ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION
REVISED UG SYLLABUS UNDER CBCS
(Implemented from Academic Year 2020-21)
PROGRAMME: FOUR YEAR B.Sc. (Hons)
Domain Subject: MATHEMATICS
Courses for Semesters VII & VIII
(Syllabus with Learning Outcomes, References, & Co-curricular Activities)

CORE AND SKILLED COURSES STRUCTURE

Structure of Courses for Semester – VII

S.No	Course		Subject	Hrs per week	Credits	IA	ES	Total
01	Course - I A or B	A	Algebra	6	5	25	75	100
		B	Classical Mechanics	6	5	25	75	100
02	Course - II A or B	A	Real Analysis	6	5	25	75	100
		B	Ordinary Differential Equations	6	5	25	75	100
03	Course - III A or B	A	Basic Topology	6	5	25	75	100
		B	Number Theory	6	5	25	75	100
04	Course - IV A or B	A	Logic and Sets	6	5	25	75	100
		B	Finite Element Analysis	6	5	25	75	100
05	Course - V A or B	A	Cryptography	6	5	25	75	100
		B	Mathematical Finance	6	5	25	75	100

Structure of Courses for Semester – VIII

S.No	Course		Subject	Hrs per week	Credits	IA	ES	Total
01	Course - I (A or B)	A	Advanced Algebra	6	5	25	75	100
		B	Elements Of Elasticity And Fluid Dynamics	6	5	25	75	100
02	Course - II (A or B)	A	Advanced Analysis	6	5	25	75	100
		B	Advanced Linear Algebra	6	5	25	75	100
03	Course - III (A or B)	A	Advanced Topology	6	5	25	75	100
		B	Lattice Theory	6	5	25	75	100
04	Course - IV (A or B)	A	Discrete Mathematics	6	5	25	75	100
		B	Graph Theory	6	5	25	75	100
05	Course - V (A or B)	A	Operation Research	6	5	25	75	100
		B	Mathematical Modelling	6	5	25	75	100

Structure of Courses for Semester – VII

S.No	*Higher Order knowledge courses*		S.No	*Skill oriented courses*
1	MAT – 701(A) : Algebra (OR) MAT – 701(B) : Classical Mechanics		4	MSK – 704(A) : Logic and Sets (OR) MSK – 704(B) : Finite Element Analysis
2	MAT – 702(A) : Real Analysis (OR) MAT – 702(B) : Ordinary Differential Equations			
3	MAT – 703(A) : Basic Topology (OR) MAT – 703(B) : Number Theory		5	MSK – 705(A) : Cryptography (OR) MSK – 705 (B) : Mathematical Finance

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MAT – 701(A) : ALGEBRA

Learning Outcomes

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

1. understand the direct product of groups and application of Sylow's theorems
2. understand the homomorphic relation between the groups, sum and direct sum of ideals
3. know factorizing the domains, factorization of polynomials and Describe some other forms of polynomial rings
4. know about submodules and direct sums
5. know about Free modules and Representation of linear mappings

UNIT-I

Structure theorems of groups **15 Hrs**

Direct products-Finitely generated abelian groups-Invariants of a finite abelian group-Sylow theorems. (Sections 8.1 to 8.4 of the Chapter 8 in the Prescribed Text Book.)

UNIT-II

Ideals and Homomorphisms **15 Hrs**

Ideals-Homomorphisms-Sums and direct sums of ideals- Maximal and prime ideals-Nilpotent and nil ideals-Zorn's lemma. (Sections 10.1 to10.6 of the Chapter 10 in the Prescribed Text Book.)

UNIT-III

Unique factorization domains and Euclidean domains **15 Hrs**

Unique factorization domains-Principal ideal domains-Euclidean domains-Polynomial rings over UFD (Sections 11.1 to 11.4 of the Chapter 11 in the Prescribed Text Book.)

UNIT IV

Modules and Vector Spaces **15 Hrs**

Definition and examples – Submodules and direct sums – R-homomorphisms and quotient modules (Sections 1,2 & 3 of Chapter - 14)

UNIT V

Free Modules **15 Hrs**

Completely reducible modules – Free modules – Representation of linear mappings – Rank of linear mapping (Sections 4 to 7 of Chapter - 14)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book :

Basic Abstract Algebra by P.B.Battacharya, S.K.jain, S.R.Nagpaul, Cambridge University Press,1995.

Reference Book :

1. Topics in Algebra : I.N.Herstein, 2nd Edition, John Wiley &Sons,1999
2. Algebra : Serge Lang, Revised Third Edition, Springer, Verlag, New York 2002
3. Algebra : Thomas W. Hungerford, Springer, Verlag, New York 1974

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Four Year – B.Sc. (Hons), Semester – VII
Domain Subject: MATHEMATICS

MAT – 701(B) : CLASSICAL MECHANICS

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

1. identify the basic concepts of mechanics and also learn applications of Lagrangian formulation.
2. Understand derivation of Lagrange's equations from Hamilton's principle and advantages of variational principle formulation
3. Understand the simplistic approach to canonical transformations,
4. Understand Poisson and Lagrange brackets and their invariance and the Hamilton Jacobi Equations for Hamilton's principal function
5. Understand special theory of relativity, Lorentz transformation and contractions and Lorentz transformations

Unit-I
Lagrangian Formulation: 15 Hrs

Mechanics of a particle, mechanics of a system of particles, constraints, generalized coordinates generalized velocity, generalized force and potential. D'Alembert's principle and Lagrange's equations, some applications of Lagrangian formulation (scope and treatment as in Art.1.1 to 1.4 and Art 1.6 of Text book.1).

Unit-II
Hamilton's principle to non-holonomic systems 15 Hrs

Hamilton's principle, derivation of Lagrange's equations from Hamilton's principle, extension of Hamilton's principle to non-holonomic systems, advantages of variational principle formulation, conservation theorems and symmetry properties (scope and treatment as in Art 2.1 and 2.3 to 2.6 of Text book.1).

