

# **COURSES OF STUDIES**

**FOR**

**5yr. Int. M.Sc.**

**In**

# **Mathematics & Computing**

**(up to 6<sup>th</sup> semester)**



**BIJU PATNAIK UNIVERSITY OF  
TECHNOLOGY, ODISHA**

5yr Int. M.Sc in Math & Computing 2014-15

1st Semester				2nd Semester			
THEORY		CONTACT HOURS		THEORY		CONTACT HOURS	
CODE	SUBJECT	L-T-P	CREDIT	CODE	SUBJECT	L-T-P	CREDIT
FMCC101	DISCRETE MATH.	3-1-0.	4	FMCC201	ALGEBRA-I	3-0-0	3
FMCC102	ORDINARY DIFF. EQU.	3-1-0.	4	FMCC202	ANALYSIS-I	3-1-0.	4
FMCC103	LINEAR ALGEBRA	3-0-0	3	FMCC203	PROBABILITY	3-1-0.	4
FPYE106	PHYSICS-I	3-0-0	3	FPYE206	PHYSICS-II	3-0-0	3
FHMF109	COMMUNICATIVE ENGLISH	3-0-0	2	FHMF209	BUSINESS C COMMUNICATION ENGLISH	2-0-0	2
FBEF111	FUNDAMENTAL OF COMP. & PROGR. IN C	3-0-0	3	FBEF210	DATA STRUCTURE using C	3-0-0	3
FPYE156	PHYSICS LAB –I	0-0-3	2	FPYE256	PHYSICS LAB -II	0-0-3	2
FHMF159	COMMUNICATIVE ENGLISH LAB	0-0-3	2	FHMF259	BUSINESS C COMMUNICATION ENGLISH LAB	0-0-3	2
FBEF161	PROGR. IN C LAB	0-0-3	2	FBEF260	DATA STRUCTURE using C LAB	0-0-3	2

3rd Semester				4th Semester			
THEORY		CONTACT HOURS		THEORY		CONTACT HOURS	
CODE	SUBJECT	L-T-P	CREDIT	CODE	SUBJECT	L-T-P	CREDIT
FMCC301	NUMERICAL METHODS	3-1-0.	4	FMCC401	ANALYSIS-II	3-1-0.	4
FMCC302	STATISTICS	3-1-0.	4	FMCC402	GEOMETRY OF CURVES & SURFACES	3-1-0.	4
FMCC303	CALCULUS-I & ANALYTIC GEOMETRY	3-1-0.	4	FMCC403	MATHEMATICAL METHODS	3-1-0.	4
FPYE306	PHYSICS-III	3-0-0	3	FPYE406	PHYSICS-IV	3-0-0	3
FHMF309	ORGANISATIONAL BEHAVIOUR	3-0-0	3	FHMF409	ECONOMICS	3-0-0	3
FBEF312	OPERATING SYSYTEM	3-0-0	3	FBEF411	RELATIONAL DATABASE MANAGEMENT SYSTEM	3-0-0	3
FPYE356	PHYSICS LAB –III	0-0-3	2	FPYE456	PHYSICS LAB-IV	0-0-3	2
FBEF362	OPERATING SYSYTEM LAB	0-0-3	2	FBEF461	RELATIONAL DATABASE MANAGEMENT SYSTEM LAB	0-0-3	2

## 5yr Int. M.Sc in Math &amp; Computing 2014-15

5th Semester				6th Semester			
THEORY		CONTACT HOURS		THEORY		CONTACT HOURS	
CODE	SUBJECT	L-T-P	CREDIT	CODE	SUBJECT	L-T-P	CREDIT
FMCC501	ADVANCED CALCULUS	3-1-0.	4	FMCC601	OPERATIONS RESEARCH	3-0-0	3
FMCC502	NUMBER THEORY	3-1-0.	4	FMCC602	COMPLEX ANALYSIS	3-1-0.	4
FMCC503	MATHEMATICAL MODELLING & SIMULATION	3-1-0.	4	FMCC603	DIFFERENTIAL EQUATION-II	3-0-0	3
FCYE508	ENVIRONMENTAL SCIENCE	3-0-0	3	FHMF609	INDIAN SOCIETY, ETHICS & CULTURE	3-0-0	3
FBEF511	DESIGN & ANALYSIS OF ALGORITHMS	3-0-0	3	FBEF611	COMPUTER NETWORK	3-1-0.	4
FBEF512	JAVA PROGRAMMING	3-0-0	3		<b>Elective I(Any One)</b>	3-1-0.	4
FBEF561	DESIGN & ANALYSIS OF ALGORITHMS LAB	0-0-3	2	FMCE604	NUMERICAL SOLUTION OF DIFFERENTIAL EQUATION	3-1-0.	4
FBEF562	JAVA PROGRAMMING LAB	0-0-3	2	FMCE605	BIO-INFORMATICS	3-1-0.	4
				FMCE606	FUZZY & ROUGH SET THEORY	3-1-0.	4
				FMCC651	OPERATIONS RESEARCH LAB	0-0-3	2
				FMCC652	STATISTICA LAB	0-0-3	2

7th Semester				8th Semester			
THEORY		CONTACT HOURS		THEORY		CONTACT HOURS	
CODE	SUBJECT	L-T-P	CREDIT	CODE	SUBJECT	L-T-P	CREDIT
FMCC701	TOPOLOGY	3-1-0.	4	FMCC801	ALGEBRA-II	3-1-0.	4
FMCC702	MEASURE THEORY	3-1-0.	4	FMCC802	STOCHASTIC PROCESS	3-1-0.	4
FMCC703	ADVANCED DIFFERENTIAL EQUATION	3-1-0.	4	FMCC803	OPTIMIZATION TECHNIQUE	3-1-0.	4
FMCC704	ADVANCED NUMERICAL METHOD	3-1-0.	4	FMCC804	MATRIX COMPUTATION	3-0-0	3
FBEF711	SOFTWARE ENGINEERING	3-0-0	3	FBEF811	COMPUTER GRAPHICS	3-1-0.	4
	<b>Elective II(Any One)</b>	3-1-0.	4	FBEF812	DATA MINING	3-1-0.	4
FBEF712	ADVANCED COMPUTER ARCHITECTURE	3-1-0.	4	FMCC851	MATLAB	0-0-3	2
FBEF713	CODING THEORY	3-1-0.	4				
FBEF714	ARTIFICIAL INTELLIGENCE	3-1-0.	4				
FMCC751	SEMINAR	0-0-3	2				

## **FMCC 101 Discrete Mathematics (3-1-0)**

### **Module-I : (13 Hours)**

Propositional logic operations, truth , First order logic, basic logical Operations  
Propositional Equivalence, Predicates and Universal & Existential Quantifiers,  
Nested Quantifiers,

Rules of Inference, Proof methods and Strategies, Sequences and Summations,  
Mathematical Induction, Recursive definition and structural induction, Program  
Correction

Recurrence relation, Solution to recurrence relation, Generating functions, Principle  
of Inclusion and exclusion, Application of Inclusion and Exclusion Principle,

Set Theory, Relation and their properties, Partitions, Closure of Relations, Warshall,s  
Algorithm, Equivalence relations, Partial orderings, .

### **Module-II : (14 Hours)**

Introduction to graph theory, Graph terminology, Representation of graphs,  
Isomorphism,

Connectivity, Euler and Hamiltonian paths, Shortest path problems, Planar graph,  
Graph coloring,

Introduction to trees, Application of trees, Tree Traversal, Minimum Spanning tree.

### **Module-III : (13 Hours)**

Semi groups, Monoids, Groups, Subgroups, Cosets, Lagrange theorem, Permutation  
groups,

Group codes ,Isomorphism, Homomorphisms, Normal subgroups, Rings, Integral  
Domain and  
Fields.

Algebraic systems, Lattices, Distributive and Complemented Lattices, Boolean  
Lattices and

Boolean Algebra, Boolean Functions and Boolean Expressions.

### **Text Books:**

1. J. L. Mott, A. Kandel, T. P. Baker, "Discrete mathematics for Computer Scientists  
& Mathematicians", Second Edition, PHI.

Chapters : 1,2,3,4(4.1-4.5), 5, 6(6.1-6.5)

2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Sixth Edition,  
2008, Tata McGraw Hill Education , New Delhi.

3. C. L. Liu and D. Mohapatra, "Elements of Discrete Mathematics", Third Edition,  
2008, Tata McGraw Hill Education, New Delhi

### **Reference Books:**

1. Gosset " Discrete Mathematics "Second Edition, Wiley.

2. Discrete Mathematical structures, Kolman, Busby & Ross, Pearson.

## **FMCC 102 Ordinary Differential Equation (3-1-0)**

### **Module-I : (14 Hours)**

**Basic Concepts of Differential Equation:** Origin and Classification of Differential equation, Solution of Differential Equation, Kinds of solution, Initial and Boundary value problem, Existence and uniqueness of solution, Formation of Differential equation. **First Order First Degree Equation:** Variable separable, Homogenous Equation, Exact Differential equation, Integrating Factors, Linear equations, Equation reducible to linear form.

**Equations of First order but of Higher Degree :** Equations solvable for  $p$ , Equation solvable for  $y$ , Equation solvable for  $x$ ,

### **Module-II : (14 Hours)**

**Linear Equations with Constant coefficient :** Linear differential equation of  $n$ th order, Homogenous Linear equation with constant coefficient, Non- Homogenous Linear equation with constant coefficient, Operators and its use to solve linear differential equations with constant coefficient, Method of Variation of Parameter, Linear Differential Equation with variable coefficient: Method of reduction of order, method based on the removal of the first derivatives.

**Existence and Uniqueness of solution:** Picard's method of successive Approximation, Existence and uniqueness Theorem.

### **Module-III : (12 Hours)**

Series Solution and special function: Power series, Radius of convergence of power series, Ordinary point, singular point and regular singular point(only definition), Series solution about an ordinary point, Legendre equation and Legendre polynomial, Orthogonality, Power series method about singular point, Bessel 's equation and Bessel's function, Orthogonality in Bessel function. Boundary value problem for Ordinary Differential Equation; Sturm –Liouville Problems.

#### **Text Books:**

1. A Course on Ordinary and Partial Differential Equation by J. Sinha Roy, S Padhy, Kalyani Publisher.  
Chapters:1(1.1-1.4),2(2.1-2.7),3(3.1-3.4)4(4.1-4.6),6(6.1,-  
6.3),7(7.1,7.2,7.3(7.3.1),7.4(7.4.1)),10 (10.1,10.2).

#### **Reference Books:**

1. Ordinary Differential Equation by P C Biswal (Pub- PHI)

## FMCC 103 Linear Algebra (3-0-0)

### Module-I (10-hours)

Geometric interpretation of solution of system of equations in two and three variables; matrix notation; solution by elimination and back substitution; interpretation in terms of matrices, elimination using matrices; elementary matrices, properties of operations on matrices. Definition and uniqueness; non-existence in general: singular matrices; calculation of inverse using Gauss-Jordan elimination; existence of one sided inverse implies invertibility ; decomposition of a matrix as product of upper and lower triangular matrices. Vector spaces and Subspaces, Solving  $Ax=0$  and  $Ax=b$ , Linear Independence, Basis and Dimension, The four fundamental Subspaces, graph and networks, Linear Transformations.

### Module-II (10-hours)

Orthogonal Vectors and Subspaces, Cosines and Projections onto Lines, Projections and Least Squares, orthogonal Bases and Gram-Schmidt, The Faster Fourier Transform, Properties of the determinant, formulas for the determinant, Expansion of determinant of a matrix in Cofactors, Applications of Determinants.

### Module-III (10-hours)

Eigen values and eigenvectors, Diagonalisation of a Matrix, Difference equations and powers  $A^k$ , Markov Matrices, Differential equations and  $e^{At}$ , stability of differential equation, complex Matrices, unitary Matrices, similarity transformations, Jordan Form, minima ,maxima and saddle points, tests for positive definiteness, Test for positive definiteness, singular value decomposition, minimum principles.

### Text Book:

1. Strang, Introduction to Linear Algebra, 4<sup>th</sup> ed., Wellesley Cambridge Press. Chapters-1-5, 6.1,6.2,6.3,6.4.

### Reference

1. I.N. Herstein, Topics in algebra, 2<sup>nd</sup> edition, 1975.
2. M. Artin, Algebra, Prentice-Hall of India.
3. Hoffman and Kunze, Linear Algebra, 2<sup>nd</sup> ed., PHI.
4. S. Kumaresan, Linear Algebra, a geometric approach, PHI.
5. Dummit : Abstract Algebra , Wiley

## FPYE 106 PHYSICS (3-0-0)(Pass)

### MECHANICS AND WAVES

#### Unit-I

Motion of a system of particles: centre of mass, velocity, acceleration, momentum, Equation of motion, Kinetic energy and angular momentum of centre of mass. Conservation of linear momentum and angular momentum for system of particles, moment of inertia, parallel axis theorem perpendicular axis theorem. Moment of inertia of cylinder and sphere. Rotational kinetic energy and power,  $g$  by compound pendulum (bar pendulum). Gravitational force, field potential energy and potential, gravitational potential and field at a point due to a thin spherical shell and a solid sphere. (10)

#### Unit-II

Central force motion, reduction of two body problems into an equivalent one body problem, general characteristics of central force motion. Derivation of Kepler's laws of planetary motion from gravitational force.

