUSTICE (LexisNexisButterworths, New Delhi) (2007)

UEIM003 Fundamental of International Business

Course Objectives

- To introduce the students various concepts and issues in international business and related activities.
- To evaluate global business opportunities and develop skills to deal with various issuesinvolved in cross-border transaction of goods, services and other resources between two or more nations.

Learning Outcomes

At the end of the course, students shall be able to:

1. understand and evaluate the basis of international trade and business.
2. explain the various methods of entry into foreign markets and assess the suitablemode for international business.
3. understand the concept of globalization and discuss the implications ofGATT/WTO in international business.
4. understand the India's institutional and policy framework for internationalbusiness.

Syllabus

Module 1: AN OVERVIEW TO INTERNATIONAL BUSINESS
Introduction

- Evolution Of International Business
- Stages Of Internationalization
- International Business Approaches
- Importance Of Cross Cultural Differences In International Business
- Modes Of Entry Into International Markets
- Advantages And Problems Of International Business

Module 2: CONCEPTUAL FRAMEWORK: INTERNATIONAL TRADE, INVESTMENT, BALANCE OF PAYMENT AND TERMS OF PAYMENT

- Mercantilism
- Theory Of Absolute Cost And Comparative Cost Advantage
- Relative Factor Endowment Theory
- Product Life Cycle Theory
- Porter's National Competitive Advantage Theory
- Foreign Collaboration/Technology Transfer Related Issues
- Factors Influencing FDI
- Reasons And Cost And Benefits Of FDI
- Concept Of Balance Of Payments And Its Components
  Terms Of Payment

Module 3: GLOBALISATION, WORLD TRADE ORGANISATION AND REGIONAL ECONOMIC INTEGRATION

- Concept Of Globalization
- Drivers Of Globalization
- Globalization Of Markets, Production, Investment, Technology
- Advantages And Disadvantages Of Globalization
- General Agreement Of Tariff And Trade
- Uruguay; Round, Establishment Of WTO And Various Agreement Of WTO
- GATS - Trade In Services
- Concept Of Regional Integrations And Regional Blocks

Module 4: INDIA'S INSTITUTIONAL AND POLICY FRAMEWORK FOR INTERNATIONAL BUSINESS

- Policy And Service Support Organizations
- Commodity Specialization
- Training And Research Institutions
- Trading / Service Corporations
- Risk Covering Institutions
- Financial Institutions
- Institutions Especially For SSIs and State Participation
- An Overview Of India's Foreign Trade Policy And Procedure

Suggested Readings

- Carbaugh J. R.International Economics. Bangalore: Thompson South-Western, Latest Edition.
- Chugan, P. K. International Technology Transfer. Mumbai: Himalaya Publishing House.
- Czinkota R.M., Ronkained I.A. and Moffet, M.H. International Business. Bangalore: Thompson South-Western. Latest Edition.
- Foreign Trade Policy and Handbook of Procedures. New Delhi: Centax Publications. Latest Edition.
- Francis C. International Business Environment. New Delhi: Prentice-Hall India, Latest Edition
- Joshi, R. M. International Business. New Delhi: Oxford University Press. Latest Edition.
- Mithani, D.M. International Economics. Mumbai: Himalaya Publishing House. Latest Edition.
- Paras R. Export – What, Where and How. New Delhi: Anupam Publications. Latest Edition.
- Paul, Justin. International Business. New Delhi: PHI Learning Pvt. Ltd. Latest Edition
- Rao, S. P. International Business; Text and Cases. Mumbai: Himalaya Publishing House. Latest Edition.

UEIA002 GIS And Remote Sensing

Course Learning Outcomes (CLO):

At the end of the course Students will be able to -

- Develop understanding about database management.
- Display data in maps.
- Acquire fundamental knowledge of Remote Sensing through Satellite imageries.
- Gain insights on application of GIS and Remote Sensing in Planning.

Teaching hours: 60

Syllabus:

Unit 1: Database Management and Data Analysis Hours: 12

- Fundamental concpets of Database Management System
- Query Building
- Understanding the usage of ArcTool Box
- Creating Charts and graphs
- Statistics Summary
- Using Field Calculator
- Calculate Geometry
- Buffering or Proximity Analysis
- Overlay Analysis
- 3D, spatial and statistical analysis
- Land Matrix
- Land Utilization
- Cloud Computing
- Crowd Sourcing

Unit 2: Displaying Data in Maps and Map Elements Hours: 16

- Symbology
- Labeling and Annotation
- Creating Map Layout
- Inserting Map Scale; Legend Map; Title; North Symbol; Creating Grids; Other map Elements and Saving a Layout.
- Conducting a Land Suitability Analysis using GIS, Introduction to new concepts like cloud computing, crowdsourcing etc.