Unit-III
Hamiltonian formulation: 15 Hrs

Legendre transformations and the Hamilton equations of motion, cyclic coordinates and conservation theorems, derivation of Hamilton's equations from a vibrational principle, the principle of least action, the equation of canonical transformation, examples of canonical transformation, the Harmonic Oscillator, the simplistic approach to canonical transformations (scope and treatment as in Art.8.1,8.2,8.5, 8.6 and 9.1 to 9.4 of Text book.1).

Unit-IV
Canonical transformations 15 Hrs

Poisson and Lagrange brackets and their invariance under canonical transformation. Jacobi's identity; Poisson's Theorem. Equations of motion infinitesimal canonical transformation in

the Poisson bracket formulation. Hamilton Jacobi Equations for Hamilton's principal function, The harmonic oscillator problem as an example of the Hamilton – Jacobi method, the Hamilton – Jacobi equation for Hamilton's characteristic function (scope and treatment as in Art 9.5, 9.6, 10.1, 10.2 and 10.3 of Text book.1)

Unit-V
Lorentz transformation equations 15 Hrs

New concept of space and Time, postulates of special theory of relativity, Lorentz transformation equations, Lorentz contraction, Time dilation, simultaneity, Relativistic formulae for composition of velocities and accelerations, proper time, Lorentz transformations form a group (scope and treatment as in chapters 1 and 2 of Text book.2).

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving sessions

Text books:

1. Classical mechanics by H.Goldstein, 2nd edition, Narosa Publishing House.
2. Relevant topics from Special relativity by W.Rindler, Oliver & Boyd, 1960.

Reference Book :

J.C. Upadhyaya, Classical Mechanics, Himalaya Publishing House

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MAT – 702(A) : REAL ANALYSIS

Learning Outcomes

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

1. understand to form a metric space from any non-empty set, compact sets and connected sets
2. understand continuity of functions, compactness and connectedness
3. know the derivative of a real valued function and the applications of Mean value theorems
4. know the conditions for existence of integrals and some applications of integrals
5. know the vector valued functions, differentiation and integration of vector valued functions and their applications

UNIT I

Basic Topology **15 Hrs**

Finite, countable and uncountable sets – Metric spaces – Compact sets – Perfect sets – Connected sets (Sections 2.1 to 2.47)

UNIT II

Continuity **15 Hrs**

Limits of functions - Continuous functions – Continuity and Compactness – Continuity and Connectedness – Discontinuities. Monotonic functions (Sections 4.1 to 4.31)

UNIT III

Differentiation **15 Hrs**

The derivative of a real function – Mean Value Theorems – The continuity of Derivatives L'Hospital's Rule. (Sections 5.1 to 5.13)

UNIT IV

Riemann Stieltjes Integrals **15 Hrs**

Definition and existence of integral – properties of integrals –. (Sections 6.1 to 6.19)

UNIT V

FTC and Vector Valued Functions **15 Hrs**

Integration and differentiation - Differentiation of Vector Valued Functions – Integration of Vector valued functions – Rectifiable curves. (Sections 6.20 to 6.27)

(FTC : Fundamental Theorem of Calculus)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

1. Principles of mathematical Analysis by Walter Rudin, Mc Graw Hill International Edition, 3rd Edition

Reference Book : Mathematical Analysis by Tom M .Apostal, Narosa Publishing House 2nd Edition 1985

MAT – 702(B) : ORDINARY DIFFERENTIAL EQUATIONS

Learning outcomes:

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

1. comprehend the bridge between the real function theory and theory of ordinary differential equations
2. understand the basic theory behind existence, uniqueness, continuity of solutions of ordinary differential equations
3. realize the dependence of solutions on various parameters involved in the differential equations
4. recognize the significance studying differential systems and its utility in understanding higher order differential equations
5. figure out qualitative behavior of solutions of differential equations of various orders.

Unit I

Real Function Theory **15 Hrs**

Essential concepts from Real Function Theory – The basic problem -The fundamental existence and uniqueness theorem –examples to demonstrate the theory- continuation of solutions (Sections 10.1, 10.2 of the prescribed text book)

Unit II

Existence and Uniqueness **15 Hrs**

Dependence of solutions on initial conditions – dependence of solutions on parameters (causal function f) - Existence and Uniqueness theorems for systems – existence and uniqueness theorems for Higher order equations – examples (Sections 10.3, 10.4 of the prescribed text book)

Unit III

Linear differential systems **15 Hrs**

Introduction to the theory of Linear differential systems – Theory and properties of Homogeneous linear systems (Sections 11.1 - 11.3 of the prescribed text book)

Unit IV

Homogeneous and Non-homogeneous Systems **15 Hrs**

Theory of non-homogeneous linear systems – Theory and properties of the nth order homogeneous linear differential equations (Sections 11.4 - 11.6 of the prescribed text book)

Unit V

Higher order non-homogeneous Linear Equations **15 Hrs**

Theory of nth order Non homogeneous Linear equations – Sturm theory – Sturm Liouville Boundary value problems (Sections 11.7, 11.8, 12.1 of the prescribed text book)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

1. Shepley L. Ross (2007). Differential Equations (3rd edition), Wiley India

Reference book:

George F. Simmons (2017). Differential Equations with Applications and Historical Notes (3rd edition). CRC Press. Taylor & Francis.

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MAT – 703(A) : BASIC TOPOLOGY

Learning Outcomes:

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

1. handle operations on sets and functions and their properties
2. understand the concepts of Metric spaces, open sets, closed sets, convergence, some important theorems like Cantor's intersection theorem and Baire's theorem
3. familiar with the concept of Topological spaces, continuous functions in more general and characterize continuous functions in terms of open sets, closed sets etc.
4. explain the concept of compactness in topological spaces characterize compactness in metric spaces and their properties.

UNIT I

Sets and Functions **15 Hrs**

Sets and Set inclusion – The algebra of sets – Functions – Products of sets – Partitions and equivalence relations – Countable sets – Uncountable sets – Partially ordered sets and lattices. (Chapter I: Sections 1 to 8 of the prescribed text book).

UNIT-II

Metric spaces **15 Hrs**

The definition and some examples – Open sets – Closed sets – Convergence, Completeness and Baire's theorem . (Chapter 2: Sections 9 to 12 of the prescribed text book).

