GAUHATI UNIVERSITY
INSTITUTE OF DISTANCE AND OPEN LEARNING

Programme Project Report

PPR ID :GU/GUIDOL/PPR/06 *(Total no. pages : 7)*

Programme: Masters of Arts in Mathematics /Master of Science in Mathematics

1. Programme mission and objective:

The mission of the Programme to be launched is *"to cater to the need of higher education in mathematics and to widen the periphery of education and application in mathematics."*

Objectives of the Programme:

- *To promote higher education and research in the field of pure and applied Mathematics,*
- *To enhance and develop their knowledge and understanding on the theoretical and practical foundations of Mathematics as a subject.*
- *To nurture the finest talents in Mathematics and capacitate them with high level of professional competence,*
- *To create resources in the field of Mathematics to contribute in the different fields of applied science,*
- *To think critically and to aid in decision-making*
- *To generate competent and well-educated man-power for the teaching profession as well as manning positions of research associates in public/private sector academic and research institutions.*

2. Relevance of the programme with HEI's mission and goals:

Gauhati University was established in 1948 with a mission to revitalize educational leadership, to set the standard for the production and dissemination of knowledge as well as to become an effective instrument of change in the society. With this aim in view, the Department of Mathematics was established in 1948 and has set up, over the years, a close association with formal and informal organizations in the field of

14/10/2025
Registrar
Gauhati University, Guwahati-14

13/10/25
DIRECTOR
IDOL, GAUHATI UNIVERSITY

educationalresearch & development which give opportunity to the students to acquire practical knowledge and ideas.

Keeping in view the motto of "*Quality Higher Education For All"* Masters of Arts in Mathematics and Master of Science in Mathematics to be offered through ODL mode is very much relevant to the HEI's mission and goals as it aims to provide quality higher education in field of Mathematics to those aspiring candidates who are deprived of higher education due to the limited number of intake in the conventional mode of education in the Universities. Moreover, to keep the quality intact, the curriculum and syllabus is designed at par with the conventional mode, keeping in mind the specific needs and acceptability of the learners in the ODL mode and in keeping with the aims and objectives of the parent department.

3. **Nature and target group of learners:** Our target group includes-

- *Those deprived of admission in the parent department of regular mode due to limited intake capacity,*
- *Those employed in various organizations who desire to pursue higher education as a passion or as a mean for movement up the promotional ladder,*
- *Drop outs primarily due to social , financial and economic compulsions as well as demographic factors,*
- *Job seekers,*

Gauhati University also has a provision in the ODL mode for lateral entry for those who had to discontinue the regular programme after successful completion of the first two semesters due to unavoidable reasons. Acceptability of the lateral entry provision is an indicator of parity of the courses in regular and distance mode. The curriculum is designed to enable learners to fulfill their aims and objectives in a manner they deem fit and proper. The curriculum is designed by a committee comprising of experts from the Department of the University, external experts and teachers of Gauhati University Institute of Distance and Open Learning (GUIDOL), keeping in view the needs of the diverse group of learners.

4. **Appropriateness of the programme to be conducted in the ODL mode for acquiring specific skills and competence-** The programmes to be offered through ODL mode will have certain learning outcomes. The programmes will help the learners

- *To enhance and develop their knowledge and understanding on the theoreticaland practical foundations of Mathematics as a subject in particular*
- *To create the knowledge of basic and advance concept of mathematics with its application in its allied fields*
- *To build knowledge of the different analytical tools based on mathematical concepts for relating mathematics and application of mathematics in the different fields of science for scientific enhancement and support*
- *To commit to action that demonstrates care for others*

5. Instructional Design:

a) **Curriculum Design**: The curriculum is designed by a committee comprising of experts from the parent department of the University, GUIDOL, keeping in view the needs of the diverse group of learners. Apart from theoretical component, the syllabus emphasizes on practical exposure of students to different fundamental programming languages of Computer Science. This is included in the course content of this programme.

b) **Detailed Syllabus**: File containing detailed syllabus is attached as Enclosure-I

c) **Duration of the Program**: Minimum 2 (two) years. However, the learners are required to complete the programme within 4 (four) years from the date of admission.

d) **Instructional Delivery Mechanism:** The programme will be delivered in 4 (four) semesters having 5(five) courses/papers in each semester and also with the opportunity to choose optional courses offered. The learners will be provided with the printed/online SLMs which cover almost all the contents in the syllabus . Counselling sessions will be held in the headquarter and various affiliated study centres. Telephonic Counselling and providing online learning resources will also be a part of the instructional Delivery mechanism. In the current pandemic situation of COVID-19, more emphasis will be given to the teaching-learning through online mode. The progress of the learners will be evaluated by Internal Assessment and Term end/semester end exam. SLM covering Syllabus is attached as Enclosure-III

e) Faculty:

1. Dr. Chandra Lekha Mahanta, Associate Professor, Department of Mathematics, Gauhati University nominated as Coordinator of the ODL programmes in Mathematics

2. The post of Academic Consultant in Mathematics has been advertised and recruitment to the post will soon be done.

3. Resource persons drawn from amongst teachers of affiliated colleges and faculty staff of the Department of the University.