#### Unit-III

Relation between elastic constants. Torsion of a cylinder, bending of beams, expression for bending moment, equation for bending, depression occurring at nth e free ends of a light, heavy cantilever. Viscosity of liquids, laminar flow through a narrow tube and poiseuille's formula surface tension-pressure difference across curved membrane. (12)

#### Unit-IV

### OSCILLATION AND WAVES

Simple harmonic oscillator, damped harmonic oscillator, power loss, Q-factor, overdamped motion, critical damping, forced vibration, resonance, sharpness of resonance. Mathematical description of travelling waves, wave equation. Transverse waves in a stretched string longitudinal waves in a gaseous medium, composition of simple harmonic waves. Lissajous figures. (8)

#### **Books:**

1. Classical Mechanics- H Goldstein (Narosa )
2. Classical Mechanics-Rana And Joag (TMH)
3. Introduction to Classical Mechanics- Takwale&Purnaik(TMh)
4. Mechanics- K R Simon (Addison Wesley)
5. Mechanics-D. S Mathur (S. Chand)
6. Properties of matter- Searle and Neaman (Arnold Publication)
7. Classical Mechanics- M. Das , P.K Jena (Sri krishna Publication)
8. Classical Mechanics- Kibble

## **FHMF 109      COMMUNICATIVE ENGLISH (3-0-0)**

**Module-I**The elements of communication ( 6 hours ) 1.1 the importance of communication through English at the present time 1.2 the process of communication and factors that influence communication : sender, receiver, channel, code, topic, message, context, feedback, 'noise', filters and barriers 1.3 the importance of audience and purpose 1.4 the information gap principle : given and new information ; information overload 1.5 verbal and non-verbal communication : body language 1.6 comparing general communication and business communication

**Module-II**The sounds of English ( 14 hours ) 2.1 vowels, diphthongs, consonants, consonant clusters 2.2 the International Phonetic Alphabet (IPA) ; phonemic transcription 2.3 problem sounds 2.4 syllable division and word stress 2.5 sentence rhythm and weak forms 2.6 contrastive stress in sentences to highlight different words 2.7 intonation : falling, rising and falling-rising tunes 2.8 varieties of Spoken English : Standard Indian, American and British (Note : This unit should be taught in a simple, non-technical manner, avoiding technical terms as far as possible. )

**Module-III**Review of English grammar (10 hours ) 3.1 stative and dynamic verbs 3.2 the auxiliary system ; finite and non-finite verbs 3.3 time, tense and aspect 3.4 voice: active and passive 3.5 modality 3.7 negation 3.8 Interrogation ; reported and tag questions 3.9 conditionals 3.10 concord 3.11 Phrasal verbs (Note The teaching of grammar should be treated as a diagnostic and remedial activity and integrated with communication practice. The areas of grammar in which errors are common should receive special attention when selecting items for review. Teaching need not be confined to the topics listed above.)

**Books recommended:** 1. An Introduction to Professional English and Soft Skills by B.K.Das et al., Cambridge University Press. (Facilitated by BPUT). 14



## **FBEF 111 Fundamentals of Computer & Prog.in C (3-0-0)**

### **Module-I :(10 Hours)**

Digital Logic Fundamentals: Logic Gates, Introduction to Multiplexer, De-multiplexer, Encoder, Decoder & Flip-Flops.

Introduction to Computer Fundamentals: Basic architecture of computer, Functional units, Operational concepts, Bus structures, Von Neumann Concept. Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Instruction format, Addressing modes, Micro instruction, Data path, Hardwired controlled unit, Micro programmed controlled unit.

Generation of Programming languages, Compiler, Linker, Loader

### **Module-II :(10 Hours)**

C language fundamentals: Character set, Key words, Identifiers, data types, Constants and variables, Statements, Expressions, Operators, Precedence and associativity of operators, Side effects, Type conversion, Managing input and output

Control structures: Decision making, branching and looping.

Arrays: one dimensional, multidimensional array and their applications, Declaration, storage and manipulation of arrays

Strings: String variable, String handling functions, Array of strings

Functions: Designing structured programs, Functions in C, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.

Storage classes: Auto, Extern, register and static variables

### **Module-II :(10 Hours)**

Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers, Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling

### **Text Books:**

1. William Stalling , “ Computer Organization and Architecture ”Pearson Education  
Balagurusamy : “C Programming” Tata McGraw-Hill

### **Reference Books:**

J. P. Hayes “Computer Architecture and Organization” McGraw Hill Education India.

H. Schildt – “C the complete Reference” McGraw-Hill

K.R. Venugopal, S.R. Prasad, “ Mastering C, McGraw-Hill Education India

**FPYE-156PHYSICS(0-0-3)**

**MECHANICS, THERMAL PHYSICS(PASS PRACTICAL)**

1. Determination of accurate weight of a body using balance by Gauss method.
2. Determination of specific heat of liquid by the method of cooling.
3. Determination of velocity of sound by resonance column method.
4. Acceleration due to gravity by bar pendulum and study of the effect of Amplitude on timeperiod.
5. Acceleration due to gravity by Kater's pendulum.
6. Specific heat of a conducting solid by method of mixture (using radiation Correction.)
7. Verification of laws of vibration of string using sonometer.
8. Determination of Young's modulus of wire by Searle's method.
9. Determination of rigidity modulus of rod by static method.
10. Determination of surface tension of water by using capillary rise method.

## **FHMF159 – Communicative English Lab (0-0-3)**

Lab sessions will be devoted to practice activities based on all three modules of theory.

- a. phonemic transcription 5 hours Students will be trained to find out the correct pronunciation of words with the help of a dictionary, to enable them to monitor and correct their own pronunciation. i transcription of words and short sentences in normal English orthography (writing) into their IPA equivalents ; ii transcription of words presented orally ; iii conversion of words presented through IPA symbols into normal orthography iv syllable division and stress marking (in words presented in IPA form)
- b. Listening 10 hours i listening with a focus on pronunciation (ear-training) : segmental sounds, stress, weak forms, intonation Students should be exposed, if possible, to the following varieties of English during listening practice : Standard Indian, British and American.
- c. Speaking 15 hours i pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences ii practising word stress, rhythm in sentences, weak forms, intonation ii reading aloud of dialogues, poems, excerpts from plays, speeches etc. for practice in pronunciation
- d. Grammar and usage 12 hours The focus will be on the elimination of common errors. Some writing activities (e.g. writing of short paragraphs on assigned topics) can be used to identify these errors. Project Work Students will be required to produce and submit by the end of Semester 1 a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting.

Ten marks (out of the 100 marks allocated for the Lab test ) will be set apart for the project.

## **FBEF161 – ‘C’ PROGRAMMING LAB (0-0-3)**

( Minimum 10 programs to be done covering 8 Experiments)

### **Experiment No. 1**

- a) Write a C program to find the sum of individual digits of a positive integer.
- b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

### **Experiment No. 2**

- a) Write a C program to calculate the following Sum:  
Sum= $1-x^2$   
 $/2! +x^4$   
 $/4! -x^6$   
 $/6! +x^8$   
 $/8! -x^{10}/10!$

b) Write a C program to find the roots of a quadratic equation.

### **Experiment No. 3**

- a) Write C programs that use both recursive and non-recursive functions
  - i) To find the factorial of a given integer.
  - ii) To find the GCD (greatest common divisor) of two given integers.
  - iii) To solve Towers of Hanoi problem.

### **Experiment No. 4**

- a) Write a C program to find both the largest and smallest number in a list of integers.
- b) Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

### **Experiment No. 5**

- a) Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
- b) Write a C program to determine if the given string is a palindrome or not

### **Experiment No. 6**

- a) Write a C program to construct a pyramid of numbers.
- b) Write a C program to count the lines, words and characters in a given text.

### **Experiment No.7**

- a) Write a C program that uses functions to perform the following operations:
  - i) Reading a complex number
  - ii) Writing a complex number
  - iii) Addition of two complex numbers
  - iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.) 21

### **Experiment No. 8**

- a) Write a C program which copies one file to another.
  - b) Write a C program to reverse the first n characters in a file.
- (Note: The file name and n are specified on the command line.)

**Book:-** PVN. Varalakshmi, Project Using C Scitech Publish

## **FMCC201 ALGEBRA – I (3-0-0)**

### **Module-I :(10 Hours)**

Preliminary Notations, Group Theory : Algebraic structures, Groups, Some Examples of Groups, Subgroups, A Counting Principle, Cosets, Normal Subgroups and Quotient Groups,

### **Module-II :(10 Hours)**

Group Homomorphisms, Isomorphisms, Automorphisms, Permutation Groups.

Ring Theory : Definition & Example of Rings, Some Special Classes of Rings

### **Module-III :(10 Hours)**

Field, Pigeon Hole Principle, Homomorphisms, Ideals, Quotient Rings., More Ideals and Quotient Rings, The Field of Quotients of an Integral Domain, Euclidean Rings, A particular Euclidean Ring.

### **Text Books :**

1. Topics In Algebra, by I. N. Herstein, Wiley Eastern.  
Ch. 1, Ch. 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.10, Ch. 3.1, 3.2, 3.3, 3.4

### **Reference Books :**

1. Modern Algebra by A. R. Vasishtha, KrishnaPrakashanMandir, Meerut.
2. Topics in Algebra by P.N.Arora, Sultan Chand & Sons.

## **FMCC 202 ANALYSIS – I (3-1-0)**

### **Module-I :(14 Hours)**

Bounded and unbounded sets, Infimum and supremum of a set and their properties, Order completeness property of  $\mathbb{R}$ , Archimedean property of  $\mathbb{R}$ , Density of rational and irrational numbers in  $\mathbb{R}$ , Dedekind form of completeness property, Equivalence between order completeness property of  $\mathbb{R}$  and Dedekind property. Order completeness in  $\mathbb{R}$ , Neighbourhood, Open set, Interior of a set, Limit point of a set, Closed set, Countable and uncountable sets, Derived set, closure of a set, Bolzano-Weierstrass theorem for sets.

### **Module-II :(14 Hours)**

Sequence of real numbers, Bounded sequence, limit points of a sequence, limit inferior and limit superior convergent and non-convergent sequences, Cauchy's sequence, Cauchy's general principle of convergence, Algebra of sequences, Theorems on limits of sequences, Subsequence's, Monotone sequences, Monotone convergence Theorem.

Infinite series and its convergence, Test for convergence of positive term series, Comparison test, Ratio test, Cauchy's root test, Raabe's test, Logarithmic test, Integral test, Alternating series, Leibnitz test, Absolute and conditional convergence.

### **Module-III :(12 Hours)**

Continuous and discontinuous functions, Types of discontinuities, Theorems on continuity, Uniform continuity, Relation between continuity and uniform continuity,

### **TEXT BOOKS:**

1. G. Das & S. Pattnaik : Fundamentals of Mathematical Analysis, TMH
2. S.C. Malik and Savita Arora: Mathematical Analysis, New Age International (P) Ltd. Publishers, 1996.

### **REFERENCE BOOKS:**

- 1.. R. G. Bartle and D.R. Sherbert, Introduction to Real Analysis ( 4<sup>th</sup> Edition), Wiley.
- 2.. K. A. Ross, Elementary Analysis: The Theory of Calculus, Under graduate Texts in Mathematics, Springer ( SIE), Indian reprint, 2004.
3. Sudhir R Ghorpade and Balmohan V. Limaye, A course in Calculus and Real Analysis, Undergraduate Text in Math., Springer (SIE). Indian reprint, 2004.

**FMCC 203**

**PROBABILITY**

**(3-1-0)**

**Module-I : (14 Hours)**

Random experiment, trial, sample point and sample space, events, operations of events, concepts of equally likely, mutually exclusive and exhaustive events. Definition of probability: Classical, relative frequency and axiomatic approaches. Discrete probability space, properties of probability under set theoretic approach. Independence of events, Conditional probability, total and compound probability theorems, Bayes theorem and its applications.

**Module-II : (14 Hours)**

Random variables – discrete and continuous, probability function and probability density function (pdf), Cumulative distribution function (cdf). Joint distribution of two random variables, marginal and conditional distributions. Independence of random variables. Expectation of a random variable (rv) and its properties., expectation of sum of random variables and product of independent random variables, conditional expectation and related problems. Generating functions and their applications

**Module-III: (12 Hours)**

Moments, moment generating function (m.g.f.) & their properties, continuity theorem for m.g.f..Probability distributions: Binomial, Poisson, Hyper geometric, Geometric and Negative Binomial. Uniform (discrete & continuous), Normal, Exponential, Gamma, Beta distributions. Cauchy. Normal and Poisson distributions as limiting case of binomial distribution.

**REFERENCE:**

1. Parzen, E.S. : Modern Probability Theory and its Applications.
2. Meyer, P. : Introductory Probability and Statistical Applications.
3. Stirzeker David :ElementryProbabilityu, Cambridge University Press.
4. Mood A.M., Graybill F.A. and BoesD.C. : Introduction to the theory of Statistics, McGraw Hill.
5. Mukhopadhyay, P :Mathmatical Statistics, new central book agency.