UNIT-III

Metric spaces **15 Hrs**

Continuous mappings, Spaces of continuous functions – Euclidean and Unitary spaces.(Chapter 2: Sections 13 to15 of the prescribed text book) Topological spaces: The definition and some examples – Elementary concepts– (Chapter 3: Sections 16 to 17 of the prescribed text book).

UNIT-IV

Topological spaces **15 Hrs**

Open bases and open sub bases, Weak Topologies, The function algebras C(X, R) and C(X, C). (Chapter 3: Sections 18 to 20 of the prescribed text book). Compactness: Compact spaces – Heine – Borel theorem (Chapter 4: Section 21).

UNIT-V

Compactness **15 Hrs**

Product of Spaces – Tychonoff's theorem and locally Compact spaces – Compactness for metric spaces – Ascoli's theorem. (Chapter 4: Sections 22 to 25 of the prescribed text book).

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving

Text Book:

1. Introduction to Topology and Modern Analysis by G. F. Simmons International Student edition – McGraw – Hill Kogakusha, Ltd.

Reference Books :

1. Schaum's Outlines : General Topology by Seymour Lipschutz
2. Topology : A first Course by James Munkres

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Four Year – B.Sc. (Hons), Semester – VII
Domain Subject: MATHEMATICS

MAT - 703(B) : NUMBER THEORY

Learning Outcomes:

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

1. understand the fundamental theorem of arithmetic and problem solving skills
2. understand Mobius function, Euler quotient function, The Mangoldt function , Liouville's function, The divisor functions and the generalized convolutions.
3. Understand Euler's summation formula, application to the distribution of lattice points and the applications to $\mu(n)$ and $\Lambda(n)$
4. Understand Shapiro's Tauberian theorem and its applications
5. Understand residue classes and complete residue systems, application of Fermat's theorem and applications of Shapiro's theorem

UNIT-I

The Fundament Theorem of Arithmetic 15 Hrs

Introduction, Divisibility, Greatest common divisor, Prime numbers, The fundamental theorem of arithmetic, The series of reciprocals of the primes, The Euclidean algorithm, The greatest common divisor of more than two numbers (Chapter 1 of the Text Book)

UNIT-II

Arithmetical Functions And Dirichlet Multiplication 15 Hrs

Introduction- The Mobius function $\mu(n)$ – The Euler quotient function $\varphi(n)$ - A relation connecting φ and μ - A product formula for $\varphi(n)$ - The Dirichlet product of arithmetical functions- Dirichlet inverses and the Mobius inversion formula- The Mangoldt function $\Lambda(n)$- Multiplicative functions- Multiplicative functions and Dirichlet multiplication- The inverse of a completely multiplicative function-Liouville's function $\lambda(n)$ - The divisor functions $\sigma_\alpha(n)$ - Generalized convolutions.(Chapter-2:- Articles 2.1 to 2.14)

UNIT-III

Averages of Arithmetical Functions 15 hrs

Introduction- The big oh notation. Asymptotic equality of functions- Euler's summation formula- Some elementary asymptotic formulas-The average order of d(n)- The average order of the divisor functions $\sigma_\alpha(n)$- The average order of $\varphi(n)$- An application to the distribution of lattice points visible from the origin- The average order of $\mu(n)$ and $\Lambda(n)$- The partial sums of a Dirichlet product- Applications to $\mu(n)$ and $\Lambda(n)$- Another identity for the partial sums of a Dirichlet product.(Chapter -3:- Articles 3.1 to 3.12)

UNIT-IV

Some Elementary Theorems On The Distribution Of Prime Numbers 15 Hrs

Introduction- Chebyshev's functions $\psi(x)$ and $\upsilon(x)$ - Relations connecting $\upsilon(x)$ and $\pi(x)$ - Some equivalent forms of the prime number theorem-Inequalities for $\pi(n)$ and P_n - Shapiro's Tauberian theorem- Applications of Shapiro's theorem- An asymptotic formula for the partial sums $\Sigma p \leq x$ $(1/p)$ - The partial sums of the Mobius function. Chapter-4:- Articles 4.1 to 4.9

UNIT-V

Congruences 15 Hrs

Definition and basic properties of congruences- Resudue classes and complete residue systems- Linear congruences- Reduced residue systems and the Euler- Fermat theorem- Polynomial congruences modulo p. Lagrange's theorem- Applications of Lagrage's theorem- Simultaneous linear congruences. The Chinese remainder theorem- Applications of the Chinese remainder theorem- Polynomial congruences with prime power moduli. Chapter -5:- Articles 5.1 to 5.9

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

Introduction to Analytic Number Theory- By T.M.APOSTOL- Springer Verlag-New York, Heidalberg-Berlin-1976.

References :

1. G.A.Jones and J.M.Jones, Elementary Number Theory, Springer

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Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MSK – 704(A) : Logic and Sets

Learning Outcomes:

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

1. understand the basic rules of inference
2. effectivelly develop and write mathematical proofs in a clear and concise manner
3. understand the basic concepts of set theory
4. understand the function, inverse function and set of functions
5. understand the relations, congruencies, equivalence relations and learn the properties of relations

Unit – I

Informal Logic **15 Hrs**

Introduction, Statements, Relations between Statements, Valid Arguments, Quantifiers (Chapter 1 of the Text Book)

Unit – II

Strategies of Proofs **15 Hrs**

Mathematical Proofs- What they are and why we need them, Direct Proofs, Proofs by Contrapositive and Contradiction, Cases, and If and Only If , Quantifiers in Theorems, Writing Mathematics (Chapter 2 of the Text Book)

Unit –IIISets **15 Hrs**

Introduction, Set – Basic Definitions, Set operations, Families of sets, Axioms for Set Theory (Chapter 3 of the Text Book)

Unit – IV

Functions **15 Hrs**

Functions , Image and Inverse Image , Composition and Inverse Functions , Injectivity, Surjectivity and Bijectivity, Sets of Functions (Chapter 4 of the Text Book)

Unit – V

Relations **15 Hrs**

Relations, Congruence, Equivalence Relations (Chapter 5 of the Text Book)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

1. Bloch, Ethan. Proofs and Fundamentals - A First Course in Abstract Mathematics, Springer London, 2011, Second Edition

Reference Text Book:

1. Chartrand, Gary. *Mathematical proofs : a transition to advanced mathematics*, Boston: Addison Wesley, 2003.
2. Copi, Irving. *Introduction to Logic*, Upper Saddle River, N.J. : Pearson/Prentice Hall, 2009.
3. Copi, Irving. *Logic: Language, Deduction and Induction,* Singapore : Pearson Education South Asia Pte Ltd., 2005
4. Cupillari, Antonella. *The nuts and bolts of proofs: an introduction to mathematical proofs*, Waltham, MA : Academic Press, 2013.