f) **Media**: Print Media, ICT enabled content and e-Learning resources

g) **Student Support Service**:In order to successfully execute the programme, the Institute has a wide range of support services. The various support services are listed as below-

i) **Network of Study Centres**: To assist its learners of the ODL mode the University has established 118 study centres throughout the State of Assam but within the territorial jurisdiction of Gauhati University.

ii) **State of the art Library** with around 7 thousand collections of materials which includes books, journals, magazines, CD and DVDs.

iii) **E- Learning Portal**: www.bodhidroom.net the first of its kind in the entire North Eastern region of India. Which provides the following services to the students:

- Online enrolment of students
- Independent Discussion Forum for every course
- Independent News Forum for every course
- Online interaction facility with faculty members
- Online interaction between the students making the scope of collaborative learning
- Interaction through chatting of all users of all courses who are online.
- Separate Chat Room for individual course
- **Message My Teacher:** When a student login to Bodhidroom, after enrolling himself/herself to a course, he/she will see the names of the virtual class teachers. Student can directly send offline messages to the teachers. When the teacher is logged on, he will receive an alert of incoming messages. Then he can reply to the message.
- Online Study Material
- Old Examination Question Papers

(iv) **Dynamic Website** Gauhati University has a dedicated dynamic website for ODL learners where one can get all the informations regarding its programmes, upcoming events, examination results etc.

v) **Computerised admission process with provision of online admissions**: The whole system of admissions and examinations are managed using professional software which gives instant online access to learners through www.idolgu.in .

vi) **Flexible Walk in Group Counselling(FWGC)**: Regular group and individual counselling will be held in the GUIDOL (headquarter) complex as well as in the parent department during all working days. Learners may walk-in to the designated GUIDOL counselling room and meet their teachers to clarify their doubts. In the current pandemic situation of COVID-19, online platform will be provided for the purpose mentioned above .

vii) **Personal Contact Programme(PCP)** :In addition to the Study Materials, useful Personal Contact Programmes will be held at various affiliated study centres, which will enable the students to clarify their confusions and ease their difficulty while going through it. Qualified faculty members of affiliated study centres will help out the attending students by providing necessary tips and guidelines during the interactive sessions. These sessions are also meant to give the students a chance to meet the teachers personally and discuss their problems. In the current pandemic situation of COVID-19, online platform will be provided for the purpose mentioned above .

viii)**Community FM Radio**: Gauhati University has its own Community radio station named as "Radio Luit 90.8 FM" and operates daily from 8AM to 8PM. The Community Radio station shall be extensively used to broadcast radio talks on various courses daily. The broadcast contents are designed as per the requirements by teaching staff of both the ODL Institute as well as the parent department. Experts are outsourced if the need arises.

6. Procedure for Admissions, Curriculum transaction and Evaluation-

Admission- The admission process shall start as per the UGC guidelines. In the current pandemic situation of COVID-19, the learner can take admission only through online admission process. The minimum eligibility for M.A.&M.Scprogramme in Mathematics is any graduate from any recognized Indian or Foreign university. The proposed fees for admission is Rs 7000.00(Seven Thousand only) per year. Financial Assistance is provided to the candidates belonging to SC/ST and OBC categories in the form of scholarship. A

few learners belonging to the economically deprived section as well as the physically challenged category are provided free ship on the recommendation of the Hon'ble Vice Chancellor.

Curriculum transaction- Activity Planner: The curriculum shall be transacted throughout the year as per the *Activity Planner* which is enclosed as Enclosure II.

Evaluation- Each course/paperwill carry 80% weightage for the term-end examinations and 20% for internal evaluation in the form of Home Assignments/internal examinations. In order to pass/clear a course/paper, a candidate must secure minimum 35% marks in each course/paper. All examinations are conducted by the Controller of Examinations as per Examination rules and regulations of Gauhati University.

7. **Library Resources**:The University has a State of the Art Central Library with rich collections of materials which includes books, journals, magazines, CD and DVDs, and is accessible to the ODL learners as well. Moreover, GUIDOL has its own Library where various books, journals and magazines are available.

   Gauhati University being a member of the UGC-Infonet Digital Library Consortium (http://www.inflibnet.ac.in/econ/index.php) which provides current as well as archival access to more than 5000 core and peer-reviewed journals and nine bibliographic databases from 23 publishers and aggregators in different disciplines. The ODL learners can access the e-resources of UGC-Infonet Digital Library Consortium from the Gauhati University campus.

8. **Estimated cost of the Programme**: total estimated cost of the programme is approximately Rs. 67.5 Lakhs which includes preparation and printing of SLMs, remuneration of the Resource persons, establishment cost and overheads. The estimate is evaluated considering the unit expenses of Rs.2.5 Lakhs per paper /1000 students for the entire duration of two years.

9. **Quality assurance Mechanism and Expected Programme outcome**:

   - **Quality assurance Mechanism: The** institute has a *Centre for Internal Quality Assurance (CIQA)* constituted by the statutory body of the HEI. Members of the Cell are drawn from among the Deans of the different Faculty, Heads of the respective departments, Executive Council members, administrative staff and teaching staff of

the institute. The Internal Quality Assurance Cell shall review the relevance and standard of the programme from time to time and make necessary changes in the syllabus and contents of the programme. The HEI shall continuously monitor the effectiveness of the program through *CIQA* and other statutory bodies.