## **FPYE 206PHYSICS (3-0-0)(Pass)**

### **FPYE-206 Electricity, Magnetism and Electronics**

#### Unit-I

Scalar and vector triple product. Differentiation of a vector with respect to a scalar. The gradient operator. The divergence and curl of vector. Gauss divergence theorem, Stokes theorem. Gauss law in electrostatics and application, Computation of field due to linear spherical and plane charge distribution, Differential form of Gauss law, the energy of a point charge, discrete and continuous distribution,

#### Unit-II

energy density, dielectrics, Susceptibility, permeability, dielectric constant. Magnetic field  $B$ , Lorentz force law, The Biot savart law  $B$  due to a straight, circular, and solenoidal currents. The vector potential, Ampere's circuital law & its differential form. Differential form of electromagnetic induction. (12)

#### UNIT-III

Maxwell equation and physical significance. Wave equation, Electromagnetic waves. wave properties, speed, growth and decay current in RC and LR circuits. Phase diagram, impedance, Power in ac circuit, power factor, series and parallel resonant circuits, Sharpness of resonance, Bandwidth and Q-factor. (8)

#### UNIT-IV

Rectifier: Half wave & full wave rectifier (semiconductor devices) Principle, circuit, operation & theory. Use of L &  $\pi$  filters in rectifier circuits (qualitative idea) Amplifier: Classification of amplifier, comparison, Voltage & power gain in CB, CE & CC configuration. RC coupled amplifier, Class B Push/pull amplifier (principle of amplification circuit description operation, theory and frequency response curve) Necessary of feedback, positive & negative feedback, criteria for sustained oscillation, Hartly and Colpitt's oscillator (principle, circuit, operation, theory and use), feedback Amplifier: Basic circuit, operation, advantage of negative feedback, Modulation & demodulation: Principle of modulation. A.M & F.M (Theory and differences between them). Principle of demodulation Function & basic theory of linear diode detectors. (10)

#### **Books:**

1. Introduction to Electrodynamics- D. J Griffiths (PHI)
2. Foundation of electromagnetic theory- Ritz and Milford (Narosa)
3. Electricity and magnetism- E. Purcell (Berkeley Physics Course) TMH
4. Electronics- Chattopadhyay & Rakshit (New Age)
5. Electronics- B. B Swain
6. Electricity and magnetism- D. C Tayal
7. Electricity and magnetism- Satyaprakash



## **FHMF 209 Business Communication English (2-0-0)**

### **Module – I**

The Elements of Business Communication (10 hours) 1.1 patterns of communication in the business world: upward, downward, horizontal, grapevine etc 1.2 internal and external channels of communication; formal and informal channels. 1.3 Introduction to cross-cultural communication. 1.4 avoiding gender, racial and other forms of bias in communication 1.5 common forms of oral and written communication in the business world: Oral presentations, interviews and group discussions Memos, reports, summaries and abstracts, e-mails

### **Module-II**

Reading and writing (15 hours) 2.1 the importance of developing reading skills 2.2 the sub-skills of reading : a. understanding the main idea and supporting details b. reading between the lines : inferential reading c. understanding the writer's point of view d. making predictions e. guessing the meanings of unfamiliar words f. skimming and scanning g. note-making 2.3 the importance of writing skills 2.4 the differences between speech and writing 2.5 the qualities of effective writing : coherence, cohesion, logical structuring and organization, clarity of language, stylistic variation etc. 2.6 the writing process : pre-writing, drafting, re-writing 2.7

### **Module –III**

Soft skill development (5 hours) 4.1 soft skills: becoming a good leader and team-player 4.2 inter-relating soft skills and communication skills

#### **Text Books:**

2. Business Communication Today by Bovee et al ( Pearson)
3. Business Communication by Meenakshi Raman and Prakash Singh (Oxford)

#### **RecommendedBooks :**

1. Crash Course in Personal Development by Brian Clegg ( Kogan Page)
2. Activities for Developing Emotional Intelligence by Adele B.Lynn (HRD Press)
3. Lateral Thinking by Edward De Bono (Penguin) 16

## **FBEF 210Data Structure Using C (3-0-0)**

### **Module I (10 hrs)**

Introduction to object oriented programming, user defined types, structures, unions, polymorphism, encapsulation. Getting started with C++ syntax, data-type, variables, strings, functions, default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.

### **Module II (12 hrs)**

Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references.

Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors.

Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.

Operator Overloading: This pointer, applications of this pointer, Operator function, member and non member operator function, operator overloading, I/O operators.

Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration.

### **Module III (08 hrs)**

Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor.

Template: template classes, template functions.

Namespaces: user defined namespaces, namespaces provided by library.

### **Text Books:**

1. Object Oriented Programming with C++ - E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ - Ashoke N. Kamthane, Pearson Education

### **Reference Books:**

1. Big C++ - Wiley India
2. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
3. "C++ and Object Oriented Programming" – Jana, PHI Learning.
4. "Object Oriented Programming with C++ "- Rajiv Sahay, Oxford
6. Mastering C++ - Venugopal, McGraw-Hill Education (India)
7. "Object Oriented Programming with C++", David Parsons, Cengage Learning.

**FPYE-256 PHYSICS (0-0-3)**

**ELECTRICITY, MAGNETISM AND OPTICS (PASS PRACTICAL)**

1. Determination of wavelength of sodium light by using Newton's ring method.
2. Determination of grating element of grating spectra.
3. Determination of wave length of Laser.
4. Determination of magnifying power of a microscope.
5. Determination of magnifying power of a telescope.
6. Determination of High resistance using Galvanometer.
7. Figure of merit of a Galvanometer.
8. Resistance of a resistor using meterbridge (applying end correction).
9. Determination of wavelength of a monochromatic light using Bi-prism and optical bench.
10. Determination of refractive index of a prism by I-D curve method using spectromethod.

## **FHMF 259 Business Communication English-Lab (0-0-3)**

a. Communication Practice 30 hours i Speaking : oral communication in social and 10 hours work-related situations, e.g.: Greeting an acquaintance/ friend, introducing oneself, introducing a friend to another friend, breaking off a conversation politely, leave-taking; making and responding to inquiries; expressing an opinion; expressing agreement/ disagreement, contradicting/ refuting an argument; expressing pleasure, sorrow, regret, anger, surprise, wonder, admiration, disappointment etc. Narrating or reporting an event; Describing people, objects, places, processes etc. Ordering / directing someone to do something Making requests; accepting / refusing a request Expressing gratitude; responding to expressions of gratitude Asking for or offering help; responding to a request for help Asking for directions (e.g. how to reach a place, how to operate a device etc.) and giving directions asking for and granting/ refusing permission prohibiting someone from doing something suggesting, advising, persuading, dissuading, making a proposal praising, complimenting, felicitating expressing sympathy (e.g. condolence etc.) Complaining, criticizing, reprimanding ii Reading 10 hours Students will be given practice in reading and comprehending 6-8 simple passages of 100-300 words each, on topics of general as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment, together with study skills (note making) and reference skills (using a dictionary). Practice will be provided in the important sub-skills of reading which are introduced in Module 2 of the theory component. iii Writing 10 hours Writing short paragraphs on given topics or topics of one's choice; social and business letters; reports; applications ; resumes ; summaries The principles of 'Process Writing' should be used to teach writing skills. i pre-writing : generating ideas, brain-storming, idea mapping, outlining ii writing : generating a first draft ; reviewing, redrafting, editing iii post-writing : making a presentation ; discussion and feedback, preparing the final draft b. Soft skills practice 10 hours Activities designed to highlight leadership and 'team' skills ; Group discussion

## **FBEF 260DATA STRUCTURE USING C LAB (0-0-3)**

(Minimum 10 experiments to be done)

**Experiment No.1** Write a C program to perform matrix multiplication using array. **Experiment No.2** (a) Write a C program to create a stack using an array and perform (i) push operation (ii) pop operation (b) Write a C program to create a queue and perform i) Push ii) pop iii) Traversal

**Experiment No. 3** Write a C program that uses Stack operations to perform the following: i) Converting infix expression into postfix expression ii) Evaluating the postfix expression

**Experiment No. 4** Write a C program that uses functions to perform the following operations on Single linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways

**Experiment No. 5** Write a C program that uses functions to perform the following operations on Double linked list: i) Creation ii) Insertion iii) Deletion

**Experiment No. 6** Write a C program that uses functions to perform the following operations on Binary Tree: i) Creation ii) Insertion iii) Deletion

**Experiment No. 7** Write C programs that use both recursive and non recursive functions to perform the Linear search operation for a Key value in a given list of integers: i) Linear search

**Experiment No. 8** Write C program that use both recursive and non recursive functions to perform the Binary search operation for a Key value in a given list of integers:

**Experiment No.9** Write a C program that implement Bubble Sort method to sort a given list of integers in descending order.

**Experiment No.10** Write a C program that implement Quick Sort method to sort a given list of integers in ascending order:

Book:- "Data structure using C" by Sudipta Mukherjee, TMH Publication

## **FMCC 301 NUMERICAL METHODS (3-1-0)**

### **MODULE-I(14 Hours)**

Errors ,Algorithms and Convergence,Transcendental and polynomial equations: Introduction, Bisection method, Regula-falsi method, Secant method, Fixed Point iteration, Newton-Raphson method, Rate of convergence .Error Analysis for iterative methods,

System of Linear Algebraic Equations:Pivoting Strategies, Matrix inversion, LU-Decomposition , Gauss Jacobi, Gauss –Seidel Method , Relaxation Techniques.

### **MODULE-II(14 Hours)**

Interpolation and Approximations: Introduction ,Langrages and Newton Interpolation, Least Square Approximation, Uniform Approximation.Differentiation .

### **MODULE-III(12 Hours)**

Numerical Integration : Newton Cotes Algorithm, Trapezoidal rule, Simpson's rule, Gauss – Legendre Integration Method, Ordinary Differential Equations: Euler's Method ,Euler Modified Method, Runge -kutta Method.

#### **Text Book :**

1. Numerical Mathematics and Computing : by W. Cheney, David Kincaid, Cengage.
2. Numerical Methods by B.P. Acharya & R.N. Das.

#### **Reference Books:**

- 1.Numerical Methods for Scientific and Engineering Computation; M.K. Jain,S.R.K. Iyengar, R.K. Jain.
2. A Introduction to Numerical AnalysisbyK.Aitkinson ,Wiley

**FMCC 302**

**STATISTICS**

**(3-1-0)**

**Module-I : (14 Hours)**

Primary and Secondary Data, Univariate data, Frequency distribution, Diagrammatic representation, graphical representation and Tabulation of data. Measures of central tendency, dispersion, skewness and kurtosis for data. Moments and quartiles,

**Module-II : (14 Hours)**

Random sampling, T, F, and  $\chi^2$  – distributions, their derivation and properties. Testing of hypothesis, Acceptance sampling, Estimation of Parameters, Confidence Intervals.

**Module-III: (12 Hours)**

Chi square test for goodness of fit ,Correlation and Regression Analysis, Fitting Straight Lines, Bivariate Frequency Distribution

**Text Books:**

1. Elementary Statistical Methods, S.P. Gupta, Sultan Chand & Sons.
2. Fundamentals of Mathematical Statistics, S C Gupta, V K Kapoor, S Chand and sons

**Reference Books:**

1. An Introduction to Probability and Statistics, V. K. Rohatgi, A.K. Md. E. Saleh, Wiley Publication.
2. Fundamentals of Statistic:.A.M. Gun, M.K. Gupta and B. Das Gupta

## **FMCC 303 Calculus& Analytical Geometry (3-1-0)**

### **MODULE-I (14 Hours)**

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates, curvature, radius of curvature for Cartesian curves, polar curves, Newton's method, centre of curvature, circle of curvature .

### **MODULE-II(13 Hours)**

Points of inflexion, Multiple points, Cusp, Nodes & conjugate points, Types of cusps, Tracing of curves in Cartesian, Parametric, and Polar coordinates .Trace (Folium of Descartes, Strophoid, Astroid, Cycloid, Cardioids, Lemniscates of Bernoulli)

### **MODULE-III(13 Hours)**

General equation of the Sphere, intersection of a sphere and a plane, intersection of two spheres, family of spheres, Intersection of a sphere and a line, Tangent plane ,condition of tangency, equation of a cone , Enveloping cone of a sphere ,cylinder, Enveloping cylinder of a sphere, Right circular cone & cylinder.

#### **Text Books:**

1)Differential Calculus by Shanti Narayan & P K Mittal , S.Chand Publication

Chapters: 14 (14.1-14.5), 15, 16, 17

2) Analytical Geometry of Quadratic Surfaces by B P Acharya & D C Sahu

Chapters: 2 ,3

#### **Reference Books:**

1)Analytical Solid Geometry by Shanti Narayan

2)Topics in Calculus by Panda Satapathy



## FPYE 306PHYSICS-III (3-0-0)

### Thermodynamics, Atomic Physics and Nuclear Physics

#### Unit-I

Thermodynamic system and thermodynamic equilibrium, Reversible and irreversible process, internal energy, first law of thermodynamics, difference between molar specific heat of an ideal gas, Derivation of relation  $PV^\gamma = \text{constant}$  for adiabatic process, work done in isothermal and adiabatic process. Entropy change in various processes. T-S diagram, Carnot cycle, Carnot engine and its efficiency, Carnot theorem, second law of thermodynamics- Kelvin plank and Clausius formulation, their equivalence, thermodynamic scale of temperature. (7)

#### Unit-II

Thermodynamic co-ordinates P.V.T and 1<sup>st</sup>Tds equation, 2<sup>nd</sup>Tdse equation. Clausius- Clapeyron equation, effect of pressure on melting point and boiling point, thermal conductivity, differential equation of heat flow in one dimension, experimental determination of thermal conductivity by Ingen-Haus and Searl's method. Vandewall's equation of state for real gases, critical constants, reduced equation of state.(7)

#### Unit-III

Black body radiation, Stefans law, energy distribution in the blackbody spectrum. Wien's displacement law, Wein's formula and Rayleigh -jeans formula (only statement and discussion). Planck's radiation formula, derivative of Rayleigh-jeans formula. Wein's formula and Stefan Boltzmann law using Planck's formula. Rutherford's atomic model and its short coming, Bohr's theory of hydrogen atom. Energy levels, explanation of spectra, correction for nuclear motion, Bohr's correspondence principal. Frank-Hertz experiment, critical potential. Photoelectric effect, Photon, Einstein's photoelectric effect, photon, Einstein's photoelectric equation, Compton effect. Particle nature of radiation.(8)

#### Unit-IV

The atomic nucleus: its size, mass, charge, spin, magnetic moment, Mass defect, binding energy, stability of nuclear force-its characteristics, Radioactive decay law, activity decay law, activity, half-life, average life, elementary idea of nuclear fission and fusion. Linear accelerator, cyclotron. (8)

### Reference

1. Heat and Thermodynamics-A.B.Gupta & H.B. Ray (New Central)
2. Sound-M.Ghosh (S.Chand)
3. Physics for degree students-vol-I, II, M.Das
4. Modern Physics-R.Murugesan
5. Introduction to Modern physics-H.S. Mani, G.K. Mehta (Affiliated East West)
6. Atomic physics-G.P.Harnwerll & W.E. Stephens. McGraw-HILL book company, Inc.
7. Atomic and nuclear physics-Satyapraksh
8. Atomic and nuclear physics-Shatendra Sharma (pearson publication)
9. Atomic and nuclear physics-Gupta Ghosha

## **FHMF 309 Organizational Behaviour(3-0-0)**

**Module I [10 hours]:** The study of Organizational Behaviour : Definition and Meaning, Why Study OB Learning – Nature of Learning, How Learning occurs, Learning and OB. Foundations of Individual Behaviour : Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB. Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation – Nature and Importance, Herzberg’s Two Factor Theory, Maslow’s Need Hierarchy Theory, Alderfer’s ERG Theory, Evaluations.