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Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MSK – 704(B) : Finite Element Analysis

Learning Outcomes :

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

1. understand the concepts behind formulation methods in FEM.
2. identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
3. develop element characteristic equation and generation of global equation.
4. apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axisymmetric and dynamic problems and solve them displacements, stress and strains induced.

Unit - I

Fundamental Concepts 15Hrs

Introduction, Historical background, Outline of presentation, Stresses and Equilibrium, Boundary conditions, Strain-Displacement relations, Stress-Strain relations, Plane stress, Plane strain problems, Temperature effects, Potential energy and equilibrium. The Rayleigh-Ritz method, Hamilton's principle. Galerkin's method, Saint Venant's principle. (Chapter 1, Section 1.1. to Section 1.11)

Unit - II

One-dimensional Problems 15 Hrs

Introduction, Finite Element Modeling: Element Division, Numbering Scheme, Coordinates and Shape Functions, The Potential Energy Approach: Element Stiffness Matrix, Force Terms The Galerkin Approach: Element Stiffness, Force Terms, Assembly of the global stiffness matrix and load vector. (Chapter 3, Section 3.1 to 3.6)

Unit – III

One-dimensional Problems (Continued) 15 Hrs

Properties of K, The Finite Element Equations: Treatment of boundary conditions: Types of Boundary Conditions - Elimitwtion Approach, Penalty Approach, Multipoint Constraints Quadratic shape functions, Temperature effects, Input data file. (Chapter 3, Section 3.7 to 3.10)

Unit - IV

Trusses 15 Hrs

Introduction, Plane trusses -Local and Global Coordinate Systems, Formulas for Calculating l and m, Element Stiffness Matrix, Stress Calculations, Temperature Effects, Three-dimensional trusses, Assembly of global stiffness matrix for the Banded and Skyline solutions - Assembly for Banded Solution, Input Data File (Chapter 4)

Unit - V

Two-dimensional Problems 15 Hrs

Introduction, Finite element modeling, Constant strain triangle - lsoparametric Representation, Potential· Energy Approach, Element Stiffness, Force Terms, Galerkin Approach, Stress Calculations, Temperature Effects (Chapter 5, Section 5.1 to 5.3)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

1. Introduction to Finite Elements in Engineering, by Tirupathi R. Chandrupatla, Ashok D.Belegundu (chapters 1 to 8 only).

References:

1. Introduction to Finite Element Method, by S.S.Rao
2. Finite Element Method, by O.C. Zienkiewicz.
3. Concepts and Applications of Finite Element Analysis, by Robert D. Cook.
4. Introduction to Finite Element Method, by J.N.Reddy.

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MSK – 705(A) : Cryptography

Learning Outcomes:

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

1. understand Divisibility and Euclidean algorithm and congruences
2. understand about Enciphering matrices
3. understand finite fields and quadratic residues
4. understandthe idea of public key cryptography
5. understand psedo-primes and Fermat's factorization

UNIT-I

Elementary Number Theory **15 Hrs**

Time Estimates for doing arithmetic - Divisibility and Euclidean algorithm - Congruences - Applications to factoring.(Chapter-I of the Text Book)

UNIT-II

Cryptography **15 Hrs**

Some simple crypto systems - Enciphering matrices (Chapter-III of the Text Book)

UNIT-III

Finite Fields and quadratic Residues **15 Hrs**

Finite fields - Quadratic residues and Reciprocity (Chapter-II of the Text Book)

UNIT-IV

Public Key Cryptography **15 Hrs**

The idea of public key cryptography - RSA - Discrete log - Knapsack (Chapter-IV : Sections IV.1 to IV.4 (omit sec.5) of the Text Book)

UNIT-V

Primality and Factoring **15 Hrs**

Pseudoprimes - The rho method - Fermat factorization and factor bases - The Continued fraction method - The quadratic sieve method.(Chapter-V of the Text Book)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

Neal Koblitz, A Course in Number Theory and Cryptography, Springer-Verlag, New York, 2002, Second Edition.

Reference Books:

1. Niven and Zuckermann, An Introduction to Theory of Numbers (Edn. 3), Wiley Eastern Ltd., New Delhi, 1976.
2. David M.Burton, Elementary Number Theory, Wm C.Brown Publishers, Dubuque, Iowa, 1989.
3. K.Ireland and M.Rosen, A Classical Introduction to Modern Number Theory, Springer Verlag, 1972.

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Four Year – B.Sc. (Hons), Semester – VII

Domain Subject: MATHEMATICS

MSK – 705 (B) : Mathematical Finance

Learning Outcomes :

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

1. Understand the that interest calculations and methods of calculations
2. Understand the annuities and types of Annuities and caluculation interest and values of annuities
3. Understand the concept of Mathematics of Capital Budgeting and Depreciation and some methods of calculations

UNIT– I

Mathematics of the Time Value of Money **15 Hrs**

Simple Interest : Total Interest, Rate of Interest, Term of Maturity, Current Value, Future Value, Finding n and r When the Current and Future Values are Both Known, Simple Discount, Calculating the Term in Days, Ordinary Interest and Exact Interest, Obtaining Ordinary Interest and Exact Interest in Terms of Each Other, Focal Date and Equation of Value, Equivalent Time: Finding an Average due Date, Partial Payments, Finding the Simple Interest Rate by the Dollar-Weighted Method (Unit – II section 1.1 to 1.14 of the text book) Bank Interest : Finding FV Using the Discount Formula, Finding the Discount Term and the Discount Rate, Difference Between a Simple Discount and a Bank Discount (Unit – II section 2.1 to 2.3 of the text book)