Unit 3: Remote Sensing and Photo Interpretation Hours: 16

- Remote Sensing -Definition, Aerial and Satellite Remote Sensing; Aerial Photo-Interpretation, Qualitative and Quantitative Elements of Photo- Interpretation
- Satellite Remote sensing, Geo-Stationary and Sun-Synchronous Satellites, Principles of Electro-Magnetic Radiations, Resolutions
- Introduction to Digital Image Processing
- Salient Features of Popular Remote Sensing Satellites; Applications in Planning
- Laboratory Exercises

Unit 4: Photogrammetry Hours: 08

- Limitations of Traditional Surveys for Planning
- Photogrammetry as an Alternative Tool for Surveying
- Arial Photographs, Classification
- Principles of Stereoscopic Vision
- Basic instruments -Stereopair, Pocket and Mirror Stereoscopes, Parallax Bars
- Principles of Photogrammetry, Measurement of Heights and Depths
- Introduction to Digital Photogrammetry

Unit 5: Planning Information Systems in India Hours: 08

- Introduction to Spatial Data Infrastructure, NNRMS, NUIS, National Urban Observatory, Municipal Information Systems, Land Information Systems, Cadastre Systems
- Applications and Limitations
- Tools for Spatial Data Handling,
- BHUVAN
- Agencies responsible for generating spatial data.

Suggested Readings:

- "National Atlas and Thematic Mapping Organisation" (NATMO) Publications
- Andrew Skidmore et al, "*Environmental Modelling with GIS and Remote Sensing*", CRC Press
- Basdudeb Bhatta, "*Remote Sensing and GIS*", Oxford University Press
- David J Maguire et al, "*GIS, Spatial Analysis, and Modelling*", ESRI Press
- Mesfin T Bekalo et al, "*Landuse Change Detection using GIS, Remote Sensing and Spatial Matrices*", Lap Lambert Academic Publications
- Mezenzia Mengist, Vdm Verlag, "*Lans Sustainability Evaluation using GIS and Remote Sensing Technology*",
- Netzband, "*Applied Remote Sensing in Urban Planning, Governance and Sustainability*", Springer, India
- PA Longley et al, "*Geographic Information Systems and Science*", John Wiley and Sons Ltd.
- Qihao Weng, "*Remote Sensing and GIS Integration: Theories, Methods and Applications*", McGraw Hill Professional
- Satheesh Gopi, "*Advanced Surveying: Total Station, GIS and Remote Sensing*", Pearson
- Thomas M Lillesand et al, "*Remote Sensing and Image Interpretation*", John Wiley and Sons Ltd.

UEIP013 Health and Nutrition

After successful completion of the course student will be able to: 1. Remember the fundamentals of health and nutrition
2. Cite examples of food labelling
3. Describe significance of macronutrients and micronutrients
4. Discuss importance of functional foods 5. Explain indicators of nutritional status

1. Introduction to the basic concepts of health and nutrition

2. Nutrition
   - Macronutrients: Carbohydrates (including dietary fibers), fats and proteins
   - Micronutrients: Vitamins, minerals, anti-oxidants, gut flora
   - Significance of macronutrients and micronutrients for optimal health

3. Meal Planning

   - Functional foods: Definition of functional foods, Role of functional ingredients and food in nutrition, Health attributes of functional foods
   - Health attributes of nutrition: Diet and disease, Diet with respect to special population (elderly, pediatric and pregnant women),
   - Indicators for maintenance of nutritional status: Nutrition Balance Indicator, Satiety Index, Fullness factor, Glycemic index and insulin index

4. Food Labelling (Food service management)

   - Nutrition Facts Panel
   - Serving Size
   - Calories
   - Ingredients list
   - Quantitative indications
   - Food additives
   - The percent daily value
   - Allergan labelling

Total Lectures **45**

Books Recommended

1. Nutritional Sciences: From fundamental to food. By Michelle McGuireand Kathy Beerman. Publisher: Yolanda Cassio. ISBN-13: 978-0840058201
2. Pressman, Alan H., Sheila Buff, and Gary Null. The Complete Idiot's Guide to Vitamins and Minerals. New York: Alpha Books.
3. Focus on Pathophysiology, Barbara A. Bullock and Reet L. Henze Lippincott Williams & Wilkins, Philadelphia
4. Lehninger Principles of Biochemistry, 3rd ed London : Macmillan Press Ltd.
5. Tortora G.J. and Anagnodokos, N.P. Principles of Anatomy and Physiology (Harper and Colling Publishers, New York)

6. Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism By: Carolyn D. Berdanier, Lynnette A. Berdanier, Janos Zempleni. Publisher: CRC Press. ISBN 9781420055528
7. Functional Foods and Nutraceuticals By: Aluko, Rotimi E. Publisher: Springer
8. B. Srilakshmi. Food science. India, New Age International (P) Limited.
9. Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth, Ranjana Mahna & Seema Puri . Textbook of Nutrition and Dietetics. India, Elite Publishers.
10. C.Gopalan. Nutritive Value of Indian Foods, India, ICMR publications.