**Module II [10 hours]:** Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness, Groups in Organizations – Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. Leadership-Leadership & Management, Theories of Leadership-Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Followership, How to be an effective Leader, Conflict-Nature of Conflict and Conflict Resolution. An Introduction to Transactional Analysis (TA).

**Module-III [10 hours]:** Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management-Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organisational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

**Text Books :** 1. Keith Davis, Organisational Behaviour, McGraw-Hill.

2. K.Aswathappa, Organisational Behaviour, Himalaya Publishing House.

**Reference Books :** 1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India

2. Pradip N. Khandelwal, Organizational Behaviour, McGraw-Hill, New Delhi.

3. Uma Sekaran, “Organizational Behaviour”, TATA McGraw-Hill, New Delhi.

4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma” Organizational Behaviour” , TATA McGraw- Hill.

5. D.K. Bhattachayya, “Organizational Behaviour”, Oxford University Press

6. K.B.L.Srivastava&A.K.Samantaray, “Organizational Behaviour” India Tech.

## **FBEF 312 OPERATING SYSTEM (3-0-0)**

**MODULE-I 10Hours**INTRODUCTION TO OPERATING SYSTEM: What is an Operating System? Simple Batch Systems, Multiprogramming and Time Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems. Operating System Structures: Operating System Services, System components, Protection system, Operating System Services, system calls **PROCESS MANAGEMENT:** Process Concept, Process Scheduling, Operation on Processes, Interprocess communication, Examples of IPC Systems, Multithreading Models, Threading Issues, Process Scheduling Basic concepts, scheduling criteria, scheduling algorithms, Thread Scheduling.

**MODULE-II 10Hours**PROCESS COORDINATION: Synchronization: The Critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors. Deadlocks: System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, recovery from Deadlock. **MEMORY MANAGEMENT:** Memory Management strategies, Logical versus Physical Address space, swapping, contiguous Allocation, Paging, Segmentation. Virtual Memory: Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms. Allocation of frames, Thrashing, Demand Segmentation.

**MODULE-III 10Hours**STORAGE MANAGEMENT: File System Concept, Access Methods, File System Structure, File System Structure, File System Implementation, Directory implementation, Efficiency and Performance, Recovery, Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, I/O System Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Request to Hardware Operation. **CASE STUDIES:** The LINUX System, Windows XP, Windows Vista

**TEXT BOOK:** 1. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009. 2. Mordern Operating Systems – Andrew S. Tanenbaum, 3rd Edition, PHI 3. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition

**REFERENCE BOOK:** 1. Operating Systems – Flynn, McHoes, Cengage Learning 2. Operating Systems – Pabitra Pal Choudhury, PHI 3. Operating Systems – William Stallings, Prentice Hall 4. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson

## **FPYE 356PHYSICS LAB -III (0-0-3)**

### **PROPERTIES OF MATTER AND HEAT**

1. Young's modulus by bending of beam by cantilever.
2. Coefficient of viscosity by viscometer.
3. Determination of Young's modulus, modulus of rigidity, and Poisson's ratio of material of a wire using Searle's method.
4. Error analysis using vernier callipers, screw gauge and spherometer.
5. Specific resistance of the given material of the wire using Carey Foster
6. Determination of  $g$  by Kater's pendulum
7. Determination of rigidity modulus of a wire by dynamic method.
8. Mechanical equivalent of heat by Joule's calorimeter.
9. Velocity of sound by resonance column method
10. Thermal conductivity of a bad conductor by Lee's method.

## **FBEF 362OPERATING SYSTEMLAB(0-0-3)**

1. Basic UNIX Commands.
2. UNIX Shell Programming.
3. Programs on process creation and synchronization, inter process communication including shared memory, pipes and messages. (Dining Philosopher problem / Cigarette Smoker problem / Sleeping barber problem)
4. Programs on UNIX System calls.
5. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing)
6. Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention
7. Program for FIFO, LRU, and OPTIMAL page replacement algorithm.

## **FMCC 401 ANALYSIS II (3-1-0)**

### **MODULE I(14 HOUR)**

Derivative of a function, Relation between continuity and differentiability, Increasing and decreasing functions, Darboux theorem, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's theorem with Cauchy's and Lagrange's form of remainders.

### **MODULE 2(12 HOUR)**

Definition, existence and properties of Riemann integral of a bounded function, Darboux theorem, Condition of integrability, Riemann integrability for continuous functions, bounded functions, monotonic function and functions with finite or infinite number of discontinuities (without proof). The integral as the limit of the sums, Properties of Riemann integral, Fundamental theorem of calculus, First Mean value theorems, Change of variables, Second mean value theorem, Generalized mean value Theorems.

### **MODULE 2(14 HOUR)**

Definition of improper integrals, Convergence of improper integrals, Test for convergence of improper integrals Comparison test, Cauchy's test for convergence, Absolute convergence, Abel's Test, Dirichlet's Test, Beta and Gamma functions and their properties and relations. Definition of pointwise and uniform convergence of sequences and series of functions, Cauchy's criterion for uniform convergence, Weierstrass M-test, Uniform convergence and continuity, Uniform convergence and differentiation, Uniform convergence and integration..

#### **Text Books:**

1• G Das and S Pattanaik: Fundamentals of Mathematical Analysis TataMcgraw-Hill Publishing Company Limited.

#### **Reference Books:**

1. S.C. Malik and Savita Arora: Mathematical Analysis, New Age International (P) Ltd. Publishers, 1996.
2. R. G. Bartle and D.R. Sherbert, Introduction to Real Analysis ( 4<sup>th</sup> Edition), Wiley
3. K. A. Ross, Elementary Analysis: The Theory of Calculus, Under graduate Texts in Mathematics, Springer ( SIE), Indian reprint, 2004.
4. Sudhir R Ghorpade and Balmohan V. Limaye, a course in Calculus and Real Analysis, Undergraduate Text in Math., Springer (SIE). Indian reprint, 2004.

## **FMCC 402 Geometry of Curves and Surfaces (3-1-0)**

### **Module I : (14 hour)**

Introduction to differential geometry-curves in two and three dimensions, curvature and torsion for space curves, existence theorem for space curve, Serret-Frenet formula for space curves.

### **Module II : (12 hour)**

Inverse and implicit function theorems, Jacobian theorem, surfaces in  $R^3$  as two dimensional manifolds, tangent space and derivative of maps between manifolds.

### **Module III : (14 hour)**

First fundamental form, orientation of a surface, second fundamental form and the Gauss map, Mean curvature and scalar curvature, integration of surfaces, Stocks formula, Gauss- Bonnet theorem.

### **TextBooks :**

1. DoCarmo, Differential Geometry, Academic Press.
2. T.J. Willmore, Differential Geometry.

### **Reference Books:**

1. A.N. Pressley, Elementary Differential Geometry, Springer.
2. C. E. Weatherburn, Differential Geometry of Three Dimension, Cambridge University Press.

## FMCC 403 MATHEMATICAL METHODS (3-1-0)

### Module-I (12 Hours )

Laplace Transform: Definition, Notation, Some simple transform, existence of Laplace transforms, Inverse Laplace Transform

Laplace transform of Derivatives, Transform of integrals, solution of differential equation using Laplace transforms, solution of simultaneous differential equation using Laplace transforms.

Unit step function and its LT, Heaviside step function, 1<sup>st</sup> shifting theorem and 2<sup>nd</sup> shifting theorem, impulse function and its LT.

### Module-II (14 Hours )

Z Transform: Definition and Notation, Linearity property of z transform, 1<sup>st</sup> shift property, 2<sup>nd</sup> shift property , Inverse z transform. Difference equation, Solution of Difference equation using Z transform,

Z transform function, Impulse response, Stability, convolution, Relation between Laplace transform and Z transform

### Module-III (14 Hours )

Fourier transform: Fourier integral, Fourier Transform, Linearity property, Differentiation, Time Shift Frequency shift and symmetry property of Fourier Transform, Relation between LT and FT

Fourier transform of step and impulse function, Convolution

Fourier transform of sequence, discrete FT, Estimation of the continuous FT, The fast Fourier Transform

#### Text Books:

1 .Advanced Modern Engineering Mathematics (3<sup>rd</sup> Edition) By Glyn James , (Pearson Education)

Chapter 2.1,Ch-2.2.1 to 2.2.9, Ch-2.3.1 to 2.3.4, Ch-2.5.1 to2.5.4, 2.5.8 to 2.5.10

Chapter-3.1, Ch-3.2.1 to 3.2.3, Ch-3.3.1 to 3.3.5, Ch-3.4.1, ch-3.5.1 to 3.5.3, Ch-3.6.1 to 3.6.5, ch-3.7

Chapter 5.1, Ch-5.2.1 to 5.2.4, Ch-5.3.1 to 5.3.6, Ch-5.4.1 to 5.4.3, Ch-5.5.1 to 5.5.3, Ch-5.6.1 to 5.6.6

## **FPYE 406PHYSICS IV (3-0-0)**

### **FPYE-406 OPTICS AND QUANTUM MECHANICS**

#### **UNIT-I(7)**

Fermat's principle, reflection and refraction at plane interference, cardinal points of a coaxial optical system, cardinal points of (i) combination of two thin lenses and (ii) thick lens, elementary ideas of monochromatic aberrations and remedies, chromatic aberration, achromatic combination, removal of chromatic aberration in a separated doublet, Ramsden's and Huygens's eyepieces,

#### **UNIT-II(8)**

Wave theory of light, Huygen's principle, reflection and refraction at plane surfaces, condition of interference, division of wave front, biprism, interference by plane parallel thin film illuminated by a point source, colour of thin films, Newton's ring, determination of wave length of monochromatic light by Newton's ring.

#### **UNIT-III(7)**

Diffraction of light, Fresnel and Fraunhofer diffraction, Fresnel's half period zones, Zone plate act as a convex lens. Fraunhofer diffraction by a single slit, double slit Plane transmission grating.

Electromagnetic nature of light, Polarized and unpolarized light. Plane polarized, circularly polarized and elliptically polarized light. Polarization by reflection and refraction, Brewster's law, Malus's law. Double refraction, ordinary and extraordinary rays, construction, working and uses of Nicol prism. Half wave plate and quarter wave plate.

#### **UNIT -IV(8)**

Inadequacy of classical physics: review of black body radiation. Particle nature of wave, photoelectric effect, Compton effect, dual nature of radiation. Wave nature of particle – De Broglie hypothesis and wave-particle duality. Superposition of two waves, group velocity and phase velocity, wave packet. Experimental confirmation of matter waves (Davisson – Germer experiment). Heisenberg's uncertainty principle and applications (Ground state energy of harmonic oscillator and hydrogen atom. Time dependent Schrodinger equation in one and three dimension. The wave function, equation of continuity, probability current density and probability density. Normalization of the wave function, Expectation value of an observable

(6)

#### References:

1. optics- A.K. Ghatak
2. Principle of optics – B.K.Mathur
3. Optics – P.K. Chakravarty
4. Physics for degree students – VOL III and IV (SrikrishnaPrakashan)
5. Introduction to Quantum mechanics – M. Das, P.K.Jena (SrikrishnaPrakashan)
6. Quantum mechanics –J.L. Powell, B. Crasemann



## **FHMF 409Economics&Costing (3-0-0)**

**Module-I: (10 hours)** Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple numerical problems to be solved). Theory of production, Law of variable proportion, Law of returns to scale.

**Module-II: (10 hours)** Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Costbenefit analysis in public projects. Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

**Module-III: (10 hours)** Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis- Linear approach. (Simple numerical problems to be solved) Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

### **Text Books:**

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
2. M.D. Mithani, Principles of Economics.

### **Reference Books :**

1. Sasmita Mishra, “Engineering Economics & Costing “, PHI
2. Sullivan and Wicks, “ Engineering Economy”, Pearson
3. R.PaneerSeelvan, “ Engineering Economics”, PHI
4. Gupta, “ Managerial Economics”, TMH 5. Lal and Srivastav, “ Cost Accounting”, TMH

## **FBEF 411 Relational Database Management System(3-0-0)**

### **Module I : (10 hours)**

Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages. Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

### **Module II : (10 hours)**

Relation Query Languages, Relational Algebra and Relational Calculus, SQL.

Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design.

Query Processing Strategy.

### **Module III: (10 hours)**

Transaction processing: Recovery and Concurrency Control. Locking and Timestamp based Schedulers.