UNIT -II

Mathematics of the Time Value of Money(Continued) **15 Hrs**

Bank Interest : Comparing the Discount Rate to the Interest Rate, Discounting a Promissory Note, Discounting a Treasury Bill (Unit – II section 2.4 to 2.6 of the text book) Compound Interest: The Compounding Formula, Finding the Current Value, Discount Factor, Finding the Rate of Compound Interest, Finding the Compounding Term, The Rule of 72 and Other Rules, Effective Interest Rate, Types of Compounding, Continuous Compounding, Equations of Value for a Compound Interest, Equated Time For a Compound Interest (Unit – II section 3.1 to 3.11 of the text book)

UNIT- III

Mathematics of the Time Value of Money(Continued) **15 Hrs**

Annuities: Types of Annuities, Future Value of an Ordinary Annuity, Current Value of an Ordinary Annuity, Finding the Payment of an Ordinary Annuity, Finding the Term of an Ordinary Annuity, Finding the Interest Rate of an Ordinary Annuity, Annuity Due: Future and Current Values, Finding the Payment of an Annuity Due, Finding the Term of an Annuity Due, Deferred Annuity, Future and Current Values of a Deferred Annuity, Perpetuities (Unit – II section 4.1 to 4.12 of the text book)

MATHEMATICS OF DEBT AND LEASING : Credit and Loans :Types of Debt, Dynamics of Interest–Principal Proportions, Premature Payoff, Assessing Interest and Structuring Payments, Cost of Credit, Finance Charge and Average Daily Balance, Credit Limit vs. Debt Limit (Unit – III section 1.1 to 1.7 of the text book)

UNIT – IV

MATHEMATICS OF DEBT AND LEASING(Continued) 15 Hrs

Mortgage Debt : Analysis of Amortization, Effects of Interest Rate, Term, and Down Payment on the Monthly Payment, Graduated Payment Mortgage, Mortgage Points and the Effective Rate, Assuming a Mortgage Loan, Prepayment Penalty on a Mortgage Loan, Refinancing a Mortgage Loan, Wraparound and Balloon Payment Loans, Sinking Funds, Comparing Amortization to Sinking Fund Methods

UNIT – V

Mathematics of Capital Budgeting and Depreciation 15 Hrs

Capital Budgeting: Net Present Value, Internal Rate of Return, Profitability Index, Capitalization and Capitalized Cost, Other Capital Budgeting Methods

Depreciation and Depletion: The Straight-Line Method, The Fixed-Proportion Method, The Sum-of-Digits Method, The Amortization Method, The Sinking Fund Method

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

M. J. Alhabeeb, Mathematical Finance, A JOHN WILEY & SONS, INC., PUBLICATION

Reference Books:

1. David G. Luenberger, Investment Science, Oxford University Press, Delhi, 1998.
2. John C. Hull, Options, Futures and Other Derivatives, 6th Ed., Prentice-Hall India, Indian reprint, 2006.
3. Sheldon Ross, An Elementary Introduction to Mathematical Finance, 2nd Ed., Cambridge University Press, USA, 2003

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MAT – 801(A) : Advanced Algebra

Learning Outcomes:

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

1. define modules, submodules and give some examples of them.

2. understand reducible modules, free modules and be able to find the rank of a linear mapping

3. understand Einstein's criteria for irreducible polynomials and algebraic extensions

4. understand splitting fields and finite fields

5.understand the Fundamental theorem of Galois theory

UNIT I

Algebraic extension of fields 15 Hrs

Irreducible polynomials and Eisenstein's criterion-Adjunction of roots-Algebraic extensions-Algebraically closed fields. (Sections 15.1 to 15.4 of the Chapter 15 in the prescribed text book.)

UNIT II

Normal and separable extensions 15 Hrs

Splitting fields-Normal extensions-multiple roots-finite fields. (Sections 16.1 to 16.4 of the Chapter 16 in the prescribed text book.)

UNIT III

Normal and separable extensions: Separable extensions. 15 Hrs

Galois Theory: Automorphism groups and fixed fields- fundamental theorem of Galois Theory. (Section 16.5 of the Chapter 16 and Sections 17.1 to 17.2 of the Chapter 17 in the prescribed text book.)

UNIT IV

Galois Theory 15 Hrs

Fundamental theorem of algebra. Galois Theory and Applications of Galois Theory to Classical problems: Roots of unity and cyclotomic polynomials-Cyclic extensions (Section 17.3 of the Chapter 17 and sections 18.1and 18.2 of the Chapter 18 in the prescribed text book.)

UNIT V

Applications of Galois Theory 15 Hrs

Applications of Galois Theory to Classical problems: Polynomials solvable by radicals-symmetric functions-Ruler and compass constructions. (Sections 18.3 and 18.4 of the Chapter 18 in the prescribed text book.)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

Basic Abstract Algebra by P.B.Battacharya, S.K.jain, S.R.Nagpaul, Cambridge University Press 2nd Edition

Reference Book :

1. Topics in Algebra : I.N.Herstein, 2nd Edition, John Wiley &Sons
2. Algebra : Serge Lang, Revised Third Edition, Springer
3. Algebra : Thomas W. Hungerford, Springer

MAT – 801(B) : Elements of Elasticity And Fluid Dynamics

Learning Outcomes

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

1: understand the equation of continuity and general analysis of fluid motion.
2: understand the equation of motion of a fluid, Bernoulli's equation and circulation theorem.
3: understand the two dimensional fluid flows and their properties.
4: understand the various deformations and equation of compatibility.
5: understand the properties of the stress, Mohr's Diagram and certain examples of stress.

Unit-I **15 Hrs**

Kinematics of fluids, real and ideal fluids, velocity of fluid at a point, streamlines and path lines, velocity potential, velocity vector, local and particle rates of change, equation of continuity, Acceleration of fluid, conditions at a rigid boundary, General analysis of fluid motion (Chapter 2 of Text book 1).