- **Expected Programme outcome**: The expected programme outcome is reflected in the Course Benchmark Statement, which is stated as below-

***Course Benchmark Statement*:** Master's degree in the Mathematics shall be awarded to those learners who demonstrate:

- *Enhanced and developed knowledge and understanding on the theoretical and practical foundations of Mathematics as a subject in particular*
- *The knowledge of basic and advance concept of mathematics with its application in its allied fields*
- *The knowledge of the different analytical tools based on mathematical concepts for relating mathematics and application of mathematics in the different fields of science for scientific enhancement and support*
- *Commiment to action that demonstrates care for others*

ENCLOSURE-I

Syllabus (IDOL) for M.A/M.Sc in Mathematics.

The M.A/ M.Sc IDOL syllabus has been restructured for the semester system on the basis of the guidelines of the UGC. There are four semesters in two years; each semester comprising of five papers. In the third semester 3 papers are common to all and the other two papers are optional. In the 4th semester two papers are common and three papers are optional. Questions will be set from each unit, proper weightage will be given unit wise and marks from each unit are shown accordingly. In each paper there will be an internal assessment of 20 marks.

Semester I

Paper- M101: Real Analysis and Lebesgue Measure

Paper-M102: Topology

Paper-M103: Algebra

Paper-M104: Differential Equation.

Paper-M105: Tensor and Mechanics

Semester II

Paper- M201: Complex Analysis

Paper-M202: Functional Analysis

Paper-M203: Hydrodynamics

Paper-M204: Mathematical Methods.

Paper-M205: Operation Research

Semester III

Paper- M301: Computer Programming in C (theory and Practical)

Paper-M302: Number Theory

Paper-M303: Continuum Mechanics

Paper-M304 Algebra II/Space Dynamics

(Optional):

Paper-M305: Special Theory of Relativity /Mathematical Logic (Optional):

Semester IV

Paper- M401: Graph Theory

Paper-M402: Numerical Analysis

Paper-M403: Functional Analysis II/ Fluid Dynamics

Paper-M404: Mathematical Statistics /Dynamical System.

Paper-M405: Fuzzy Sets and their Applications/General Theory of Relativity and Cosmology.

Detailed Course Structure

Semester I

M101: Real Analysis and Lebesgue Measure

Unit 1: (Marks-20)

Uniform convergence at an interval. Cauchy's criterion. Test for uniform convergence. Properties of uniformly convergent sequences and series of functions. Uniform convergence and continuity. Integration, differentiation Weirstrass approximation theorem (Statement only) and its application. Uniqueness theorem for power series. Abel's and Taylor's theorem. Fundamental properties.

Unit 2: (Marks-20)

Function of bounded variation, continuity, Differentiation, their continuity and monotonicity. Definition and Existence of R-S integral, properties of R-S integral integration and differentiation, fundamental theorem of calculus.

Unit3: (Marks-20)

Lebesgue outer measure, Measurable sets and properties. Borel sets and their measurability characterization of measurable sets, Non-measurable sets, Measurable function, Properties, Operation of measurable function, sets of measure zero.

Unit 4: (Marks-20)

Lebesgue integral, Lebesgue integral of a bounded function, comparison of Riemann integral and Lebesgue integral. Integral of non negative measurable function, General Lebesgue integral. Convergence of Lebesgue integral, Bounded convergence theorem (statement only) Monotone Convergence theorem (statement only), Lebesgue Convergence theorem (statement only).

Books Recommended:

1. Malik and Arora: Mathematical Analysis, Narosa Publishing House, New Delhi.

2. L.Royden: Real analysis, Prentice Hall of India.
3. W.Rudin: Principles of mathematical Analysis, 3rd Edition, McGraw Hill
4. Jain and Gupta: Lebesgue Measure and integration, Willey Eastern Ltd

M102: Topology

Unit 1: (marks-20) Metric Space:

Convergence of sequences, completeness, Bair's theorem, continuous mappings, spaces of continuous function's Euclidean and unitary spaces.

Unit 2: (marks-10) Topological Space:

Continuity and homeomorphism, subspace, bases and sub bases. Weak topologies.

Unit 3: (marks-20) Compactness:

Compact spaces, product spaces, Tychonoff's theorem and locally compact spaces. Compactness for metric spaces, Ascoli's theorem.

Unit 4(marks-20) Separations:

TI-space and Hausdorff spaces, Completely regular spaces and normal spaces, Urysohn's lemma and Tietze extension theorem.

Unit 5: (marks-10) Connectedness:

Connected spaces, components of a space, totally disconnected spaces, locally connected spaces.

Books Recommended:

1. G.F Simmons.: Introduction to Topology and Modern Analysis, McGraw Hill
2. J.R.Munkers: Topology, A first course, Prentice Hall, India

M103: Algebra

Unit1: (marks-20)

Direct product and Direct sums of Groups, Decomposable groups, Normal and Subnormal series of groups, Composition series, Jordan Holder theorem, solvable groups.

Unit2: (marks-20)

Divisibility in Commutative rings, PID, UFD and their properties, Eisenstein's irreducibility criterion.

Unit3: (marks-20)

Field theory-Extension fields, Algebraic and Transcendental, Splitting field, perfect fields, Finite fields (Moore's theorem etc.). Construction by ruler and compass, elements of Galois theory.