Database Recovery System: Types of Data Base failure & Types of Database Recovery, Recovery techniques

### **Text Books:**

1. Database System Concepts by Sudarshan, Korth (McGraw-Hill Education )
2. Fundamentals of Database System ByElmasari&Navathe- Pearson Education

### **References Books:**

- (1) An introduction to Database System – Bipin Desai, Galgotia Publications
- (2) Database System: concept, Design & Application by S.K.Singh (Pearson Education)
- (3) Database management system by leon&leon (Vikas publishing House).
- (4) Fundamentals of Database Management System – Gillenson, Wiley India
- (5) Database Modeling and Design: Logical Design by Toby J. Teorey, Sam S. Lightstone, and Tom Nadeau, <sup>th</sup>4<sup>th</sup> Edition, 2005, Elsevier India Publications, New Delhi

## **FPYE 456PHYSICS LAB–IV (0-0-3)**

### **FOURTH SEMESTER PASS PRACTICAL**

#### **. FPYE-456 HEAT, OPTICS AND ELECTROMAGNETISM**

1. Angle of minimum deviation (I-D curve) using spectrometer.
2. Determination of magnifying power of a microscope.
3. Comparison of emf's using stretched wire potentiometer.
4. Thermal conductivity of a bad conductor by lee's method.
5. Optical rotation of sugar solution by polarimeter.
6. Determination of magnifying power of a telescope.
7. To study series and parallel resonant LCR circuit.
8. Figure of merit of a galvanometer.
9. To measure voltage and Frequency of a sinusoidal wave form using a CRO and to find unknown frequency by producing Lissajous figure.
10. Resistance of a resistor using Meter Bridge

#### **FBEF 461Relational Database Managements System Lab(0-0-3)**

1. Use of SQL syntax: insertion, deletion, join, updation using SQL. (1 class)
2. Programs on join statements and SQL queries including where clause. (1 class)
3. Programs on procedures and functions. (1 class)
4. Programs on database triggers. (1 class)
5. Programs on packages. (1 class)
6. Programs on data recovery using check point technique. (1 class)
7. Concurrency control problem using lock operations. (1 class)
8. Programs on ODBC using either VB or VC++. (1 class)
9. Programs on JDBC. (1 class)
10. Programs on embedded SQL using C / C++ as host language. (1 class)

## **FMCC 501 Advanced Calculi(3-1-0)**

### **Module –I (14 Hours)**

#### **Special Function**

Some special functions: Bessel's function, Legendre polynomial (function), Gamma, Beta, error functions; Integral transforms: Fourier transform, Z-transform

### **Module –II (14 Hours)**

#### **Calculus of variation:**

Variation of a functional, Euler-Lagrange equation

Variational problems with fixed boundaries, variational problem with moving boundaries, sufficient conditions for an extremum, direct methods in variational problem. Variational methods for boundary value problems in ordinary and partial differential equations.

### **Module –III (12 Hours)**

#### **Linear Integral Equations:**

Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigenfunctions, resolvent kernel.

#### **Text Books:**

1 Linear Integral Equation by Santi Swarup; Krishna publications

2) Calculus of variation by A.S. Gupta ; PHI

Chapter-1(1.1-1.6), 2(2.1-2.3), 3(3.1-3.6), 4(4.1-4.2), 6(6.1-6.3)

## **FMCC 502 NUMBER THEORY (3-1-0)**

### **Module-I (12 Hours)**

Integer arithmetic, Divisibility, Division Algorithm, Greatest Common Divisor, Euclidian Algorithm, Linear Diophantine Equation, Prime Numbers, Fundamental Theorem of Arithmetic, Sieve of Eratosthenes, Dirichlet's Theorem on infinitely many primes in arithmetical progression, Introduction to Congruence, Basic Properties of Congruence, Linear Congruence and Chinese Remainder Theorem

### **Module-II (14 Hours)**

Fermat's Little Theorem, Carmichael Numbers, Wilson's Theorem, Sum and Number of Divisors, Greatest Integer Function, Application to the Calendar, Euler's Theorem, Euler's Phi Function, Properties of phi Function, Order of an Integer Modulo  $n$ , Primitive Roots for Primes, Composite Numbers Having Primitive Roots, Theory of Indices.

### **Module-III (14 Hours)**

Euler's Criterion, Legendre Symbol and Its Properties, Quadratic Reciprocity, Quadratic Congruences With Composite Moduli, Perfect Numbers, Mersenne Primes and Amicable Numbers, Fermat Numbers, Solution of Nonlinear Diophantine Equations, Sum of Two Squares, Finite and Infinite Continued Fractions, Pell's Equation.

### **Recommended Texts:**

1. **David M. Burton, Elementary Number Theory**, 6th Edition. TATA McGraw-HILL  
Chapters: 2,3(3.1,3.2),4,5(5.2,5.3),6(excluding 6.2),7,8,9,11,12,13,15.
2. **Kenneth H. Rosen**, Elementary Number Theory (and its applications) 5<sup>th</sup> Ed. Pearson Addison-Wesley.

### **Reference Books:**

1. **H. Davenport**, Higher Arithmetic, 7<sup>th</sup> Ed. Cambridge University Press
2. **G.H. Hardy and E.M. Wright**, An Introduction to the Theory of Numbers, 5<sup>th</sup> Ed. Oxford University Press.
3. **Koshy**, Elementary Number Theory with Applications, Academic Press.
4. **A. Weil**, Number Theory for Beginners, Springer.

## **FMCC 503 Mathematical Modelling and Simulation(3-1-0)**

### **Module-1(14 Hours)**

What is Modeling-Model and reality ,Properties of Models ,Building a Model, Elementary Methods-Arguments from scales ,Dimension Analysis, Graphical methods –Mathematical Modeling through Graphs: Solutions that can be Modeled Through Graphs – Mathematical Modeling in Terms of Directed Graphs, Signed Graphs, Weighted Digraphs and Un-oriented Graphs.

### **Module-2 (14 Hours)**

Mathematical Modeling through Ordinary Differential Equations of First order :Linear Growth and Decay Models – Non-Linear Growth and Decay Models – Compartment Models – Dynamic problems – Geometrical problems. Mathematical Modeling through Ordinary Differential Equations of Second Order :Planetary Motions – Circular Motion and Motion of Satellites – Mathematical Modeling through Linear Differential Equations of Second Order – Miscellaneous Mathematical Models

### **Module-3(12 Hours)**

Mathematical Modeling through Difference Equations: Simple Models – Basic Theory of Linear Difference Equations with Constant Coefficients – Economics and Finance – Population Dynamics and Genetics – Probability Theory

#### **Text Books:**

1. J.N. Kapur, Mathematical Modelling, Wiley Eastern Limited, New Delhi,Edward A. Bender.. An Introduction to Mathematical Modeling,S.M. Ross ..Simulation, India Elsevier Publication.

#### **Reference Books:**

1. **A. C. Fowler**, Mathematical Models in Applied Sciences, Cambridge University Press.
2. **A.M.Law and W.D.Kelton** , Simulation Modeling and Analysis, T.M.H. Edition.
3. **SankarSengupta**, System Simulation and Modeling , Pearson

## **FCYE 508 ENVIRONMENTAL SCIENCE (3-0-0)**

### **Module – I**

**(10Hours)**

Ecological Concepts: Biotic components, Ecosystem Process: Energy, Food Chain, Water cycle, Oxygen cycle, Nitrogen cycle, carbon cycle, Environmental gradients, Tolerance levels of environment factor, EU, US and Indian Environmental Law. Chemistry in Environmental Engineering: Atmospheric chemistry, Soil chemistry. Noise pollution- Noise standards, measurement and control. Water Treatment: water quality standards and parameters, Ground water. Water treatment processes, Pre-treatment of water, Conventional process, Advancedoxidation process.

### **Module – II**

**(10Hours)**

(a)Waste Water Treatment: COD and BOD of Waste water treatment process, pretreatment, primary and secondary treatment of waste water, Activated sludge treatment: Anaerobic digestion, Reactor configurations and methane production.

(b)Air Pollution : Air pollution and pollutants, criteria of pollutants, Acid deposition, Global climate change –greenhouse gases, air pollution meteorology, Atmospheric dispersion. Industrial Air Emission Control. Flue gas desulphurization, NO<sub>x</sub> removal, Fugitive emissions.

(c) Solid waste, Hazardous waste management, Solid Waste Management, Source classification and composition of MSW: Separation, storage and transportation, Reuse and recycling, zero waste management, Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment: Incinerators,super critical liquids, Inorganic waste treatment. E.I.A., Environmental auditing,

### **Module – III**

**(10Hours)**

Occupational Safety and Health Acts, Safety procedures, Type of Accidents, Chemical and Heat Burns, Prevention of Accidents involving Hazardous substances, Human error and Hazard Analysis. Hazard Control Measures in integrated steel industry, Petroleum Refinery, L.P.G. Bottling, Pharmaceutical industry. Fire Prevention – Detection, Extinguishing Fire, Electrical Safety, Product Safety. Safety Management- Safety Handling and Storage of Hazardous Materials, Corrosive Substances, Gas Cylinders, Hydro Carbons and Wastes. Personal Protective Equipments.

### **Text Book :**

1. Environmental Engineering Irwin/ McGraw Hill International Edition, 1997, G. Kiely,
2. Industrial Safety Management, L. M. Deshmukh, Tata McGraw Hill Publication.

### **Reference Books**

1. Chemistry for Environmental Engineering and Science, Clair N. Sawyer, Perry L. Mc Carty and Gene F. Parkin, 5<sup>th</sup> edition, Mc GrawHill
2. Environmental Engineering by Arcadio P. Sincero&Gergoria A. Sincero PHI Publication
3. Principles of Environmental Engineering and Science, M. L. Davis and S. J. Masen, McGraw Hill International Edition, 2004
4. Environmental Science, Curringham&Saigo, TMH,
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.
6. Industrial Safety Management and Technology, Colling. D A – Prentice Hall, New Delhi.

## **FBEF 511 Design and Analysis of Algorithm (3-0-0)**

### **Module- I: (10 Hours)**

Introduction to design and analysis of algorithms, Growth of Functions (Asymptotic notations, standard notations and common functions), Recurrences, solution of recurrences by substitution, recursion tree and Master methods, worst case analysis of Merge sort, Quick sort and Binary search, Design & Analysis of Divide and conquer algorithms.

Heapsort : Heaps, Building a heap, The heapsort algorithm, Priority Queue, Lower bounds for sorting.

### **Module – II : (10 Hours)**

Dynamic programming algorithms (Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence)

Greedy Algorithms - (Assembly-line scheduling, Activity- selection Problem, Elements of

Greedy strategy, Fractional knapsack problem, Huffman codes).

Data structure for disjoint sets:- Disjoint set operations, Linked list representation, Disjoint set forests.

### **Module – III : (10 Hours)**

Graph Algorithms: Breadth first and depth-first search, Minimum Spanning Trees, Kruskal and Prim's algorithms, single- source shortest paths (Bellman-ford and Dijkstra's algorithms), All- pairs shortest paths (Floyd – Warshall Algorithm). Back tracking, Branch and Bound.

Fast Fourier Transform, string matching (Rabin-Karp algorithm), NP - Completeness (Polynomial time, Polynomial time verification, NP - Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithms (Vertex-Cover Problem, Traveling Salesman Problem).

### **Text Book:**

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C.Stein : Introduction to algorithms - 2nd edition, PHI,2002. Chapters: 1,2,3,4 (excluding 4.4), 6, 7, (7.4.1), 8 (8.1) 15 (15.1 to 15.4), 16 (16.1, 16.2, 16.3), 21 (21.1,21.2,21.3), 22(22.2,22.3), 23, 24(24.1,24.2,24.3), 25 (25.2), 30,32 (32.1, 32.2) 34, 35(35.1, 35.2)

### **Reference Books:**

- 1.Algorithms – Berman, Cengage Learning
- 2.Computer Algorithms: Introduction to Design & Analysis, 3<sup>rd</sup> edition-by Sara Baase,Allen Van Gelder, Pearson Education
- 3.Fundamentals of Algorithm-by Horowitz &Sahani, 2<sup>nd</sup> Edition, Universities Press.
- 4.Algorithms By Sanjay Dasgupta, UmeshVazirani – McGraw-Hill Education
- 5.Algorithm Design – Goodrich, Tamassia, Wiley India.



## **FBEF 512      JAVA PROGRAMMING      (3-0-0)**

### **Module – I (10Hrs)**

Introduction to Java and Java programming Environment. Object Oriented Programming. Fundamental Programming Structure: Data Types, variable, Typecasting Arrays, Operators and their precedence. Control Flow: Java's Selection statements (if, switch, iteration, statement, while, dowhile, for, Nested loop). Concept of Objects and Classes, Using Existing Classes building your own classes, constructor overloading, static , final, this keyword . Inheritance: Using Super to Call Super class constructor, Method overriding, Dynamic method Dispatch, Using Abstract Classes, Using final with inheritance. The Object Class. Packages & Interfaces : Packages, Access Protection, Importing package, Interface, Implementing Interfaces, variables in Interfaces, Interfaces can be extended. Exception Handling: Fundamentals, Types Checked , Unchecked exceptions, Using try & catch, Multiple catch, throw , throws, finally, Java's Built in exceptions, user defined exception.

### **Module - II (10Hrs)**

Multi Threading: Java Thread Model, Thread Priorities, Synchronization, Creating a thread, Creating Multiple threads, Using is Alive ( ) and join ( ), wait ( ) & notify ( ). String Handling: String constructors, String length, Character Extraction, String Comparison, Modifying a string. Java I/O: Classes & Interfaces, Stream classes, Byte streams, Character streams, Serialization. JDBC: Fundamentals, Type I, Type II, Type III, Type IV drivers. Networking: Basics, Socket overview, Networking classes, & interfaces, TCP/IP client sockets, whois, URL format, URL connection, TCP/IP Server Sockets.