UEIM006 Human Resource Management

Course Objectives

- To introduce the students to human resource management function.
- To understand the people management role in organizations.

Learning Outcomes

At the end of the course, students will:

1. acquire an insight into the role and responsibilities of the HRM function.
2. learn about the different systems within HRM viz. Recruitment and Selection, Performance Management, Compensation Management, Employee Relationship Management and recognize their strategic contribution to business and organizations
3. carry out job and role analysis and write job descriptions.

Syllabus

Module I: Introduction

- An Introduction to Human Resource Management
- Skills and Competencies of a Human Resource Manager
- Corporate Strategy and Human Resource Management

Module II: Manpower Planning and Talent Acquisition

- Manpower Planning and Deployment
- Job Analysis, Design and Redesign of Jobs
- Recruitment & Selection

Module III: Managing and Rewarding Employee Performance

- Performance Management
- Compensation Management
- Learning & Development

Module IV: Managing Employee Relations

- Employee Relationship Management
- Industrial Disputes & Conflicts
- Labour Legislation
- Managing Employee Exit and Separations

Module V: Contemporary issues in Human Resource Management

Suggested Readings

- Dessler, G. Varkkey, B. (2011. Human Resource Management. (12th Edition). New Delhi: Pearson Education.
- Bernardin, J. H. (2007). Human Resource Management – An

Experiential Approach. New Delhi: Tata McGraw Hill Publishing Company Limited.

- Singh B.D. (2004). Industrial Relations, Emerging Paradigms. New Delhi: Excel Books.
- Varkkey, B., Dutta, R. and Rao, G. P. (Eds). (2000). Value Creation: The Challenge of HR in the New Millennium. New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Ramaswamy, E.A. (2000). Managing Human Resources: A Contemporary Text. New Delhi: Oxford University Press.
- Pande, S. and Basak, S. (2012). Human Resource Management. (1st Edition). New Delhi: Pearson Education.

EIM001 Indian Economy

Course Objectives:

- To introduce the students to the various dimensions of the Indian Economy
- To provide a historical and current analysis of how the Indian Economy has reached its current state of affairs

Learning Outcomes

At the end of the course, students shall be able to:

1. Understand the various aspects of India's economy
2. Develop a perspective on the different problems and approaches to economic planning and development in India
3. Understand the role of the Indian Economy in the global context, and how different factors have affected this process

Syllabus

Module 1: STRUCTURE OF THE INDIAN ECONOMY

- India As A Developing Economy; Indian Economy On The Eve Of Independence; National Income Of India: Trends And Levels
- Human Resources And Economic Development; Human Development In India; Occupational Structure And Economic Development
- Natural Resources, Economic Development And Environmental Degradation
- Infrastructure In The Indian Economy; Social Infrastructure And Social Sector

Module 2: PLANNING AND ECONOMIC DEVELOPMENT

- Objectives And Strategy Of Economic Planning In India;
- Approach To The Ongoing Five Year Plan
- Regional Planning In India
- Financing Of The Plans
- Economic Reforms In India – Main Features And Achievements.

Module 3: DOMESTIC SECTOR

- Institutional And Technological Reforms In Indian Agriculture
- Agricultural Finance And Marketing
- Agricultural Prices And Policy
- Industrial Policy
- Sources Of Industrial Finance; Role Of Small Scale And Cottage Industries In Indian Economy.

Module 4: EXTERNAL SECTOR OF THE ECONOMY

- India's Balance Of Payments – Problems And Solutions

- Trends, Composition And Direction Of India's Foreign Trade
- New Trade Policy
- WTO And Indian Economy
- Foreign Investment Inflows
- India's Exchange Rate Policy

Module 5: ISSUES AND CHALLENGES OF INDIAN ECONOMY

- Problems Of Poverty
- Inequality
- Unemployment And Inflation - Strategy And Policy Of The Government
- Food Security And Public Distribution System
- Salient Features Of The Relevant Union Budget

Suggested Readings

- Datt, R and Sundharam, K.P.M. Indian Economy. New Delhi: S. Chand & Company Ltd. (Latest Edition).
- Jalan, B. The Indian Economy: Problems and Prospects. Penguin Books.
- Misra, S.K. and Puri, V.K. Indian Economy. Himalaya Publishing House.
- Agrawal, A.N. Indian Economy: Problems of Development and Planning. New Age International Publishers.
- Economic Survey. Government of India (Latest Issue).
- Relevant Business Newspapers.