Unit4: (marks-20)

Canonical forms, similarity of linear transformations, Invariant subspaces, Reduction to triangular forms, nilpotent transformations, index of nil potency, invariants of a nilpotent Transformation, Primary decomposition theorem, Jordan blocks and Jordan forms.

Books Recommended:

1. S.Singh and Zameruddin: Modern Algebra, Vikash Publication.
2. S. Lipschitz: Linear Algebra, Schaum's outline series.
3. Hoffman and Kunz: Linear Algebra, PHI.
4. I.N.Herstein: Topic in Algebra

M104: Differential Equation.

Unit1: (marks-20)

Solution of 2^{nd} order differential equations with variable coefficients including method of variation of parameters. Statement only Existence theorem of 1^{st} order equation, Statements of existence theorems for system of 1^{st} order equations and for nth order differential equations, Wronskian.

Unit2: (marks-20)

Method of series solution of 2nd order differential equations with particular reference to Legendre, Bessel and Gauss. Simultaneous differential equations and total differential equations.

Unit3: (marks-20)

Origin of partial differential equations of 1st order, Lagrange's method of solving 1st order linear partial differential equations. Particular solutions under various prescribed conditions. Linear homogeneous equations with more than two independent variables.

Unit4:(marks-20)

Charpit's method of solving non-linear 1st order partial differential equations. Complete Integrals. Standard forms of non-linear 1st order partial differential equations.

Books Recommended:

1. Theory and problems of differential equations-Frank Ayres Jr. Schaum's Outline Series,McGraw Hill.
2. M. D. Raisinghannia: Advance Differential Equations, S Chand & Co.
3. Gupta Malik and Mittal: Partial Diffrential Equation,Pragati Prakashan

M105: Tensors & Mechanics

Unit1: (marks-10)

Transformation of coordinates, summation convention, Kronecker delta, definition of tensors covariant, contra variant and mixed tensor, Cartesian tensors, rank of a tensor, symmetric and antisymmetric tensors, outer and inner product of tensors, contraction, quotient law. Riemannian space, metric tensor, fundamental tensors, associate tensors, magnitude of a vector, angle between two vectors Parametric curves.

Unit2: (marks-10)

Christoffel's three-index symbols (or brackets) and properties, covariant differentiation of tensors, divergence and curl of a vector and gradient of a scalar.
Intrinsic derivatives, curvature of a curve, parallel displacement of vectors.

Unit3: (marks-10)

Forces in three dimension and general conditions of equilibrium, Poinsot's central axis, wrench, cylindroids.

Unit4: (marks-10)

Virtual works, bending moments, equilibrium of slightly elastic beams, general equations of a bent rod, equations of three moments, work done in bending a rod.

Unit5: (marks-10)

Newton's laws and inertial frame of reference, general equations of motions, conservative force fields, general principle of conservation of energy, linear momentum and angular momentum.

Unit6: (marks-10)

Motion in two dimensions, motion under a central force with particular reference to inverse square law of force, Kepler's laws of planetary motions, two body problem, motion in resisting medium and motion when the mass varies.

Unit7: (marks-10)

Motion in three dimensions, velocity and acceleration in cylindrical and spherical polar coordinates, motion on cylindrical spherical and conical surfaces.

Unit8:(marks-10)

Revision of moments and general equations of motion of rigid body, motion in two dimensions under finite and impulsive forces, expression for K.E.; motion about a fixed axis.

Books Recommended:

Tensors:

1. Agarwal D.C.: Tensor Calculus of Riemainan geometry.

2. Ayers: Vectors and introduction to Tensor, Scaum's Outline Series, Tata McGraw Hill.

Mechanics:

1. Lamb: Statics , CUP
2. S. L Loney: Statics, CUP
3. A. S Ramsey: Statics, CUP, CBS Publishers & Distributors.
4. Tyagi, Nand and Sharma: Statics, Krishna Prakashan mandir
5. Chorlton: Text Books of dynamics, Van Nostrand
6. Goldstein: Classical mechanics, Addison Wesley.
7. Loney S.K.: Dynamics of a particle and of rigid bodies (CUP)
8. A. S Ramsey: Dyanamics PartII
9. Singe and Griffith: Principles of mechanics, McGraw Hill
10. Spiegel M: Dynamics Part II, Scaum's Outline Series, Tata McGraw Hill.

M201Complex Analysis

Unit1:(Marks-20)

Analytic functions: The Cauchy Riemann equations, harmonic functions, elementary functions many valued functions.

Analytic functions as mappings: Isogonal and conformal Transormations. Bilinear transformations: geometrical inversion, coaxial circles, invariance of the cross-ratio. Fixed points of a bilinear transformation; some special bilinear transformations, e.g. real axis on itself, unit circle on itself, real axis on the unit circle etc.

Branch point and branch lines, concept of the Riemann Surface.

Unit2: (Marks -20)

Complex Integration

Integral along oriented curve, Cauchy's theorem, the Cauchy-Goursat theorem; Cauchy's integral and functions defined by integrals, the derivatives of a regular function; Morera's theorem, Cauchy's inequality, Liouville's theorem; Maximum modulus principle.