Unit-II **15 Hrs**

Equation of motion of a fluid, pressure at a point in a fluid at rest and in a moving fluid, conditions at a boundary of two in viscid immiscible fluids, Euler's equations of motion, Bernoulli's equation. Discussion of the case of steady motion under conservative body forces, Vortex motion, Kelvin's circulation theorem. Some further aspects of vortex motion (Chapter 3(excluding sections 3.8 to 3.11) of Text book 1).

Unit-III **15 Hrs**

Some two - dimensional flows: Meaning of two - dimensional flow, use of cylindrical polar coordinates, the stream function, the complex potential for two – dimensional, irrotational, incompressible flow, complex potential for standard two – dimensional flows, some worked examples, two - dimensional image systems. The Milne- Thomson circle theorem, the theorem of Blasius (Chapter 5(excluding sections 5.10 to 5.12) of Text book 1).

Unit-IV **15 Hrs**

Analysis of strain: Deformation, affine deformation, infinitesimal affine deformation, geometrical interpretation of the components of strain, strain quadric of Cauchy, principal directions, invariants, general infinitesimal deformation, Examples of strain, equations of compatibility, finite deformations. (Chapter 1 of Text book 2)

Unit-V **15 Hrs**

Analysis of stress, body and surface forces, stress tensor, equations of equilibrium, transformation of coordinates, stress quadric of Cauchy, Mohr's diagram, examples of stress (Chapter 2 of Text book2)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text books:

1. Text book of Fluid Dynamics by F.Chorlton, CBS publishers and distributors, New Delhi.
2. Mathematical theory of Elasticity, by I.S.SOKOLNIKOFF 2 nd edition; Tata Mc Graw Hill-New Delhi

Reference Book :

S.W. Yuan, Foundations of Fluid Mechanics, Prentice Hall

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MAT – 802(A) : Advanced Analysis

Learning Outcomes:

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

1. solve the problems on convergence of Sequences and Series of functions and uniform behavior of sequences of plan curves
2. understand the Stone – Weierstras theorem
3. know Exponential and Logarithmic functions and Fourier Series
4. Linear transformations and differentiation
5. understand the contraction principle, role of fixed point theorem and the rank theorem

UNIT I
Sequences and Series of Functions

Discussion of Main Problem – Uniform Convergence - Uniform Convergence and Continuity – Uniform Convergence and Integration – Uniform Convergence and Differentiation (Sections 7.1 to 7.18)

UNIT II
Equicontinuous families of functions and Power Series

Equicontinuous families of functions – the Stone – Weierstrass theorem – Power Series (Sections 7.19 to 7.33 & 8.1 to 8.5)

UNIT III
Some Special Functions

The Exponential and Logarithmic functions – The Trigonometric functions – Algebraic completeness of the complete field – Fourier Series(Sections 8.6 to 8.16)

UNIT IV
Functions of several variables

Linear transformation – Differentiation. (Sections 9.1 to 9.21)

UNIT V
Functions of several variables (continued..)

The contraction Principle – The Inverse function Theorem – The implicit function Theorem – The Rank Theorem – Determinants(Sections 9.22 to 9.41)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving

Text Book:

Principles of mathematical Analysis by Walter Rudin, Mc Graw Hill International Edition 3rd Edition

Reference Book :

Mathematical Analysis by Tom M .Apostal, Narosa Publishing House 2nd Edition 1985

MAT – 802(B) : Advanced Linear Algebra

Learning Outcomes:

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

1. understand the basic to the analysis of a single linear transformation on a finite-dimensional vector space and the analysis of characteristic values and the rational and Jordan canonical forms.

2. understand concept of finite-dimensional inner product spaces and basic geometry, relating orthogonalization and unitary operators and normal operators.

UNIT-I

Elementary Canonical Forms **15 Hrs**

Introduction – Characteristic Values – Annihilating Polynomials –invariant subspaces – Simultaneous Triangulation – Simultaneous Diagonalization, Simultaneous

(Chapter 6, Section 6.1 to 6.5 of the text book)

UNIT-II

Elementary Canonical Forms(Continued) **15 Hrs**

Direct – sum Decompositions – invariant direct sums – the primary decomposition theorem

(Chapter 6, Section 6.6 to 6.8 of the text book) The Rational and Jordan Forms: cyclic subspaces and Annihilators – cyclic decompositions and the rational form. (Chapter 7, Section 7.1 to 7.2 of the text book)

UNIT-III

Elementary Canonical Forms(Continued) **15 Hrs**

The Jordan Form – Computation of Invariant Factors – Semi Simple Operators. (Chapter 7, Section 7.3 to 7.5 of the text book)

UNIT-IV

Inner product spaces **15 Hrs**

Inner products, Inner product spaces, Linear functionals and adjoints,(Chapter 8, Section 8.1 to 8.3 of the text book)

UNIT - V

Inner product spaces(continued) **15 Hrs**

Unitary operations, Normal operators (Chapter 8, Section 8.4 to 8.5 of the text book)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book :

Linear Algebra second edition By Kenneth Hoffman and Ray Kunze, Prentice Hall of india Private Limited, New Delhi.

Reference Books :

Bhattacharya, P.B., Jain, S.K and Nagpal, S.R., First Course in Linear Algebra, Wiley Eastern Ltd. New Delhi

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MAT – 803(A) : Advanced Topology

Learning Outcomes:

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

1. define T_1-space, T_2 – space
2. understand Urysohn's Lemma, and the Tietz's extension theorem
3. understand the Stone – Chech compactification,
4. understand and can define the Connectedness of a topological space
5. understand the Weierstrass approximation theorem and Stone-Weierstrass theorems

UNIT-I

Separation **15 Hrs**

T1 spaces and Hausdorff spaces – Completely regular spaces and normal spaces – Urysohn's lemma and the Tietze's extension theorem. (Chapter 5: Sections 26 to 28 Prescribed text book).