UEIL021 Information Technology and Cyber Law

Teaching Hours: 45 Credit: 3

I Introduction

The rapid growth of computer technology makes our life easier and attracts us to make every transaction by using electronic sources. All of us use computer every day through personal computer, laptop, mobile phone, notebook, *etc.* On the other hand unemployed persons are attracted to involve in unethical and unsocial activities, even in some of the cases, it extend to criminal activities. This coursewill disseminate the knowledge of computer technology which use cyberspace to transact the text, photo, documents, videos, money, etc. The course will also develop their ability to link internet technology with legal principles in fixing the tortious liabilities of the wrongdoer to compensate the victim and criminal liabilities of the offenders after following the due process of law. The Course will create ability among the students to apply Indian Information Technology Act in regulating E-Commerce, E-Governance, E-Banking and cybercrimes.

II Course Learning Outcome:

After the completion of the course the students will be able to:

1. Understand the information technology with technical & social perspectives. 2. Analyses the critical issues in developing cyber jurisprudence & policy.

III Syllabus

Module 1: Information Technology

What is Networking and Internet? What are various Computer Technologies used in Networking? What is relation between Computer Web Technology? , Types of networks; Intra-net and internet, Understanding Internet, www, Computer Memory and Storage, What is relationship between Cyberspace, Technology and Law, Defining the Scope of Information Communication Technology

Module 2: Stakeholders in cyber world

Defining the expansion of Cyber World & IT Industry, Who are Users (subscribers), Service Providers, Intermediaries, Cyber Cafe and other stakeholders. What kind of Agreements are Regulating Stakeholders Relationships: Click Wrap, Shrink Wrap, EDI. Discussing Electronic Contracts regulations in Indian & Cross Border Contracts (Reference to IT Act 2000 & UNCITRAL Model Law)

Module 3: Issues related to Software and Web designing

What are various IPR Issues in Cyber Space?, What is Domain Name Dispute, Cyber Squatting, What is Meta-Tagging, Framing and linking issue, Understanding Issues related to copyright, trade name and trademark infringement in IPR Law, Issues relating to Biotechnology and ICT related to software copyright, software privacy, open source software.

Module 4: Regulating Information Technology

How Authentication of electronic Records is done?, what digital signature? & how it is different from electronic signature?, what are regulatory powers of Controller and Certifying authorities?, Understanding, E-governance, E-commerce, E-banking including mobile banking, What are Civil liabilities under IT Act, Who is Adjudicating officer & What is Cyber Regulation Appellate Tribunal.

Module 5: Cyber Crimes

What is Cyber Crimes & what are its various classifications?, Appraisal of Crimes targeting Commuters, Social crimes committed through internet, Cyber pornography and stalking, Personal

crimes, Economic offenses and Social Networking, Terrorist activities through internet. What are various measures taken by government to prevent cybercrimes?

Module 6: Investigation of cyber crimes

How investigation of cybercrime is done? Who is responsible for Cyber Crime Investigation? What are Territorial powers and issues, Confiscation of the computer and other e-devices? What is Computer and cyber forensics, discussing the Admissibility of E-Evidence in court of Law?

Module 7: Issues and challenges to cyber law

Discussing the Relevance of Data Protection Laws & Cyber Security, Legal recognition of Digital Evidence**,** Recognition of liability in the digital world, deciphering the Jurisdiction Issues in Transnational Crimes**,** What is Cloud Computing & what is its regulatory structure, Issue of Communication Convergence, Relevance of Online Dispute Resolution in India.