Unit3: (Marks -20)

Power series:

Taylor's and Laurent's theorem: Zeros and singularities, their classification, poles and zeros of meromorphic functions.

The argument theorem, "Rouche's theorem, location of roots of equations.

Unit4: (Marks-20)

The Calculus of Residues:

The residue theorem: evaluation of integrals by contour integration, special theorems used in evaluating integrals.

Books Recommended:

1. Phillips E.C.: Function of a Complex Variable, Oliver and Boyd.
2. Shanti Narayan : theory of Functions of a complex Variables, S. Chand and Co.
3. Spiegel Murry R: Theory and Problems of Complex variables, Schaum's Outline Series TMH.

M202 Functional Analysis

Unit1: (Marks -20)

Banach Space: Definitions and some examples, Basic properties, continuous linear transformation, finite demensional normed linear spaces.

Unit2:(Marks-20)

Hahn-Banach theorem, natural embedding of NLS*, open mapping theorem, closed graph theorem, Banach Steinhaus theorem, conjugate of an operator.

Unit3:(Marks-20)

Hilbert Spaces: Definition and simple properties, orthogonal complement, orthogonal sets, conjugate space H*, adjoint of an operator, self adjoint of an operator, normal and unitary operator, projection.

Unit4:(Marks-20)

Finite-dimensional spectral Theory: Spectrum of an operator, spectral theorem.

Books recommended:

1. Simmons G.F.: Introduction to Topology and Modern Analysis, McGraw Hill/ Megginson.
2. Lahiri, B.K.: Functional Analysis, the World Press Pvt. Ltd, Calcutta.
3. Limaye, B.V.: Functionla Analysis, New Age Publication.

M203 Hydrodynamics

Unit 1 (Marks-20): Kinematics of fluid motion: Path lines stream lines equations of continuity, equation of motion and their integrals, boundary conditions . Impulsive motions. Analysis of fluid motion and general theory of irrotational motion.

Unit 2 (Marks-20):Motion in a plane: Use of Complex potential. Source. Sink, Doublet. Method of images. The Circle theorem. The theorem of Blasius. Motion past circular cylinder.

Unit3:(Marks-20): Motion in space: Motion past a sphere axisymmetric motion. Stokes stream function and its use.

Unit 4(Marks-20): Vortex motion : Properties of vortex filament motion due to rectilinear vortex and a system of vortices motion of a vortex filament due to the influence of others. Ranking vortex.

Books recommended:

.

1. W.H.Besant and A.S. Ramsay: A Treatise on Hydromechanics. Part II. CBS Publishers. Delhi.
2. Frank Chorlton: Text Book of Fluid Dynamics- C.B.S Publishers. Delhi.
3. G.K.Batchelor: An Introduction to Fluid Mechanics, Foundation Books. New Delhi.
4. M.D. Raisinghania: Hydrodynamics- S. Chand and Co. Limited.

M204: Mathematical Methods

Unit1: (Marks-20): Laplace Transform: Basic properties of Laplace Transform, Convolution theorem and properties of convolution, Inverse Laplace Transform, Application of Laplace Transform to the solution of differential equation. Evaluation of definite integrals.

Unit2: (Marks-20): **Fourier Transform:** Fourier Integral Transform. Properties of Fourier Transform, Fourier sine and cosine transform, Application of Fourier Transform to differential equation. Evaluation of definite integrals.

Unit3 (Marks-20): Fredholm Integral Equations: Definition of Integral equation, Eigen values and Eigen functions: Reduction to a system of algebraic equations, Reduction of ordinary differential equation into integral equation. Fredholm integral equations with separable kernals, Method of successive approximations, Iterative scheme for Fredholm Intergral equation of second kind.

Unit4 (Marks-20): Voltera Integral Equations: Voltera Integral equations of second kind, Resolvent kernel of Voltera equation and its result, Application of iterative scheme to Voltera integral equation of the second kind. Convolution type kernals.

Books recommended:

1. S. G. Mikhlin: Linear Integral Equations, (Translated from Russian), Hindustan Book Agency, 1960.
2. Raisinghania: Integral Transforms, S. Chand & Co.

3. M.R. Spiegel: Theory and Problems of Laplace transforms, Schaum's outline series.

M205 Operations Research

Unit-1 (Marks-10): History and Development of Operations Research. Operations Research and its Scope Necessity of Operations Research in Industry and Management. General idea of queuing problem-Markovian and non Markovian queues. Queuing theory and its operating characteristics, queuing model-M/M/1, M/M/K. General equations of the models.

Unit-2 (Marks-10): Simulation: Theory of simulation. Monte Carlo method, applications to the problems of replacement and maintenance inventory, queuing and financial problems.

Unit-3 (Marks-20): Linear Programming: Simplex method. Theory of the simplex Method, Duality and Sensitivity Analysis. Other Algorithms for Linear Programming, Dual Simplex Method. Integer programming-Branch and Bound technique. Conceept of cutting plane. Gomory's all integer cutting plane method.
Applications to Industrial Problems:- Optimal product mix and activity levels. Petroleum refinery operations Blending problems. Economic interpretation of dual linear programming problems. Input-output analysis.

Unit-4: (Marks-10): Transportation and Assignment Problems.

