COURSES OF STUDIES

FOR

5yr. Int. M.Sc.

In

Mathematics & Computing

(up to 6th semester)

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA
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**FMCC 101  Discrete Mathematics (3-1-0)**

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

**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, Subgrorups, 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:**


**Reference Books:**
2. Discrete Mathematical structures, Kolman, Busby & Ross, Pearson.

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

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


**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 nth 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:**

   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)

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:

Reference
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 n th e free ends of a light, heavy cantilever. Viscosity of liquids, laminar flow through a narrow tube and poisseuille’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)
5. Mechanics- D. S Mathur (S. Chand)
6. Properties of matter- Searle and Neaman (Arnold Publication)
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)
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:

Reference Books:
FPYE-156 PHYSICS(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.
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:
\[
\text{Sum} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \frac{x^{10}}{10!}
\]
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.)

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)

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 :
   2. Topics in Algebra by P.N.Arora, Sultan Chand & Sons.
FMCC 202  ANALYSIS – I  (3-1-0)

Module-I : (14 Hours)

Module-II : (14 Hours)
Sequence of real numbers, Bounded sequence, limit points of a sequence, limit interior 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

REFERENCE BOOKS:


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:

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

FPYE-206 Electricity, Magnetism and Electronics

Unit-I

Unit-II

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.

UNIT-IV
Books:
1. Introduction to Electrodynamics- D. J Griffiths (PHI)
2. Foundation of electromagnetic theory- Ritz and Milford (Narosa)
3. Electricity and magnetism- E. Purcell (Berkely 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:
1. Business Communication Today by Bovee et al (Pearson)
2. Business Communication by Meenakshi Raman and Prakash Singh (Oxford)

Recommended Books:
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 210 Data 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)
6. Mastering C++ - Venugopal, McGraw-Hill Education (India)

**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.
7. Figure of merit of a Galvanometer.
8. Resistance of a resistor using meterbridge (applying end correction).
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 260 DATA 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

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

**MODULE-I(14 Hours)**


**MODULE-II(14 Hours)**


**MODULE-III(12 Hours)**


**Text Book:**


**Reference Books:**

2. A Introduction to Numerical Analysis by K. Aitkinson, Wiley
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 $x^2$ – 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:


Reference Books:

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

Reference Books:
1) Analytical Solid Geometry by Shanti Narayan
2) Topics in Calculus by Panda Satapathy

FPYE 306 PHYSICS-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 $PV^γ = \text{constant}$ 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$^{st}$Tds equation, 2$^{nd}$Tdsequation .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 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


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

2. Sound - M. Ghosh (S. Chand)
3. Physics for degree students - vol-I, II, M. Das
4. Modern Physics - R. Murugeshan
5. Introduction to Modern physics - H.S. Mani, G.K. Mehta (Affiliated East West)
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-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.


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

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

MODULE-I 10 Hours

Basic concepts, scheduling criteria, scheduling algorithms, Thread Scheduling.

MODULE-II 10 Hours

MODULE-III 10 Hours


FPYE 356 PHYSICS 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 poissions ratio of material of a wire using Searle’s method.

4. Error analysis using verniercallipers, 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.
1. Basic UNIX Commands.

2. UNIX Shell Programming.

3. Programs on process creation and synchronization, inter process communication including shared memory, pipes and messages. (Dinning 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:**


**Reference Books:**


**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 $\mathbb{R}^3$ 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:
2. T.J. Willmore, Differential Geometry.

Reference Books:
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, 1st shifting theorem and 2nd 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 to 2.5.4, 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 406 PHYSICS 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 Fraunhoffer diffraction, Fresnel’s half period zones, Zone plate act as a convex lens, Fraunhoffer diffraction by a single slit, double slit Plane transmission grating.


**UNIT-IV (8)**


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


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:

Reference Books :

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)
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

FPYE 456 PHYSICS 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 resister using Meter Bridge

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**FBEF 461 Relational 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


**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:**
   Chapters: 2,3(3.1,3.2),4,5(5.2,5.3),6(excluding 6.2),7,8,9,11,12,13,15.

**Reference Books:**

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

**Module-1 (14 Hours)**

**Module-2 (14 Hours)**


**Module-3 (12 Hours)**


**Text Books:**


**Reference Books:**

3. **SankarSengupta**, System Simulation and Modeling , Pearson

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

**Module – I**

(10 Hours)

Module – II (10Hours)
(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, NOx 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)

Text Book :

Reference Books
2. Environmental Engineering by Arcadio P. Sincero&Gergoria A. Sincero PHI Publication
4. Environmental Science, Currenceham&Saigo, TMH,
5. An Introduction to Environmental Engineering and Science by Gilbert M. Masters & Wendell P. Ela - PHI Publication.

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.


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 knapsac 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:

Reference Books:
1. Algorithms – Berman, Cengage Learning
5. Algorithm Design – Goodrich, Tamassia, Wiley India.
Module – I (10 Hrs)

Module - II (10 Hrs)
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 (10 Hrs)


Reference Books: 1. Balguruswamy, Programming with JAVA, TMH.
2. Programming with Java: Bhave& Patekar, Pearson Education.
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)


**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

Reference books:
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, Rouche’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:

2. Complex Analysis by Alhfors, 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, Orthogonalism 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)

Module-III (10 hrs)
Some standard forms of variable coefficients, Separation of variables (Product method), Non linear equations of the second order (Mange’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 6th 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, BrahmaSamaj and Arya Samaj.

Text Books
1. Indian Society and Culture- P.C Das, B.C Das, S.S Das-Kalyani Publisher.

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)

Module –II (13 Hrs)


Module – III (13 Hrs)


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

Text Books:

Reference Book:
Elective - I (any one)

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

Text Books:


Reference Books:

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

Module-I (10 hours)


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)


Text Book:

Reference Book:
2. Jerry M Mendel, Uncertain Rule – Based Fuzzy Logic Systems ; Introduction and New
Directions, PH PTR, 2000.

FMCC 651 OPERATIONS 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 Nonlinear Programming by any suitable simulator
9. Iterative method for optimization problem by any suitable simulator
10. Application of nonlinear 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.
8. Simple integration by random numbers, STATISTICA implementation.
9. Finding 1st, 2nd moments by using STATISTICA.

General statistical application in validation of medical related data.