UNIT-II

Separation (continued) **15 Hrs**

The Urysohn imbedding theorem – The Stone – Chech compactification. (Chapter 5: Sections 29 to 30 Prescribed text book). Connectedness: Connected spaces– connectedness of Rn and Cn . (Chapter 6: Section 31 Prescribed text book).

UNIT-III

Connectedness (continued) **15 Hrs**

The components of a space – Totally disconnected spaces – Locally connected spaces. (Chapter 6: Sections 32 to 34 Prescribed text book)

UNIT-IV

Approximation **15 Hrs**

The Weierstrass approximation theorem - The Stone-Weierstrass theorems (Chapter 7: Section 35 to 36 Prescribed text book).

UNIT-V

Approximation (continued) **15 Hrs**

Locally compact Hausdorff spaces – The extended StoneWeierstrass theorems. (Chapter 7: Sections 37 to 38 Prescribed text book).

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

1. Introduction to Topology and Modern Analysis by G. F. Simmons, International Student edition – McGraw – Hill Kogakusha, Ltd.

Reference Books :

1. Schaum's Outlines : General Topology by Seymour Lipschutz
2. Topology : A first Course by James Munkres

MAT – 803(B) : Lattice Theory

Learning Outcomes :

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

1. Understand the concept of partially ordered set and properties of partial ordered sets
2. Understand the concept of lattice, semilattice and their properties
3. Understand the concept of ideals and homomorphisms in lattices
4. Understand the distributive and the modular lattices
5. Understand the characterization of modular and distributive lattices

UNIT-I

Partly Ordered Sets **15 Hrs**

Set Theoretical Notations, Relations, partly ordered Sets, Diagrams, special Subsets of a Partly ordered set, length, Lower and Upper Bounds, The minimum and maximum condition.(Chapter 1, section 1 to 8 of the Text Book)

UNIT –II

Lattices in General **15 Hrs**

Algebras, lattices, The Lattice Theoretical Duality principle, semi Lattices, lattices as Partly ordered sets, Diagrams of lattices, Sub lattices, Ideals (Chapter 2, section 10-16 of the Text Book)

Unit –III

Lattices in General(Continued) **15 Hrs**

Bound Elements of a lattice, Atoms and Dual Atoms, Complements, Relative Complements, Semi complements, Irreducible Prime Elements of a lattice, The Homomorphism of a lattice, Axiom Systems of lattices (Chapter 2, section 17-21 of the Text Book)

UNIT – IV

Complete lattices **15 Hrs**

Complete lattices, Complete Sub lattices of a Complete lattice, Conditionally Complete Lattices, Compact Elements, Compactly Generated lattices, Subalgebra lattice of an Algebra, Closure Operations.(Chapter 3, Sections 22-27 of the Text Book)

UNIT – V

Distributive and Modular Lattices **15 Hrs**

Distributive lattices, Infinitely Distributive and Completely Distributive lattices, Modular lattices, Characterization of Modular and Distributive lattices by their Sublattices, Distributive Sublattices of Modular Lattices.(Chapter 3, Sections 30-34 of the Text Book)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

Introduction to Lattice Theory, Gabor Szasz, Academic press

Reference Book:

1. "Lattice Theory", G. Birkhoff, Amer. Math. Soc.

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MSK – 804(A) : Discrete Mathematics

Learning Outcomes :

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

1. learn the applications of graph theory in other subjects.
2. understand representations of different problems by means of graphs.
3. learn the relation between bipartite graphs and odd cycles.
4. learn the concepts of forest, binary trees, eccentricity of a vertex and radius of connected graphs.
5. learn the importance of multi graphs in other subjects like physics and chemistry.
6. learn different characterizations of modular and distributive lattices.

UNIT- I **15 Hrs**

Basic Ideas, History, Initial Concepts, Summary, Connectivity , Elementary Results, Structure Based on Connectivity . (Chapters – 1 & 2 of Text Book 1)

Unit –II **15 Hrs**

Trees, Characterizations, Theorems on Trees, Tree Distances, Binary trees, Tree Enumeration, Spanning trees, Fundamental Cycles, Summary. 12 hours (Chapter – 3 of Text Book 1)

Unit – III **15 Hrs**

Traversability, Introduction, Eulerian Graphs, Hamiltonian Graphs, Minimal Spanning Trees, J.B.Kruskal's Algorithm, R.C.Prim's Algorithm. (Chapter 4 of Text Book 1 and Section 7.5 of Text Book 2) 12 hours

Unit –IV **15 Hrs**

Poset Definition, Properties of Posets, Lattice Definition, Properties of Lattices. 12 hours (Chapter 1-A of Text Book 3)

Unit –V **15 Hrs**

Definitions of Modular and Distributive Lattices and its Properties. 12 hours (Chapter 1-B of Text Book 3)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text books:

1. Graph Theory Applications by L.R.Foulds, Narosa Publishing House, New Delhi.
2. Discrete Mathematical Structures by Kolman and Busby and Sharen Ross, Prentic Hall of India – 2000, 3rd Edition
3. Applied Abstract Algebra by Rudolf Lidl and Gunter Pilz , Published by Springer-Verlag.

Reference Book :

A text Book of Discrete Mathematics by Harish Mittal, Vinay Kumar Goyal, Deepak Kumar Goyal, IK International Publishing House Pvt.Ltd, New Delhi.