Unit-5: (Marks-10): Network Analysis - Shortest Path Problem. Minimum Spanning Tree Problem. Maximum Flow Problem, Minimum Cost Flow Problem. Network simplex Method. Project Planning and Control with PERT- CPM.

Unit 6: **(Marks-20): Nonlinear Programming:** One and Multi-Unconstrained Optimization. Kuhn-Tucker Conditions for Constrained Optimization. Quardratic Programming. Separable Programming Convex Programming Non-convex Programming.

Books recommended:

1. Kanti Swarup.P.K. Gupta and Manmohan: Operations Research. S.Chand and Co.
2. . H.A.Taha.Operations Research: An introduction. Macmillan Publishing Co. Inc. New York.
3. FS Hillier and GJLiberman: Introduction to Operations Research (Sixth Edition). McGraw Hill International Edition. Industrial Engineering Series. 1995 (This book comes with a CD containing tutuorial software)
4. P.K.Gupta and D.S. Hira: Operations Research-An Introduction S.Chand and Co.

M301 Computer Programming in C

Unit 1. (Marks- 20): An Overview of Programming: The basic model of computation, Algorithms, Flow charts, programming languages, compilation, linking and loading, efficiency and analysis of algorithms.

C Essentials: Character set, variables and identifiers, built in data types, operators and expressions, constants, type conversions, basic input/put operations, anatomy of a C program.

Unit 2. (marks-20): Control Flow: Conditional branching, The switch statement, looping, nested loops, the break and continue statements, the goto statement, infinite loops.

Unit 3. (marks-20): Arrays, Pointers and Functions: Declaration, initialization, pointer arithmetic. Basics of functions, passing arguments, declaration and calls, return values.

SAMPLE PROGRAMS FOR PRACTICAL (MARKS-20)

To evaluate an arithmetic expression. To find GCD, Factorial. Fibonacci series. Prime number generation. Reversing digits of an integer. Finding square root of a number. To find the roots of a quadratic equation. To find the greatest and smallest of a finite set of numbers. To find the sum of different algebraic and trigonometric series. Addition, subtraction and multiplication of matrices.

Books recommended:

1. Rajaraman V.: Computer Oriented Numerical methods, Prentice Hall of India, New Delhi.
2. Balaguruswamy E.: ANSIC.
3. Kernighan W. and Ritchie D.K.: The C programming Language, PHI.

M302 Number theory

Unit 1. (Marks-20): Divisibility and the primes: Principle of mathematical induction, least common multiple, greatest common divisor. Euclidean algorithm, prime numbers, unique factorization theorem)

Unit 2. (Marks-20): Congruences: Operations of congruences, Residue sets mod m, Euler's theorem, order of a mod m, linear congruences, the theorems of Fermat and Wilson, The Chinese Reminder theorem, Polynomial congruences.

Unit 3. (Marks-20): Quardratic Residues: Primitive roots, Indices, quardratic residuce mod m, Euler's criterion, The Legendre sybmbol, The law of quadratic reciprocity. The Jacobi symbol.

Unit 4. (Marks-20): Arithmetic functions and some Diophantine equations: Multiplicative Arithmetic functions, τ and σ functions, Mobius function, Euler's function, The inversion formula. Linear Diophantine equations, equations of the form $x^2+y^2=z^2$, related equations, Representation of a number by sum of two or four squares.

Books recommended:

1. Burton D.M.: Elementary Number Theory, Universal Book stall, New Delhi.
2. K. C. Chowdhury: A first course in theory of numbers, Asian Books Pvt. Ltd.
3. S. B. Malik: Vikash Publishing House Pvt. Ltd.: Basic Number Theory

M303Continuum Mechanics

Unit 1. (Marks-20): Analysis of Stress: The continuum concept. Homogeneity isotropy mass density. Cauchy's stress principle. Stress tensor. Equations of equilibrium. Stress quaric of Cauchy. Principal stresses. Stress invariants. Deviator and spherical stress tensors.

Unit 2. (Marks-20): Analysis of Strain: Lagrangian and Eularian descriptions. Deformation tensors. Finite strain tensor. Small deformation theory. Linear strain tensors and physical interpretation. Stress ratio and finite strain interpretation strain quardric of Cauchy. Principal strains. Strain invariants. Spherical and Deviator strain components. Equations of Compatibility.

Unit 3. (Marks-20): Motion: Material derivatives, path lines and stream lines. Rate of deformation and Vorticity with their physical interpretation. Material derivatives of volume. Surface and line elements. Volume, surface and line integrals. Fundamental laws of continuum Mechanics.

Unit 4. (Marks-20): Constitutive equations of Continuum Mechanics: Linear elasticity. Generalized Hook's Law. Strain energy function. Elastic constants for isotropic homogeneous materials. Elaststatic and Elastodynamic problems.
Fluids: Viscous Stress tensor. Barotropic flow : Stokesian fluids. Newtonian fluids. Navier stokes equations. Irrotational flow. Perfect fluids. Bernoulis equation. Circulation.

Books recommended:

1. G. E. Mase: Continuum Mechanics - Schaum's outline series. McGraw Hill Book Company.
2. R. Chatterjee: Mathematical Theory of Continuum Mechanics- Narosa Publishing House. New Delhi.