### **Module - III (10Hrs)**

Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets, Applet context and show documents (). Event Handling: Delegation Event model, Event Classes, Event Listener Interfaces, Adapter classes. AWT: AWT Classes window fundamentals, component, container, panel, Window, Frame , Canvas, Creating a frame window in an Applet , working with Graphics , Control Fundamentals , Layout managers, Handling Events by Extending AWT components. Core java API package, reflection, Remote method Invocation (RMI) Swing: J applet, Icons & Labels, Text fields, Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees, Tables. Exploring Java-lang: Simple type wrappers, Runtime memory management, object (using clone ( ) and the cloneable Interface), Thread, Thread Group, Runnable.

**Text Books:** 1. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.  
2. Java The complete reference: Herbert Schildt, TMH, 5th Edition.

**Reference Books:** 1. Balguruswamy, Programming with JAVA, TMH.  
2. Programming with Java: Bhave&. Patekar, Pearson Education.  
3. Big Java: Horstman, Willey India, 2nd Edition.  
4. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.  
5. Java How to Program: H.M. Deitel& Paul J. Deitel, PHI, 8 th Edition

## **FBEF 561 DESIGN & ANALYSIS OF ALGORITHMS LAB (0-0-3)**

1. Using a stack of characters, convert an infix string to postfix string.(1 class)
2. Implement insertion, deletion, searching of a BST. (1 class)
3. (a) Implement binary search and linear search in a program (b) Implement a heap sort using a max heap.
4. (a) Implement DFS/ BFS for a connected graph. (b) Implement Dijkstra's shortest path algorithm using BFS.
5. (a) Write a program to implement Huffman's algorithm. (b) Implement MST using Kruskal/Prim algorithm.
6. (a) Write a program on Quick sort algorithm. (b) Write a program on merge sort algorithm. Take different input instances for both the algorithm and show the running time. 7. Implement Strassen's matrix multiplication algorithm.
8. Write down a program to find out a solution for 0 / 1 Knapsack problem.
9. Using dynamic programming implement LCS.
10. (a) Find out the solution to the N-Queen problem. (b) Implement back tracking using game trees.

## **FBEF 562 JAVA PROGRAMMING LAB (0-0-3)**

To do various JAVA programs on:

- i)** Introduction, Compiling & executing a java program.
- ii)** Data types & variables, decision control structures: if, nested if etc.
- iii)** Loop control structures: do, while, for etc.
- iv)** Classes and objects.
- v)** Data abstraction & data hiding, inheritance, polymorphism.
- vi)** Threads, exception handlings and applet programs
- vii)** Interfaces and inner classes, wrapper classes, generics

## FMCC 601

## OPERATION RESEARCH

(3-0-0)

### Module-I (10 Hours)

Modeling of problems and principle of modeling. **Linear programming:** Formulation of LPP, Graphical solution, Simplex method, BigM method, II Phase method, Revised simplex method, Duality theory and its application, Dual simplex method, Sensitivity analysis in linear programming

**Transportation problems:** Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Stepping stone method.

### Module -II (10 Hours)

**Assignment problems:** Hungarian method for solution of Assignment problems.

**Integer Programming:** Branch and Bound algorithm for solution of integer Programming Problems.

**Simulation and Modeling :** Introduction to simulation and modeling.

**Markov analysis :** Introduction to markov processes, State and Transition Probabilities, Transition Diagram, n-step transition probabilities.

### Module -III (10 Hours)

**Queuing models:** General characteristics, Markovian queuing model, M/M/1 model, Limited queue capacity, Multiple server, Finite sources, Queue discipline. **Non-linear programming:** Introduction to non-linear programming. **Unconstraint optimization:** Fibonacci and Golden Section Search method. **Constrained optimization with equality constraint:** Lagrange multiplier, **Constrained optimization with inequality constraint:** Kuhn-Tucker condition.

#### Text books

1. A. Ravindran, D. T. Philips, J. Solberg, " *Operations Research- Principle and Practice*", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " *Optimization for Engineering Design*", PHI Learning Pvt Ltd

#### Reference books:

1. Stephen G. Nash, A. Sofer, " *Linear and Non-linear Programming*", McGraw Hill
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis," *Engineering Optimization*", Second edition, Wiley India Pvt. Ltd
3. H.A.Taha,A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, " *Operations Research*", Eighth Edition, Pearson Education
4. F.S.Hiller, G.J.Lieberman, " *Operations Research*", Eighth Edition, Tata McDraw Hill
5. P.K.Gupta, D.S.Hira, " *Operations Research*", S.Chand and Company Ltd.
6. KantiSwarup, P. K. Gupta, Man Mohan, " *Operations Research*", Sultan Chand and Sons.

## FMCC 602

## COMPLEX ANALYSIS

(3-1-0)

### Module-I (14 Hours)

The complex number system: The real numbers, The field of complex numbers, the complex plane, polar representation and roots of complex numbers, Line and half planes in the complex plane. Power series and radius of convergence, analytic function, Power series representation of analytic functions, Cauchy-Riemann equation, analytic function as mapping and its Mobius transformation.

### Module-II(14 Hours)

Complex integration: Zeros of analytic function, entire function, Liouville's theorem, fundamental theorem of algebra, maximum modulus theorem, Index of a closed curve, Cauchy's theorem and Cauchy's integral formula, Morera's theorem.

### Module-III (12Hours)

Classification of singularity, Poles, absolute convergence, Laurent series development, Residue theorems, evaluation of integrals by using residue theorem, Argument principle, Rouché's theorem, Maximum Modulus theorem, Schwarz's Lemma.

### Text Book :

1. Functions of one Complex variable- J. B. Conway ( SpringerVerlag , International student edition , Narosa Publishing house, Chapter-1(1.1-1.5),Chapter-3(3.1- 3.3),Chapter-4(4.2 - 4.5),Chapter-5(5.1-5.3) , Chapter-6(6.1 - 6.2).

### Reference Books:

1. A Text book of Complex variable: by M.L Khanna (Meerut Publication)
2. Complex Analysis by Ahlfors, TMH.
3. Complex Variable; Theory & Application :Kasana , PHI

## **FMCC 603                      DIFFERENTIAL EQUATION -II    (3-0-0)**

### **Module-I (10 hrs)**

Boundary value problems for Ordinary Differential Equations; Sturm -Liouville Problems ,Orthogonality of Eigen functions, Green's functions, Self adjoint Equations of second order.

Ordinary Differential Equations in more than two variables, Simultaneous linear first order equations in three variables, Methods of solution of Pfaffian differential Equations in three variables

### **Module-II(10 hrs)**

Partial Differential Equations of first order: Formulation of first order Partial Differential Equation, Linear Partial Differential Equations of first order, Non-Linear Partial Differential Equations of first order, Special types of Partial Differential Equations of first order, Solution of Partial Differential Equations of first order satisfying given conditions (Charpit's Methods)

### **Module-III(10 hrs)**

Partial Differential Equations of second and higher order: Linear Partial Differential Equations with constant coefficients, Equations reducible to linear Partial Differential Equations with constant coefficients, Partial Differential Equations with variable coefficients.

Some standard forms of variable coefficients, Separation of variables (Product method), Non linear equations of the second order (Monge's Method).

### **Books Recommended:**

(1) A course on Ordinary and Partial Differential Equations

J Sinha Roy and Padhy

(2) Ordinary and Partial Differential Equations

M D Raisinghania.

## **FHMF 609                      INDIAN SOCIETY, ETHICS & CULTURE    (3-0-0)**

### **Module I (10 hours)**

Introduction to Ethics 1.1 Basic Terms-Morality, Ethics, Emotional Intelligence, Ethical Dilemma 1.2 View on ethics by Aristotle, Gandhian Principle 1.3 Moral development Theory by Kohlberg 1.4 Indian society's origin and Composition 1.5 Secularisation and Democratisation.

### **Module II (10 hours)**

Ethics and religion-2.1 Personal Ethics, Governing factors of an Individual's value system, utilitarianism, Deontology, Moral Absolutism 2.2 Protestant Religious movements in the 6<sup>th</sup> century B C - Gautama Buddha and Buddhism, Mahavir Jain and Jainism 2.3 Cultural attainment with reference to the Gupta Golden age 2.4 Ethical Issues-IPR, CSR, Bioethics, Media Ethics.

### **Module III (10 hours)**

Roots of Indian Culture 3.1 Harappan Culture and Vedic culture 3.2 Cultural Expansion, Hellenistic impact on art and architecture 3.3 Impact of Islam on Indian life 3.4 Socio-religious Reform Movements- Bhakti movement, BrahmoSamaj and Arya Samaj.

### **Text Books**

1. *Indian Society and Culture- P.C Das, B.C Das, S.S Das-Kalyani Publisher.*
2. *Professional Ethics- R. Subramanian-Oxford university Press*

### **Reference Books**

1. *Business Ethics-Manuel Velasquez-Pearson Education*
2. *Ethics & Conduct of Business- John R Boatright, B. P. Patra- PEARSON Publication*

## **FBEF 611    COMPUTER NETWORK            (3-1-0)**

### **Module – I(14 Hrs)**

Overview of Data Communications and Networking. Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals. Digital Transmission: Line coding, Block coding, Sampling, Transmission mode. Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals. Multiplexing : FDM , WDM , TDM , Over view of OSI Model .

### **Module –II (13 Hrs)**

**Data Link Layer** Error Detection and correction: Types of Errors, Detection, Error Correction Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC. Point-to –Point Access: PPP Point –to- Point Protocol, PPP Stack, Multiple Access and Random Access.

### **Module – III (13 Hrs)**

**Network Layer:** Host to Host Delivery: Internetworking, addressing and Routing Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6 Transport Layer: Process to Process Delivery: UDP; TCP congestion control and Quality of service.

#### **Application Layer :**

Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP) and file transfer (FTP) ,HTTP

#### **Text Books:**

1. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4<sup>th</sup> Ed
2. Computer Networks: A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson 5<sup>th</sup> Ed

#### **Reference Book :**

1. Computer Networks:A system Approach:Larry L, Peterson and Bruce S. Davie,Elsevier, 4<sup>th</sup> Ed
2. Computer Networks: Natalia Olifer, Victor Olifer, Willey India .

**Elective - I (any one)**

**FMCE 604 Numerical Solution of Differential Equation (3-1-0)**

**(Will be uploaded soon)**



## FMCE 605 BIOINFORMATICS (3-1-0)

### Module-I(10 hours)

*Molecular Biology and Biological Chemistry:* The Genetic Material, Gene structure and Information Content, Protein Structure and Function, The nature of Chemical bonds, Molecular Biology Tools, Genomic Information Content, *Data Searches and Pairwise Alignments:* Dot Plot, Simple Alignments, Gaps, Scoring Matrices, Needleman and Wunsch

Algorithm, Global and local Alignments, Database searches, Multiple sequence Alignments, *Substitution Patterns:* Patterns of substitutions within Genes, Estimating Substitution numbers, Variations in evolutionary rates between Genes, Molecular clocks, evolution in Organelles.

### Module-II(10 hours)

*Distance based methods of Phylogenetics:* History of Molecular Phylogenies, Phylogenetic trees, Distance matrix methods, Maximum likelihood approaches, Multiple sequence Alignments, *Character Based methods of Phylogenetics:* Parsimony, Inferred ancestral sequences, Strategies for Faster searches, Consensus trees, tree confidence, Comparison of Phylogenetic methods, Molecular Phylogenies.

### Module-III(10 hours)

*Genomics and Gene Recognition:* Prokaryotic genomes, Prokaryotic gene structure, GC-content Prokaryotic genomes, Prokaryotic gene density, Eukaryotic genomes, Eukaryotic gene structure, Open reading frames, GC-content Eukaryotic genomes, Gene expression, Transposition, Repetitive elements, Eukaryotic gene density, *Protein and RNA structure prediction:* Amino acids, Polypeptide composition, Secondary structure, Tertiary and quaternary structure, Algorithms for Modeling Protein Folding, Structure prediction, Predicting RNA secondary structures, *Proteomics:* from Genomes to Proteomes, Protein classification, Experimental techniques, Inhibitors and drug design, Ligand screening, X-ray crystal structures, NMR structures, Empirical methods and prediction techniques, Posttranslational modification prediction.

### Text Books:

1. Dan E. Krane, Michael L. Raymer, "Fundamental Concepts of Bioinformatics", First Edition, 2003, Pearson Education, Inc. New Delhi.
2. Teresa Attwood, David Parry-Smith, "Introduction to Bioinformatics", 1999, Pearson Education, Inc. New Delhi.

### Reference Books:

1. Shuba Gopal, A. Haake, R. P. Jones, P. Tymann, "Bioinformatics: A Computing Perspective", First Edition, 2009, McGraw-Hill Education (India), New Delhi.
2. Yi-Ping P. Chen, "Bioinformatics Technologies", 2006, Springer India Pvt. Ltd., New Delhi.
3. Arthur Lesk, "Introduction to Bioinformatics", 2009, Oxford University Press, ISBN-13: 978-0199208043.
4. Bryan Bergeron, "Bioinformatics Computing", 2003, PHI Learning. New Delhi.
5. Zoe Lacroix, Terence Critchlow, "Bioinformatics: Managing Scientific data", 2009, Elsevier India Pvt. Ltd., New Delhi.

## FMCE 606 Fuzzy and Rough Set Theory (3-1-0)

### Module-I (10 hours)

Crisp sets and Fuzzy sets : Introduction – crisp sets an overview – the notion of fuzzy sets –basic concepts of fuzzy sets – membership functions – methods of generating membership functions – defuzzification methods- operations on fuzzy sets - fuzzy complement – fuzzy union – fuzzy intersection – combinations of operations – General aggregation operations.

### Module-I (10 hours)

Fuzzy arithmetic and Fuzzy relations: Fuzzy numbers- arithmetic operations on intervals- arithmetic operations on fuzzy numbers- fuzzy equations- crisp and fuzzy relations – binary relations – binary relations on a single set – equivalence and similarity relations – compatibility or tolerance relations.