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MSK – 804(B) : Graph Theory

Learning Outcomes :

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

1. Be familiar with the definitions and basic theory of graphs;;
2. Be able to implement standard algorithms of graph theory
3. Be able to prove simple results in graph theory.
4. Identify trees and obtain spanning trees of graphs.
5. Find Euler and Hamiltonian paths and circuits in a graph

UNIT I

An Introduction to Graph **15 Hrs**

The Definition of a Graph, Graph as Models, More Definitions, Vertex Degrees, Subgraphs.(Chapter 1, Section 1.1 to 1.5 of the Text Book)

UNIT II

Matrix Representation of graphs **15 Hrs**

Paths and cycles, The Matrix Representation of graphs, Fusion(Chapter 1, Section 1.6 to 1.8)
Trees and Connectivity: Definitions and Simple Properties, Bridges, Spanning Trees (Chapter 2, Section 2.1 to 2.3 of the Text Book)

UNIT III

Trees and Connectivity(Continuity) **15 Hrs**

Connector Problems, Shortest Path Problems, Cut Vertices and Connectivity (Chapter 2, Section 2.4 to 2.6 of the Text Book)

UNIT IV

Euler Tours and Hamiltonian Cycles **15 Hrs**

Euler Tours, The Chinses Postman Problem, Hamiltonian Graphs, The Travelling Sallesman Problem. (Chapter 3, Section 3.1 to 3.4 of the Text Book)

UNIT V **15 hrs**

Matching and Augmenting paths; The marriage problem; The personnel assignment problem; The optimal Assignment problem. (Chapter 4, Section 4.1 to 4.5 of the Text Book)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book :

1. John Clark & Derek Allan Holton, A first look at GRAPH THEORY, Allied Publishers Limited 1995.

Reference Books:

1. S.A.Choudham, A First Course in Graph Theory, Macmillan India Ltd.
2. Robin J.Wilson, Introduction to Graph Theory, Longman Group Ltd.
3. J.A.Bondy and U.S.R. Murthy, Graph Theory with Applications, Macmillon, Londo

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MSK – 805(A) : Operation Research

Learning Outcomes :

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

1. Study on LPP enables to arrive at an optimal decision/solutions in difficult decision making.
2. Study on LPP applied to problems pertaining to both profit making and low cost related real world situation.
3. Study on Post optimal analysis enables into manage and control resource allocation.
4. Study of Transportation problem and Assignment problem introduces to implementing simplex procedure for more variables using Modi method stepping stone method and hungary method
5. Study on games and strategies helps in decision making for problems with competitive situations like candidates for elections, marketing campaigns by different companies etc.

UNIT-I

Linear Programming: Simplex Method 15 Hrs

Introduction-Fundamental properties of solutions-The computational procedure-Use of artificial variables. 12 hours (Sections 4.1 to 4.4 of the Chapter 4 in the Prescribed Text Book.)

UNIT-II

Duality in Linear Programing 15Hrs

Introduction-General Primal-Dual pair-Formulating a Dual problem-Prime-Dual Pair in matrix form-Duality theorems-Complementary slackness theoremDuality and simplex method. 12 hours (Sections 5.1 to 5.7 of the Chapter 5 in the Prescribed Text Book.)

UNIT-III

Duality in Linear Programing 15Hrs

Economic Interpretation of Duality, Dual Simplex method Post-optimal Analysis : Introduction-Variation in the cost vector-Variation in the requirement vector-variation in the coefficient matrix-Structural variations- Applications of Post-optimal Analysis. 12 hours (Sections 5.8, 5.9 and 6.1 to 6.6 of the Chapters 5 and 6 in the Text Prescribed Book.)

UNIT-IV

Transportation Problem and Assignment Problem 15 Hrs

Introduction-General transportation problem-The transportation table-Solution of a transportation problem-Finding an initial basic feasible solution-Test for optimality-Degeneracy in Transportation problem-Transportation Algorithm (MODI Method)-Introduction -Mathematical formulation of the problem-The Assignment method-Special cases in Assignment problem-A typical Assignment problem. 12 hours (Sections 10.1 to 10.3 and 10.8 to 10.11 of the Chapter 10 in the Prescribed Text Book.) (Sections 11.1 to 11.5 of the Chapter 11 in the Prescribed Text Book.)

UNIT-V

Games and Strategies 15 Hrs

Introduction-Two-person zero-sum games-some basic terms-The maximin-minimaxprinciple-Games without saddle points-Mixed strategies-Graphic solution of 2xn and mx2 games. 12 hours (Sections 17.1 to 17.6 of the Chapter 17.)

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text Book:

1. Operations Research, Kanti Swarup, P.K. Gupta and Man Mohan Sultan Chand & Sons, New Delhi, 2006.

Reference Books:

1. Operations Research, An Introduction: Hamdy A Taha, Maxwell Macmillan International Edition, New York, 1992.

2. Operations Research Theory, methods and Applications, S.D. Sarma, kedar nath Ramnath publications, 2008.

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Semester-wise Revised Syllabus under CBCS 2020-21

Four Year – B.Sc. (Hons), Semester – VIII

Domain Subject: MATHEMATICS

MSK – 805(B) : Mathematical Modelling

Learning Outcomes:

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

1. understand concept of modelling and simulation
2. construct mathematical models of real world problems
3. solve the mathematical models using mathematical techniques

Unit–1

Mathematical Modelling 15 Hrs

Simple situations requiring mathematical modelling, characteristics of mathematical model.(Chapter 1 Sections 1.1-1.5 of the Text Book)

Unit – 2

Mathematical Modelling through ordinary differential equations of first order 15 Hrs Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models. (Chapter 2 Sections 2.1- 2.4 of the Text Book)

Unit – 3

Mathematical Modelling through system of Ordinary differential equations of first order 15 Hrs

Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected-susceptible(SIS) model, SIS model with constant number of carriers. Medicine : Model for Diabetes Mellitus. (Chapter 3 Sections 3.11, 3.12, 3.2 of the Text Book)

Unit – 4

Mathematical Modelling through difference equations Introduction to difference equations 15 Hrs

The need for mathematical modelling through difference equations : some simple models, basic theory of linear difference equations with constant coefficients (Chapter 5 Sections 5.1 and 5.2 of the Text Book)

Unit - 5

Mathematical Modelling through difference equations Introduction to difference equations(continued) 15 Hrs

Harrod Model, cobweb model application to Actuarial Science (Chapter 5 Sections 5.3 (5.3.3 not included))

Activities:

1. Assignments
2. Student Seminars and Guest Lecturers
3. Problem Solving Sessions

Text book:

J N Kapur, Mathematical Modelling, New Age International publishers.(2009)

Reference Books:

1. Barnes, B., Fulford, G. R. (2008). Mathematical Modelling with Case Studies, CRC Press.
2. Bender, E. A. (2012). An introduction to mathematical modelling. Courier Corporation.
3. Meerschaert, M. M. (2013). Mathematical Modelling, Academic Press.