M304 Algebra II

(Optional):

Unit 1. (Marks-20): Posets and lattices, Modular, Distributive lattices, Direct product (sum) of an infinite family of groups. Structure theorems for finitely generated abelian groupsUnit 2: Sylow's theorem and its applications.

Unit 2. (Marks-20): Free abelian groups, free groups, free products of groups, representation of a group.

Unit 3. (Marks-20): Modules, submodules, Direct product and direct sum of modules, prime ideals in commutative rings, complete ring of quotients of a commutative rings.

Unit 4. (Marks-20): Primitive rings, Radical, completely reducible module and rings, Artinian and Noetherian rings and modules.

Books recommended:

1. V.K. Sarma: Lattices and Boolean Algebra- Vikas Publ House.

2. Singh and Zameeruddin: Modern Algebra- Vikas Publ House
3. B. Chandler: Group Theory, Schaum's Series
4. Bhattacharyya, Jain and Nagpaul: Basic Abstract Algebra- CUP, 1997

M304 Space Dynamics

(Optional)

Unit 1. (Marks-20): Basic formulae of a spherical triangle-The Two-body problem: The motion of the centre of mass . The relative motion. Kepler's equation. Solution by Hamilton Jacobi Theory. The Determination of Orbits: Laplace's Gauss Methods.

Unit 2. (Marks-20): The Three Body problem: General Three Body Problem. Restricted Three Body Problem. Jacobi integral. Curves of zero velocity. Stationary solutions and their stability. The n-body problem: The motion of the centre of Mass. Calssical integrals.

Unit 3. (Marks-20): Perturbation : Osculating orbit, perturbing forces. Secular and Periodie perturbations, Lagrange's planetary Equations on terms of perturbing forces and in terms of perturbed Hamiltonian. Motion of the moon-The perturbing forces. Perturbation of Keplerian elements of the moon by the sun.

Unit 4. (Marks-20): Flight Mechanics: Rocket performance in a vacuum, vertically ascending paths. Gravity twin trajectories. Multi-stage rocket in a vacuum. Definitions pertinent to single stage rocket. Performance limitations of single stage rockets. Definitions pertinent to multi stage rockets. Analysis of multi-stage rockets neglecting gravity. Analysis of multi-stage rockets including gravity.

Books recommended:

1. J.M.A.Danby: Fundamentals of Celestial Mechanics. The Macmillan Company. 1962
2. E. Finaly, Freundlich. Clestial Mechanics. The Macmillan Company. 1958

3. Ralph Deutsch. Orbital Dynamics of Space Vehicles. Prentice Hall INC. Engle Wood Cliff. New Jersey 1963.
4. Theodre E. Sterne: An Introduction of Clestial Mechanics. Intersciences Publishers. INC 1960-
5. Angelo Miele: Flight Mechanics Vol 1. Theory of flight paths. Addision Wiley Publishing Company INC.1962.

M305: Special Theory of Relativity

(Optional)

Unit 1. (Marks-16): Inertial and non-inertial frames, Geometry of Newtonian mechanics, Galilean Transformations, Back-ground of the fundamental postulates of the special theory of relativity, Lorentz transformation. Relativistic concept of space and time and relativity of motion, Geometrical interpretation of Lorentz transformation as a rotation. Lorentz transformation as a group.

Unit 2. (Marks-16): Relativistic addition law of velocities and its interpretation in terms of Robb's rapidity, Invariance of speed of light, consequences of Lorentz transformation e.g. (I) Lorentz Fitzgerald contraction (ii) Time dilation (iii) Simultaneity of events, Proper length and proper time, Application in problems. Transformation of acceleration

Unit-3. (Marks-16): Relativistic mechnics. Variation of mass with velocity, Transformation of mass, force and density Equivalence of mass and energy, Transformation of momentum and energy, Energy momentum vector. Applications in problems, Relativistic Lagrangian and Hamiltonian.

Unit-4. (Marks-16)

Minkowski's space, Geometircal representation of simultaneity, Contraction and dilation, space like and time like intervals, position. Four vectors, Four velocity, Four forces and Four momentums, Relativistic equations of motion, Covariant four-dimensional formulation of the laws of mechanics.

Unit-5. (Marks-16): Electrodynamics: Fundamentals of electrodynamics, Transformation of differential operators, D' Alembert operator, Drivation of Maxwell's equation, Electromagnetic potentials and Lorentz condition, Lorentz face, Lorentz transformations of space and time in four-vector form, Transformations of charge and current density,. Invariance of Maxwell's equations, Transformation equations of electric field strength and magnetic field induction components, Invariance of E^2-$H^2$and E.H.

Books recommended:

1. Robert Resnick: Introduction to special Relativity, Wiley Eastern Lt. (1990)
2. A S Eddington: The Mathematical Theory of relativity, Cambridge University Press 1965
3. Satya Prakash: Relativistic Mechanics (Theory of Relativity) Pragati Prakashan, 2000

M305 Mathematical Logic (Optional)

Unit1. (Marks-16): Informal statement calculus: Statements and connectives, truth functions and truth-tables, normal forms, adequate sets of connectives, arguments and validity.

Unit 2. (Marks-16): Formal statement calculus: Formal definitions of Proof. Theorem and Deduction the formal theory L of statement calculus the deduction theorem and its converse.