Fuzzy measures – belief and plausibility measures – probability measures – possibility and necessity measures – possibility distribution - relationship among classes of fuzzy measures.

### Module-I (10 hours)

Fuzzy Logic and Applications : Classical logic : an overview – fuzzy logic – approximate reasoning - other forms of implication operations - other forms of the composition operations – fuzzy decision making –fuzzy logic in database and information systems - fuzzy pattern recognition – fuzzy control systems.

### Text Book:

1. George J Klir and Tina A Folger , Fuzzy sets, Uncertainty and Information, Prentice Hall of India, 1988.
2. H.J. Zimmerman, Fuzzy Set theory and its Applications, 4<sup>th</sup> Edition, Kluwer Academic Publishers, 2001.
3. Goerge J Klir and Bo Yuan , Fuzzy sets and Fuzzy logic: Theory and Applications. Prentice Hall of India, 1997.

### ReferenceBook :

1. Hung T Nguyen and Elbert A Walker, First Course in Fuzzy Logic, 2<sup>nd</sup> Edition , Chapman & Hall/CRC, 1999.
2. Jerry M Mendel, Uncertain Rule – Based Fuzzy Logic Systems ; Introduction and New Directions, PH PTR, 2000.
3. John Yen and Reza Langari, Fuzzy Logic : Intelligence Control and Information, Pearson Education, 1999.
4. Timothy J Ross, Fuzzy Logic with Engineering Applications, McGraw Hill International Editions, 1997.

## **FMCC 651 OPERATION RESEARCH LAB(0-0-3)**

1. Introduction to linear programming problem, solving lpp by mat lab(Introduction)
- 2 Solve various simplex problem using mat lab Function
3. Solve Transportation and assignment problem using ,Any suitable simulator
- 4 Compare. between Transportation ,Assignment problem by Using mat lab
- 5 Explore queuing theory for scheduling, resource allocation, and traffic flow applications using mat lab
- 6 Elementary concept of Modelling and Simulation using Mat-lab
- 7 Solve Various Decision Problem Using mat lab
- 8 Introduction to Non linear Programming by any suitable simulator
- 9 Iterative method for optimization problem by any suitable simulator
- 10 Application of non linear programming using Mat lab

## **FMCC 652 STATISTICA LAB (0-0-3)**

1. Introduction to statistical problem by STATISTICA.
2. Finding Correlation ,Regression by the use of STATISTICA.
3. T- test ,Chi square test by using STATISTICA.
4. Testing of hypothesis, confidence interval by using STATISTICA.
5. Statistical validation of various types of data by using STATISTICA.
6. Design and modelling of Binomial and Poisson distribution by STATISTICA.
7. Generation of random numbers , by any simulator.
8. Simple integration by random numbers ,STATISTICA implementation.
9. Finding 1<sup>st</sup>,2<sup>nd</sup> moments by using STATISTICA.

General statistical application in validation of medical related data.

## **FMCC701 TOPOLOGY(3-1-0)**

### **Module –I : (14 Hours)**

Countable and uncountable set, Infinite sets and the Axiom of choice, Well-ordered sets. Topological spaces, Basis and sub basis for a topology, The order, product and subspace topology, closed sets and limit points. Continuous function and homeomorphism, Metric topology, Connected spaces, connected subspaces of the real line, Components and local connectedness.

### **Module –II : (14 Hours)**

Compact spaces, Basic properties of compactness, Compactness and finite intersection property, Compact subspaces of the real line, Compactness in metric spaces, Limit point compactness, Sequential compactness and their equivalence in metric spaces, Local compactness and one point compactification.

### **Module –III : (12 Hours)**

First and second countable spaces, Lindelöf space, Separable spaces, separable axioms, Hausdorff, Regular and normal spaces. The Urysohn lemma, completely regular spaces, The Urysohn metrization theorem, Imbedding theorem, Tietz extension Theorem, Tychonoff theorem, Stone-Cech compactification.

### **Text Book :**

1. Topology, J.R. Munkhres, 2e, Pearson Education, 2000.

Chapter: 1(7,9,10),2(excluding section 22), 3, 4 (excluding section 36), 5.

### **Reference Book :**

1. Introduction to general Topology, by K.D.Joshi, Wiley Eastern Ltd., 1983.
2. Foundation of General Topology, by W.J. Pervin, Academic Press, 1964.
3. General Topology, by S.Nanda and S.Nanda, Macmillan India.

## **FMCC702 MEASURE THEORY(3-1-0)**

### **Module – I : (16 Hours)**

Preliminary idea about set theory, functions and mappings, sequence and series metric space, topological space, cardinal numbers and cantor like sets.

#### **Measure on the real line:**

Lebesgue outer measure, measurable set, regularity, measurable functions, Borel and Lebesgue measurability.

### **Module –II : (12 Hours)**

#### **Integrations of functions of Real variables:**

Integrations of non negative functions, The general integral, Integration of series, Lebesgue and Riemann integrals.

### **Module –III : (12 Hours)**

#### **Differentiations:**

The four derivatives, Continuous non differentiable functions. Functions of bounded variations, Lebesgue's differentiation theorem, Differentiation and Integration, The Lebesgue set

#### **Text Book :**

Measure theory and integration by G. De. Barra. [New Age International (P) Ltd]

Chapter 1, chapter 2(2.1 to 2.5), chapter 3, chapter 4.

#### **Reference books:**

- (1) Real Analysis by H L Royden (Prentice Hall)
- (2) Methods of Real Analysis by R Goldberg (Oxford IBM Publications)
- (3) Lebesgue Measure and Integrations by P K Jain and V P Gupta (Wiley Eastern Limited)

## **FMCC703ADVANCED DIFFERENTIAL EDUCATION(3-1-0)**

### **Module-I : (14 Hours)**

Application of first order differential equation in Growth, decay, Chemical Reactions, Elementary Mechanics, One dimensional heat flow, Orthogonal trajectories, Biological Sciences (The oxygen debt), Mixing problems, Business and Economics.

Application of Linear differential equation in Escape velocity problem, Undamped simple harmonic vibrations, Damped vibrations. Electric circuits problems.

Hermite equations and Hermite Polynomials, Hypergeometric equations, Hypergeometric functions, Elementary properties hypergeometric functions.

### **Module-II : (14 Hours)**

**System of Linear Differential Equations :** Basic Theory of Linear Systems, Trial Solution Method for Linear System with Constant co-efficients, Operator method for linear system with Constant co-efficients, Matrix method for linear system with Constant co-efficients. Non-Homogeneous Linear Systems.

**The Laplace Equation:** Boundary value problem for Laplace's Equations, Fundamental Solution of Laplace's Equation, Integral Representation of Harmonic Functions, Mean Value Formula for Harmonic Functions, Green's Functions for Laplace's Equation

### **Module-III : (12 Hours)**

**The Wave equation:** Derivation of One Dimensional Wave Equation, Solution of the wave Equation (Method of separation of variables), D'Alembert's solutions of the wave Equation, Derivations of Two Dimensional Wave equation, Solutions of Two Dimensional Wave equation.

**The Heat equation:** The One Dimensional Heat Equation, Solution of One Dimensional Heat Equation Derivation of two Dimensional Heat Equation, Solution of Two Dimensional Heat Equation, Laplace Equations in Polar Coordinates.

### **Books Recommended:**

(1) A course on Ordinary and Partial Differential Equations by J. Sinha Roy and S. Padhy, Kalyani Publishers.

Chapters: 2(2.8), 4(4.8), 7(7.3.2,7.4.3,7.4.4), 8, 15(15.1-15.4), 16(16.1-16.4)

(2) Higher Engineering Mathematics by B V Ramana

Chapter 19 (19.1-19.8)

(3) Ordinary and Partial Differential Equations by M. D. Raisinghania.

## **FMCC704 ADVANCED NUMERICAL METHOD (3-1-0)**

### **Module –I (14 Hours)**

Solution of equations in one and two variables: mullers method, for two variables; fixed pt iteration, Newton's method.

Interpolation; Hermite, cubic spline and piecewise interpolation.

Numerical differentiation; first order derivative, higher order derivative

### **Module -II :(14Hours)**

Numerical integration; Romberg integration, Gaussian quadrature (2-pt, 3-pt, 4-pt), asymptotic error formula and their applications, automatic numerical integral, singular integrals.

Numerical solution to ODE; Multistep methods, midpt method, trapezoidal method, a lower order predictor-corrector method, convergence and stability theory for multistep methods,

### **Module -III: (12 Hours)**

Matrix eigen value problem; power method, shifted power method, inverse power, RQ-method, error and stability results.

Numerical solution to partial differential equations; parabolic, elliptic, Hyperbolic equations using finite difference method.

### **Text Book ::**

1. An Introduction to Numerical Analysis by Kendall E. Atkinson
2. Advanced numerical methods, L.V. Fusset.

### **Reference Books :**

1. Numerical methods for Scientific and Engineering Computation, M.k.Jain, S.R.K.Iyengar.
2. Numerical methods for Engineers by Chapra & Canale, TMH

## **FBEF711 SOFTWARE ENGINEERING (3-0-0)**

### **Module-I (10 hours)**

*Introduction:* Evolution and impact of Software Engineering, Socio-technical Systems, Critical Systems, Software Processes, and Software Life cycle Models, Software Project Management.

*Requirements & Specification:* Software Requirements, Requirements Engineering Processes, Feasibility study, Requirements analysis and specification, System Models, Critical System Specification, Formal Specification.

### **Module-II (10 hours)**

*Design and Analysis Aspects:* Architectural Design – Cohesion and coupling, Abstraction, Data flow Oriented Design, Distributed Systems Architecture, Application Architectures, Object-Oriented Design, Real-time Software Design, User Interface Design and Usability Engineering.

*Software Development:* Rapid Software Development, Software Reuse: Design Patterns, Component Based Software Engineering (CBSE), Critical Systems Development, Software Evolution.

*Implementation and Testing:* Verification and Validation, Software Testing, Critical Systems validation.

### **Module-III (10 hours)**

*Software Reliability and Quality Management:* Musa's Reliability Model, Managing People, Software Cost Estimation— COCOMO Model, Quality Management, Process Improvement, Configuration Management, Software Maintenance, CASE Tools.

*Modern Trends and Emerging Technologies:* Humphrey's Capability Maturity Model, CMMI (Capability Maturity Model Integration), Agile software development, Extreme Programming (XP), Security Engineering, Service-oriented Software Engineering, Aspect-oriented Software Development.

### **Text Books:**

1. RajibMall, "*Fundamentals of Software Engineering*", 2<sup>nd</sup> Edition, 2007, PHI Learning Pvt. Ltd. New Delhi.
2. Ian Sommerville, "*Software Engineering*", 8<sup>th</sup> Edition, 2007, Pearson Education Inc., New Delhi.

### **Reference Books:**

1. Roger S. Pressman, "*Software Engineering: A Practitioner's Approach*", 7<sup>th</sup> International Edition, McGraw-Hill Education (Asia), Singapore.
2. Shari Lawrence Pfleeger, Joanne M. Atlee, "*Software Engineering*", 3<sup>rd</sup> Edition (2006) , Pearson Education, Inc. New Delhi.
3. Ben Shneiderman, Catherine Plaisant, "*Designing the User Interface: Strategies for Effective Human-Computer Interaction*", 4<sup>th</sup> Edition (2006), Pearson Education, Inc. New Delhi.
4. Pankaj Jalote, "*Software Engineering*", First Edition, 2009, Wiley India Pvt. Ltd., New Delhi.
5. Dines Bjørner, "*Software Engineering: Volume-1, Volume-2 & Volume -3*", Springer India Pvt. Ltd., New Delhi.



**FBEF712ADVANCED COMPUTER ARCHITECTURE(3-1-0)**

**FBEF713 CODING THEORY(3-1-0)**

**FBEF 714 ARTIFICIAL INTELLIGENCE(3-1-0)**

**Module-1 (15 hours)**

Artificial Intelligence: Introduction, Intelligent Agents: Agents & Environments, Concept of Rationality, Nature & Structure of Agents; Problem Solving: Solving Problems by Searching, Classical Search, Adversarial Search, Constraint Satisfaction Problems. Knowledge, Reasoning and Planning: Logical agents, First order logic, Inference in First order logic.

**Module-2 (13 hours)**

Classical planning, Knowledge Representation; Uncertain Knowledge and Reasoning: Probabilistic Reasoning, Learning from Examples, Knowledge in Learning; Natural Language Processing: Language models, Text Classification, information retrieval, information extraction

**Module-3 (12 hrs)**

Natural Language for Communication: Phrase structure Grammars, Syntactic Analysis, Augmented grammars and semantic interpretation, Machine translation, Speech recognition; Perception; Expert Systems: Introduction, Design of Expert systems.

**Text Books:**

1. Stuart **Russell** and Peter **Norvig**, “*Artificial Intelligence: A Modern Approach*”, Third Edition, 2010, Pearson Education, New Delhi.  
Chapters: 1, 2, 3, 4 (4.1, 4.2), 5 (5.1, 5.2, 5.3), 6, 7, 8, 9, 10 (10.1, 10.2, 10.3, 10.5), 12, 14 (14.1-14.6), 18 (18.1- 18.7), 19 (19.1, 19.2, 19.3), 22, 23, 24 (24.1-24.3, 24.5).
2. Joseph **Giarratano** and Gary **Riley**, “*Expert Systems: Principles and Programming*”, Fourth Edition, CENGAGE Learning India Pvt. Ltd., New Delhi.  
Chapters: 1 and 6.