Reference :

1. Surya Prakash Tripathi, Ritendra Goel And Praveen Kumar Shukla, Introduction To Information Security And Cyber Laws,Wiley India Private Limited, 2014 (Technical Approach)
2. Apar Gupta,Commentary On Information Technology Act,Lexis Nexis India; (2nd Ed.) (2011).
3. Pavan Duggal, Cyber Law - An Exhaustive Section Wise Commentary On The Information Technology Act Along With Rules, Regulations, Polices, Notifications Etc., Universal Law Publishing Co. Pvt Ltd., (2014)
4. Cyber Laws, Justice Yatindra Singh, Universal Law Publishing Co., (2010).
5. Pavan Duggal, Textbook On Cyber Law, Universal Law Publishing Co. Pvt Ltd., (2014)
6. Ajit Narayanan And Bennum (Ed.): Law, Computer Science And Artificial Intelligence.
7. Linda Brennan And Victoria Johnson, Social, Ethical And Policy Implication Of Information Technology.
8. Karnika Seth, Computer Internet And New Technology Laws, Lexisnexis, (1st Edition) (2013).
9. Kamath Nandan, Law Relating To Computers Internet & E-Commerce (A Guide To Cyber Laws & The Information Technology Act, 2000 With Rules & Notification), (5th Edn., Universal Book Traders), (Reprint 2004).
10. Arvind Singhal And Everett Rogers, India's Communication Revolution : From Bullock Carts To Cyber Marts.
11. Mike Godwin, Cyber Rights Defencing Free Speech In The Digital Age

Additional Sources :

1. Talwant Singh Addl. Distt. & Sessions Judge, Delhi, *Cyber Law & Information Technology*http://delhicourts.nic.in/CYBER%20LAW.pdf
2. *New Crimes Under The Information Technology (Amendment) Act*http://www.ijlt.in/archive/volume7/5_Mohanty.pdf
3. *A to Z of cyber crime by Asian School of cyber laws* available at http://ensaiosjuridicos.files.wordpress.com/2013/06/122592201-cybercrime.pdf)
4. Louise Ellison and Yaman Akdeniz, I*nvestigating Cyber Law and Cyber Ethics: Issues, Impacts, and Practices, Cyber-stalking: the Regulation of Harassment on the Internet*http://www.cyber-

rights.org/documents/stalking_article.pdf
5. Cyber Crimes and Information Technology http://www.nalsar.ac.in/pdf/Journals/Nalsar%20Law%20Review-Vol.%204.pdf
6. *A Study of the Privacy Policies of Indian Service Providers and the 43A Rules*
7. http://cis-india.org/internet-governance/blog/a-study-of-the-privacy-policies-of-indian-service-pro viders-and-the-43a-rules
8. *Relationship Between Privacy and Confidentiality*
9. http://cis-india.org/internet-governance/blog/relationship-between-privacy-and-confidentiality
10. *Availability and Accessibility of Government Information in Public Domain*
11. http://cis-india.org/accessibility/blog/availability-and-accessibility-of-government-information-in- public-domain
12. *Cloud Computing in India: The current Legal regime and the main Issues and Challenges* :http://www.indialawjournal.com/volume7/issue-1/article3.html

UEIL014

Appendix-A
(Noti-No-NU-066
Acmtg - 17-4-17)

NIRMA UNIVERSITY
INSTITUTE OF LAW
University Elective Course
Academic Year 2017-18

L	T	PW	C
3	-	-	3

Course Code	
Course Title	**Intellectual Property Rights**

Course Learning Outcomes:

At the end of this course the student will able to:

1. Understand on various facets of IPR including Trade Mark, Patent, Copyright and Design Law
2. Identify various issues and challenges related to IPR.

Syllabus **Teaching Hours: 45**

Unit 1 Introduction **6 Hours**

1.1 Concept of Property
1.2 Concept of Intellectual Property
1.3 Various Justification of Property
1.4 Introduction to TRIPS Agreement

Unit 2 Patent Law **9 Hours**

2.1 Concept and basis of protection
2.2 Criterin of Patentability
2.3 Novelty, Utility and Non-obviousness
2.4 Non Patentable Inventions
2.5 Procedure for patent registration
2.6 Rights of Patentee and Infringement procedure
2.7 Green Patents
2.8 Leverage of Patents

Unit 3 Copyrights Law **8 Hours**

3.1 Introduction and justification
3.2 Subject-Matter of Copyright
3.3 Literary, Dramatic, Musical, Artistic, Cinematograph Films and Sound Recordings
3.4 Copyright and related rights
3.5. Fair use

1

3.6 Rights covered under copyright & remedies for infringement

Unit 4 Trademarks Law **8 Hours**

4.1 Concept and justification of trademarks protection

4.2 Types of marks - Distinctiveness, Descriptive marks, Generic marks and Well-Known Trademarks

4.3 Grounds of Refusal of Registration

4.4 Procedure for Registration

4.5 Rights of trademark owner and Infringement – passing off of trademarks

4.6 Trademarks and Geographical indication

Unit 5. Design Law **8 Hours**

5.1 Basics of Design & Justifications for protecting designs

5.2 Features of Shape, Configuration, Pattern, or Ornament or Composition of Lines or Colour

5.3 Excluded Subject-Matter

5.4 Rights of Design owner and protection against Infringements

Unit 6. Traditional Knowledge and Biodiversity **6 Hours**

6.1. Concept of Traditional knowledge

6.2 Bio-piracy and bio-prospecting

6.3 Access and benefit sharing under CBD

Suggested Readings:

- Ahuja V K, Intellectual Property Rights, Lexis Nexis- Butterworths, New Delhi, 2015
- B.L. Wadhera, Law on Intellectual Property Rights, Universal Publication, 2014
- Cornish, W R, Cases and Materials on Intellectual Property, 3rd Ed. London: Sweet & Maxwell, 1999.
- Verkey Elizabeth, Law of Patents, Second Edition, Eastern Book Company, Lucknow, 2012

UEIL012

NIRMA UNIVERSITY
INSTITUTE OF LAW

Course Name: Introduction to Human Rights
University Elective

Credit: 3
Hours: 45

L	T	PW	C
3	-	-	3

Introduction:
Human Rights are those rights which every man or woman is entitled do by virtue of being born as a Human Being. So as to make these rights a reality, it is equally important to progressively create awareness and sensitivity to support these universally accepted human rights. The course is primarily aimed at sensitizing students on various issues of human rights. Students will also be guided through various human rights enforcing agency like National Human Rights Commission, United Nations and other international human rights organizations. The aim is to encourage students to think as human rights advocates in their examination of specific policy choices and to develop strategies designed to advance human rights in their private and public sphere.

Course Objective:

The object of the course is to:

- Form an understanding of theoretical dilemmas of human Rights Law.
- To identify different human rights by analyzing different rights independently in the light of its philosophical underpinnings.
- To have an understanding of the working of National, Regional and International human Rights protecting agencies.
- To sensitize students on emerging issues concerning Human Rights.

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

- Know about the history and development of human rights Law.
- Understand various concepts, theories relating to human rights and human rights enforcement mechanisms.
- Critically think on upholding of human rights and values and profess the same in their day-to-day interactions.

Syllabus:
Unit I: Jurisprudence of Humanrights

-5-

- Significance of Human Rights
- Concept of Rights
- Problems of Conceptualization of Human Rights
- Justificatory theories
    - Theology
    - Natural law Theory
    - Positivism
    - Marxism
    - Sociological Process

Unit II: Implementation Mechanisms

- International Mechanism
- Regional Mechanism
- National mechanism

Unit III: Domestic Governance of Human Rights in India: 1993 Legislation

- Constitution of Commission at central and State Level
- Jurisdiction of Commission
- Powers and Duties of Commission

References:

- Henry J Steiner, Philip Alston 2008.*Human Rights Cases and Materials*, Oxford: Oxford Uni. Press.
- Dworkin, R.1979. *Taking Rights Seriously*, London: Duckworth.
- Hart H.L. 1969. *Liberty and Morality*, Oxford: Oxford Uni. Press.
- Waldron.J.;ed, 1984 *Theories of Rights*,Oxford: Oxford Uni. Press.
- Dube.M.P and Bora.N.; eds.2000 *Perspective on Human Rights*, New Delhi: Anamika Publishers.
- Winston Morton E.1989. *The Philosophy of Human Rights*, Belmont: Wadworth.
- SAHRDC. 2008, Human Rights and Humanitarian Law, New Delhi. Oxford Uni. Press.

UEIM002

Course Title: Introduction to Strategic Management

Credit Hours: 3

Course Number: UEIM002

Course Objectives

- To introduce the students to strategic management
- To provide knowledge about concepts & frameworks required to analyse a firm in business context

Learning Outcomes

At the end of the course, students shall be able to:

1. Understand the role of strategy in business,
2. Develop an understanding of the basic strategy framework,
3. Apply frameworks regarding how firms gain advantage in the marketplace.