**Reference Books:**

1. Elaine A. **Rich** and Kevin **Knight**, “*Artificial Intelligence*”, 3<sup>rd</sup> Edition, 2009, McGraw-Hill Education (India), New Delhi.
2. Nils J. **Nilsson**, “*Artificial Intelligence: A New Synthesis*”, 2<sup>nd</sup> Edition, 2000, Elsevier India Publications, New Delhi.
3. Michael **Negnevitsky**, “*Artificial Intelligence: A Guide to Intelligent Systems*”, Second Edition, 2005, Pearson Education, Inc. New Delhi.
4. Dan W. **Patterson**, “*Introduction to Artificial Intelligence and Expert Systems*”, 1<sup>st</sup> Edition, 1996, PHI Learning Pvt. Ltd., New Delhi.
5. Ben **Coppin**, “*Artificial Intelligence Illuminated*”, 2005, Narosa Publication, New Delhi. ISBN: 978-81-7319-671-3

## **FMCC751 SEMINAR(0-0-3)**

## **FMCC801 ALGEBRA-II(3-1-0)**

### **Module-I (14 hours)**

Normal subgroup, Isomorphism theorem, Automorphisms, Permutation group: Cyclic decomposition and Alternating group  $A_n$ . Structure theorems for groups: Direct Product, finitely generated abelian group. Structure theorem for groups: Invariants of a finite abelian group, Sylows theorem. Unique factorization domain, Principal ideal domain, Euclidean domains, polynomial rings over UFD.

### **Module-II(12 hours)**

Algebraic extension of fields: Irreducible polynomials and Einstein criterion, Adjunction of roots, Algebraic extension. Algebraically closed fields, Normal separable extensions: splitting fields, normal extensions. Normal separable extension: Multiple roots, Finite fields, Separable extensions.

### **Module-III (14 hours)**

Galois Theory: Automorphism groups and fixed fields, Fundamental theorem of Galois theory. Application of Galois theory to classical problems: Roots of unity and Cyclotomic polynomials, Cyclic extensions, Polynomials solvable by radicals, Symmetric functions, Ruler and compass constructions.

#### **Text Book**

**P.B. Bhattacharya, S.K Jain and S.R.Nagpaul:** Basic Abstract Algebra, Cambridge University Press. Chapter : 5 (Art 2,3), 7(Art 1,2), 8( Art 1-4), 11 (Art 1-4), 15(Art 1-3), 16( Art 1,2), 18(1-5).

#### **Reference Books:**

1. **VivekSahai and VikasBist** : Algebra (Narosa publication House).
2. **I.S. Luthar and I.B.S. Passi** : Algebra Vol. 1 Groups (Narosa publication House).
3. **I.N. Herstein** : Topics in Algebra (Wiley Eastern Ltd.).
4. **Surjit Singh and QuaziZameeruddin** :Modern Algebra (Vikas Publishing House).
5. **S.K. Jain & S.R. Nagpal** : Basic Abstract Algebra (Cambridge University Press 1995).
6. **Dummit** : Abstract Algebra , Wiley
7. Modern Algebra by A. R. Vasishta, Krishna PrakashanMandir, Meerut.

## **FMCC802 STOCHASTIC PROCESS(3-1-0)**

### **Module-I(14 hours)**

Introduction of Stochastic process, specification of stochastic process, Stationary process, martingales. Markov chain, Transition probability, Classification of states and chains, Determination of higher transition probability, Stability of Markov chain, Reducible chains, Markov chain with discrete and continuous space.

### **Module-II(14 hours)**

Poisson process with related distribution, Generalization of Poisson process, Birth and death process, Erlang process, Brownian motion, Wiener process, Kolmogorov equations, First passage time distribution of Wiener process

### **Module-III(12 hours)**

Renewal process, Renewal process in continuous time, Renewal equations, Wald's equation, Renewal theorem, delayed and equilibrium renewal process.

### **Text book**

1. Stochastic Process by J. Medhi, New Age International Publication (2<sup>nd</sup> edition)

### **Reference book**

1. Stochastic Process by Sheldon M. Ross, Wiley & sons, (2<sup>nd</sup> edition)
2. Stochastic Process by D N Shanbhag, C R Rao, Gulf Publishing.
3. Stochastic Methods by Crispin Gardiner, Springer.
4. Probability, Random Variables and Stochastic Processes, 4<sup>th</sup> Edn., A. Papoulis and S. U. Pillai, TMH Publication.

## FMCC803 OPTIMIZATION TECHNIQUES (3-1-0)

### Module-I (14 Hours)

**Integer Programming:** Integer programming problem, Application of IPP, Gomory cutting plane method and fractional cut method for solution of IPP, Zero one programming problem, Linear fractional programming, Quadratic programming.

**Game theory :** Pay off, types of games, maxima minima principle ,without saddle point , $2 \times 2$  and  $2 \times n$  and  $n \times 2$  dominance principle.

**Goal programming:** Goal programming model formulation, Goal programming algorithm and modified simplex method of Goal programming. Application of Goal programming.

**Sequencing :** Basic assumptions,  $n$  jobs through two machines , $n$  jobs through three machines,  $n$  jobs through  $k$  machines , 2 jobs through  $k$  Machines,

### Module -II (12 Hours)

#### Network model

Minimal spanning tree problem, Cyclic Dijkstra's algorithm, shortest route problems, Maximal flow problem ,minimal cost capacity flow problem.

#### Decision theory

Decision making Environments, Decision making under Uncertainty, Decision making under conditions of Risks ,Decision Trees, Limitation of Decision Tree.

**Simulation and Modeling :**Introduction to simulation and modeling, random variable ,Monte Carlo Technique and Monte Carlo Simulation , Generation of random variables.

### Module -III (14 Hours)

**Dynamic Programming :**Decision tree Bellman principle of optimality, characteristics of DPP and DPP algorithm, solution of LPP by Dynamic programming ,Application of DPP.

Penalty function method , Projected gradient method ,Karmarkar Algorithm, Generalized Reduced Gradient Method ,Steepest descent method.

Geometric programming , Stochastic Programming , Project management PERT AND CPM , Non Traditional Optimization Algorithm ,Genetic Algorithm, Global Optimization ,Classical optimization Theory.

#### Text books

1. A. Ravindran, D. T. Philips, J. Solberg, " *Operations Research- Principle and Practice*", Second edition, Wiley India Pvt Ltd
2. Kalyanmoy Deb, " *Optimization for Engineering Design*", PHI Learning Pvt Ltd

#### Reference books:

1. H.A.Taha, A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, " *Operations Research*", Eighth Edition, Pearson Education.
2. A.P.Verma , " *Operations Research*", S.K .Kataria & Sons.
3. F.S.Hiller, G.J.Lieberman, " *Operations Research*", Eighth Edition, Tata McDraw Hill
4. Kalabati. S.. " *Optimization for Engineering*",
5. KantiSwarup, P. K. Gupta, Man Mohan, " *Operations Research*", Sultan Chand and Sons.

## **FMCC804 MATRIX COMPUTATION(3-0-0)**

### **MODULE-1 (10)**

**Gaussian Elimination and Its Variants:** Matrix Multiplication Systems of Linear Equations, Triangular Systems, Positive Definite Systems; Cholesky Decomposition, Banded Positive Definite Systems, Sparse Positive Definite Systems, Gaussian Elimination and the LU Decomposition, Gaussian Elimination with Pivoting, Sparse Gaussian Elimination, **Sensitivity of Linear Systems:** Vector and Matrix Norms, Condition Numbers.

### **MODULE-2 (10)**

**The Least Squares Problem,** The Discrete Least Squares Problem, Orthogonal Matrices, Rotators, and Reflectors, Solution of the Least Squares Problem, The Gram-Schmidt Process, Geometric Approach, Updating the QR Decomposition, **The Singular Value Decomposition,** Introduction, Some Basic Applications of Singular Values.

### **MODULE-3 (10)**

**Eigen values and Eigen vectors,** Systems of Differential Equations, Basic Facts, The Power Method and Some Simple Extensions, Similarity Transforms, Reduction to Hessenberg and Tridiagonal Forms, The QR Algorithm, Implementation of the QR algorithm, Use of the QR Algorithm to Calculate Eigenvectors, The SVD Revisited, **Eigen values and Eigen vectors,** Eigen spaces and Invariant Subspaces, Subspace Iteration, Simultaneous Iteration, and the QR Algorithm, Eigen values of Large, Sparse Matrices, Eigen values of Large, Sparse Matrices, Sensitivity of Eigen values and Eigenvectors, Methods for the Symmetric Eigenvalue Problem, The Generalized Eigenvalue Problem.

#### **Text Book :**

**1. Fundamentals of Matrix Computation by David S Watkins**

Ch1.Ch 2.1,2.2,Ch 3,Ch 4.1,4.2,Ch 5,Ch 6.

#### **Reference Book :**

1. Matrix Computations by Gene H. Golub, Charles F. Van Loan The Johns Hopkins University Press, Baltimore.

## **FBEF811 COMPUTER GRAPHICS(3-1-0)**

### **Module – 1 (14 hours)**

**Computer Graphics:** A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software, Introduction to OpenGL.

Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, fill methods for areas with irregular boundaries, Antialiasing.

Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations.

Two Dimensional Viewing: Viewing pipeline, Clipping Window, Normalization & Viewport coordinate Transformations, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping. Three Dimensional Viewing: 3-dimensional Viewing Concepts, Viewing pipeline, Projection Transformations (Orthogonal, Oblique parallel, Perspective), Clipping Algorithms.

### **Module – 2 (14 hours)**

Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Shape Grammars.

Visible Surface Detection Methods: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer method, A-Buffer Method, Scan line and Depth Sorting, Area subdivision Method, Ray Casting Method.

Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations). Computer Animation, Hierarchical Modeling (introductory idea only).

### **Module – 3 (12 hours)**

**Multimedia Fundamentals:** Introduction, Multimedia & Hypermedia, WWW, Multimedia software tools, Multimedia Authoring and Tools, Graphics and Image Data Representation, Color Models in images & video, Fundamental Concepts in Video, Basics of digital Audio.

Multimedia Data Compression: Lossless Compression Algorithms (Basics of Information Theory, Run length coding, variable length coding, lossless image compression), Lossy Compression Algorithms (distortion measure, quantization, Discrete Cosine transform), Basic Image Compression standard-JPEG, Basic Video Compression standard-MPEG (MPEG-1&2).

### **Text Books:**

1. Donald **Hearn** & M. Pauline **Baker**, “*Computer Graphics with OpenGL*”, Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-Nian**Li** and Mark S. **Drew**, “*Fundamentals of Multimedia*”, First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

### **Reference Books:**

1. Jennifer **Burg**, “*The Science of Digital Media*”, First Edition, 2009, Pearson Education Inc., New Delhi.
2. Francis S. **Hill** & Stephen M. **Kelly**, “*Computer Graphics using OpenGL*”, Third Edition, 2007, PHI Learning Pvt. Ltd., New Delhi.
3. Zhigang**Xiang**, Roy A. **Plastock**, “*Computer Graphics*”, Second Edition, 2007, McGraw-Hill Education (India), New Delhi.
4. Leen**Ammeral**, Kang **Zhang**, “*Computer Graphics for Java Programmers*”, Second Edition, 2007, Wiley India Pvt. Ltd., New Delhi.
5. Edward A. **Angel**, “*Interactive Computer Graphics: A Top-Down Approach Using OpenGL*”, Fifth Edition, 2009, **Pearson** Education Inc., New Delhi.

## **FBEF812 DATA MINING (3-1-0)**

### **Module - I (14 Hours)**

Overview: Data warehousing, The compelling need for data warehousing, the Building blocks of data warehouse, data warehouses and data marts, overview of the components, metadata in the data warehouse, trends In data warehousing, emergence of standards, OLAP, web enabled data warehouse, Introduction to the data warehouse project, understanding data warehousing Architecture, Data warehousing implementation, from data warehousing to data mining.

### **Module - II (14 Hours )**

Introduction to Data mining, Data mining Functionalities, Data preprocessing (data summarization, data cleaning, data integration and transformation, data reduction, data discretization),

Mining frequent patterns, associations, correlations (market basket analysis, the apriori algorithm, mining various kinds of association rules, from association mining to correlation analysis)

Classification: classification by decision tree induction, Rule based classification, classification by neural networks, classification by genetic algorithm

### **Module - III (12 Hours)**

Cluster Analysis: types of data in cluster analysis, A categorization of major clustering methods(partitioning methods, hierarchical methods),clustering high dimensional data, outlier analysis

Advanced techniques: web mining, spatial mining, temporal mining, Data mining applications in (financial data Analysis, retail industry, telecommunication industry, Biological data analysis, intrusion detection, in other scientific applications)

### **Text Books:**

1. Data warehousing Fundamentals: PaulrajPonniah, Willey India.
2. Data Mining: Concepts and techniques: J.Han and M.Camber, Elsevier.

### **Reference books:**

1. Data Mining: Arun Pujari, University Press
2. Data Mining –a Tutorial based primer by R.J.Roiger, M.W.Geatz, Pearson Education.
3. Data Mining & Data Warehousing Using OLAP: Berson, TMH.
4. Data Warehousing: ReemaThareja, Oxford University Press

## **FMCC851 MATLAB(0-0-3)**

- 10.Introduction to statistical problem by mat lab.
- 11.Finding Correlation ,Regression by the use of mat lab.
- 12.T- test , Chi square test by using mat lab.
- 13.Testing of hypothesis, confidence interval by using mat lab.
- 14.Statistical validation of various types of data by using mat lab.
- 15.Design and modeling of Binomial and Poisson distribution by mat lab.
- 16.Generation of random numbers , by any simulator.
- 17.Simple integration by random numbers ,mat lab implementation.
- 18.Finding 1<sup>st</sup>,2<sup>nd</sup> moments by using mat lab.
- 19.General statistical application in validation of medical related data.