Syllabus

Module 1: INTRODUCTION TO STRATEGY
• Meaning & Scope of Strategy • The process of strategic management • Introduction to the Vocabulary of Strategy: Vision, Mission, Goals, Objectives, Values, Strategy, Resources and Capabilities
Module 2: THE BUSINESS LANDSCAPE
• Sectors & Industries • Analysing A Company's External Environment • Understanding A Company's Strategy, Resources, Capabilities • Phases In Industry's Development

Module 3: GAINING COMPETITIVE ADVANTAGE
• Generic Strategies • Analytical Tools For Competitive Advantage
Module 4: STRATEGY EXECUTION
• People Management Aspects • Resource Management And Operations • Corporate Culture And Leadership Issues

Suggested Readings

- Chandrasekaran, N & Ananthanarayanan, P. S. (2011). Strategic Management. New Delhi: Oxford University Press.
- Phadtare, M. (2010). Strategic Management: Concepts and Cases. New Delhi: PHI Learning.
- Srinivasan, R. (2014). Strategic Management: The Indian Context. New Delhi: PHI Learning.
- Bhandari, A & Verma, R. P. (2013). Strategic Management: A Conceptual Framework. New Delhi: McGraw Hill Education (India) Pvt. Ltd.
- Ghemawat P. (2009). Strategy and the Business Landscape.New Delhi: Prentice Hall

UEIL011

NIRMA UNIVERSITY
INSTITUTE OF LAW
Academic Year: 2016-17
University Elective
Introduction to the Indian Constitution

Credit: 3
Hours: 45

L	T	PW	C
3	-	-	3

Introduction:

India is a democracy and her Constitution seeks to establish its fundamental organs of government and administration, describe their structure, composition, powers and principal functions, define democracy through relationship of the organs with one another and with the people. The Constitution also guarantees certain Fundamental Rights to its citizens that are not to be infringed by the Government. A good understanding of the Constitution and the law, which has developed through constitutional amendments, judicial decisions, constitutional practice and conventions is, therefore, absolutely necessary for a student of law.

The purpose of teaching constitutional law is to highlight its never-ending growth. Constitutional interpretation is bound to be influenced by one's social, economic or political predilections. A student must, therefore, learn how various interpretations of the constitution are possible and why a significant interpretation was adopted in a particular situation. Such a critical approach is necessary requirement in the study of Constitutional law.

Course Learning Outcomes:

After the completion of the course the students will be able:

1. To understand the nature, scope and extent of the Fundamental rights
2. To understand the Composition, Role and Functions of Executive, Legislature and Judiciary.
3. To analyze and critic the interrelationship between the different organs of the Government i.e. Executive, Legislature and Judiciary.
4. To apply the knowledge of the constitutional provisions in solving the emerging challenges posed to the constitution.

Unit I: Introduction to Indian Legal System

- Constitution, Constitutionalism, Constitutional Law, Constitutional Conventions

-2-

- Historical evolution of the Constitution of India during British Raj
- Formation of Constituent Assembly
- Working of Constituent Assembly
- Salient Features of Indian Constitution

Unit II: Goal, Values, Ideals & Aspirations from the Constitution

- Objectives Resolution
- Preamble to Indian Constitution
- 42nd Amendment Act & the Preamble

Unit III: Nature of Indian Union

- Indian Union
- Formation, Creation and Establishment of new States under the Union
- Citizenship

Unit IV: Fundamental Rights

- Definition of State
- Definition of Law
- Right to Equality
- Fundamental Freedoms
- Right to Life & Personal Liberty
- Right against Exploitation
- Right to Religion
- Right to Constitutional Remedies

Unit V: Organs of the Government

- Union Executive
- Union Parliament
- Union Judiciary

Unit VI: Emergency Provisions

- National Emergency
- State Emergency
- Financial Emergency

Unit VII: Amendment to the Constitution

- Need for Amendment
- Types of Amendment
- Procedure for Amendment

Unit VIII: Constitutional Bodies

- Comptroller & Auditor General of India

-3-

- Finance Commission of India
- Election Commission of India

Unit IX: Panchayati Raj Institutions

- Committees
- 73rd & 74th Amendment Act
- Rural Local Bodies
- Urban Local Bodies
- PESA Act

Text Book:

1. M. P. Jain, Constitutional Law, 6th Edition Lexis Nexis Butterworths.
2. V. N. Shukla's, Constitution of India, 12th Edition, Eastern Book Company
3. J.N. Pandey,The Constitutional Law of India, 50th Edition, Central Law Agency

Reference:

1. H.M. Seervai, Constitutional Law of India (4th ed., Vol 1 (1991), Vol. 2 (1993), Vol.3 (1996)
2. D.D. Basu, Shorter Constitution of India (14th ed., 2009)
3. V.D. Sebastian, Indian Federalism the Legislative Conflicts (1985).
4. B. Shiva Rao, The Framing of India's Constitution – Select Documents (1967)
5. Granville Austin, Indian Constitution: Corner stone of the nation (1966)
6. Granville Austin, Working a Democratic Constitution - A History of the Indian Experience (1999)

-4-

- Significance of Human Rights
- Concept of Rights
- Problems of Conceptualization of Human Rights
- Justificatory theories
    - Theology
    - Natural law Theory
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- Winston Morton E.1989. *The Philosophy of Human Rights*, Belmont: Wadworth.
- SAHRDC. 2008, Human Rights and Humanitarian Law, New Delhi. Oxford Uni. Press.

3.6 Rights covered under copyright & remedies for infringement

Unit 4 Trademarks Law **8 Hours**

4.1 Concept and justification of trademarks protection

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4.3 Grounds of Refusal of Registration

4.4 Procedure for Registration

4.5 Rights of trademark owner and Infringement – passing off of trademarks

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5.1 Basics of Design & Justifications for protecting designs

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Unit 6. Traditional Knowledge and Biodiversity **6 Hours**

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- Cornish, W R, Cases and Materials on Intellectual Property, 3rd Ed. London: Sweet & Maxwell, 1999.
- Verkey Elizabeth, Law of Patents, Second Edition, Eastern Book Company, Lucknow, 2012

Right to Information-UEIL013

Credit: 3
Hours: 45

L	T	PW	C
3	-	-	3

Introduction:-

The great democratising power of information has given us all the chance to effect change and alleviate poverty in ways we cannot even imagine today. With information on our side, with knowledge a potential for all, the path to poverty can be reversed. Right to information is a weapon to bring good governance in the country. It is true that right to information proved to be a tool in a great democracy to provide its citizens a functional transparency of the governance. The Right to information is applicable for every citizen of India; therefore, it is necessary to known the jurisprudence of right to information. It is to believe that after the constitution of India, it is the only enactment interrelated by judiciary in its little age. Another necessity to know about the Right to Information Act is that it is a complete code in itself. The following syllabus prepared with this perspective will comprise about 45 units of one hour duration.

Course Learning Outcomes:

At the end of course, the students will be able :

(1) Know the historical development of RTI, origin and role of judiciary in recognizing it as fundamental rights RTI along with RTI movement.

(2) Distinguish between the 'other authorities' under Article 12 of the Constitution and "public authorities' under RTI Act.

(3) Understand the RTI mechanism of redressal system, authority, appellate authority, State Commission and National Commission with their function and powers.

(4) Differentiate between protective information and information should be disclosed.

(5) Understand the role of RTI in good governance.

(6) Draft and file a RTI Application.

1. Origin and de□elopment of Right to Information

1.1. Doctrine of 'right to know'

1.2. Origin of right to information

1.3. The Right to information - Fundamental Right

1.4. Development of right to know

1.5. The Government Privilege to withhold Disclosure of Documents

6. The Freedom of Information Act, 2002

7. Right to information and Good Governance

2. Introduction of Right to Information

2.1 Preamble of the Right to information Act, 2005

2.1 Scope and limitations of the Act

2.2.1 Act not to apply to certain organisations

2.2.2 Act to have overriding effect

2.2.3 Bar of jurisdiction of courts

2.3 Public authority

3. Right to Information

3.1 Meaning of 'information' and 'right to information'

3.2 Obligations of public authorities

3.3 Designation of Public Information Officers

3.4 Request for obtaining information

3.5 Disposal of request

3.6 Exemption from disclosure of information

3.7 Grounds for rejection to access in certain cases

3.8 Third party information

4. The Central Information Commission

4.1 Constitution of Central Information Commission

4.2 Term of office and conditions of service

4.3 Removal of Information Commissioner

4.4 Powers and functions of Information Commissions

5. The State Information Commission

5.1 Constitution of State Information Commission

5.2 Term of office and conditions of service

5.3 Removal of State Information Commissioner

5.4 Powers and functions of Information Commissions

6. Appeal against the order of Public Information Officer

7. Penalties in case information not issued in stipulated time

8. Monitoring and Reporting

9. Right to privacy vs. right to information

9.1 The Official Secret Act, 1923

9.2 Right to Information conflict with Right to Privacy

References:

- Das P.K. : *Handbook on Right to Information Act, 2005*; Universal Publication, New Delhi
- Nagarjan P.S. : *Right to Information and Law;* Gogia Law House, Hyderabad
- Jain K.K. *: Right to Information;* Regal Publication New Delhi
- Prof. (Dr.) SV Joga Rao : Law Relating to Right to Information, Pentagon Press
- Right to Information, Vnigu Publication Ahmedabad
- Saini PK & Gupta RK : Right to Information Act, 2005, Deep and Deep Publication, New Delhi
- Sathe SP : Right to Information, LexisNexis : Butterworth
- Dr Srivastva : Right to know versus Governmental Secretary