Unit 3. (Marks-16): Adequacy theorem for 1: Valuation in L. tautology in L. the Soundness theorem. Extensions of L. consistency of an extension the adequacy theorem of L.

Unit 4. (Marks-16): Informal predicate Calculus: Symbolism of predicate calculus. First order language interpretation truth values of well-formed formulas satisfaction

and truth. Formal Predicate Calculus: Predicate Calculus as a formal theory the adequacy theorem of K.

Unit 5. (Marks-16): Mathematical Systems: First order systems with equality the theory of groups first order arithmetic formal set theory consistency and models.

Books recommended:

1. A.G. Hamilton: Logic for Mathematics
2. Elliot Mendelson: Introduction of Mathematical Logic.

M401: Graph theory

Unit 1. (Marks-20): Graphs, subgraphs, walk, paths, cycles and components, intersection of graphs, Degrees, Degree sequence. Trees, spanning tree, cycles, cocycles. Cycle space. Cocycle space, connectivity, cut vertices, cut edges, blocks., connectivity parameters, Menger's theorems.

Unit 2. (Marks-20): Eulerian and Traversible graphs: Characterization theorems, characterization attempts for Hamiltonian graphs, two necessary and sufficient conditions of a graph to be Hamiltonian, Factorizations, Basic concepts, 1-factorizat5ion, 2- factorization, coverings, critical points, and lines.

Unit 3. (Marks-20) : Planarity: Subdivision of graph, identification of vertices, plane and planar graph, outer planar graph, Euler's polyhedron formula, Kuratowski's theorems, Genus, thickness, coarseness and crossing number of a graph.

Unit 4. (Marks-20): Algebraic graph theory: Adjacency matrix and spectrum of graphs, vertex, partition and the spectrum.

Books recommended:

1. Harary: Graph Theory, NAROSA Publishing Co.
2. N. Biggs: Algebraic Graph Theory, CUP

3. Godsil Springer: Algebraic Graph Theory..

M402: Numerical Analysis

Unit1. (marks-20): Interpolation formulae: Newtons's forward interpolation formula, Newton's backword interpolation formula, Newton's divided difference interpolation formula, Lagrange's interpolation formula, Gauss forward interpolation formula, Gauss backword interpolation formula, Stirling's formula, Bessel's formula.

Unit 2. (marks-20):Numerical Differentiation and Integration Numerical Differentiation and Integration, Simpson's rule, Weddle's central difference formula, quadrature formula, Gauss's quadrature formula, Euler's formula for summation and quadrature.

Unit 3. (marks-20): Solution of Algebraic and Transcendental Equations: Numerical Solutions of Algebraic and Transcendental Equations, Solutions by the method of iteration and the Newton-Raphson method, cases of repeated roots.

Unit 4. Linear Equations: (marks-20): Direct method for solving systems of linear equations (Gauss Elimination, LU decomposition, Cholesky decomposition), iterative methods (Jacobi, Gauss-Seidel, Relaxation methods).

Books recommended:

1. Householder A.S.: Principles of Numbrical Analysis, McGraw Hill, New York.
2. Jain M.K.: Numerical Analysis for scientists and Engineers, S.Publishers.
3. Kung: Numerical Analysis, McGraw Hill Book Co.
4. Niyogi P. : Numerical Analysis and Algorithms, Tata McGraw Hill
5. Rajaraman V.: Computer Oriented Numerical methods, Prentice Hall of India, New Delhi.

M403: Fluid Dynamics

(Optional)

Unit 1(Marks-20): Waves: Long wave and surface wave stationary wave. Energy of the waves. Waves between different media. Group velocity, Dynamical significance of Group velocity. Surface tension and Capillary waves. Effect of Surface tension in water waves.

Unit 2 (Marks-20): Viscous fluid motion: Navier-Stokes equation of motion rate of change of vorticity and circulation rate of dissipation of energy. Diffusion of a viscous filament.

Unit 3 (Marks-20): Exact solution of Navier Stokes Equation: Flow between plates. Flow through a pipe (circular elliptic). Suddenly accelerated plane wall. Flow near an Oscillating flat plate. Circular motion through cylinders.
Stoke's linearization process. Flow past a sphere. Whitehead paradox and Stoke's paradox. Oseen's approximation.

Unit 4 (Marks-20): Laminar Boundary Layer Theory: General outline of Boundary layer flow. Boundary layer thickness. Displacement thickness. Energy thickness. Flow along a flat plate at zero incidence . Similarity solution and Blasius solution for flow about a flat plate.
Karman's momentum integral equation. Energy integral equation. Pohlhausen solution of momentum integral equation.

Books recommended:

1. I.M.Milne Thomson: Theoretical Hydrodynamics: McMillan Company.
2. S.Goldstein Modern development of Fluid Dynamics. Vol-1. Dover publication. New York.
3. G.K.Batchelor: An Introduction to Fluid Dynamics.
4. M. D. Raisighania: Fluid Dynamics: S. Chand.

M403: Functional Analysis II (Optional)

Unit-1. (Marks-10): Vector topologies: Examples First properties Mazur's and Eidelheit's separation theorems Metrizable vector topologies.

Unit-2. (Marks-15):

The Open Mapping Theorem: The closed graph Theorem and the uniform Boundedness Principle for F-spaces. Topologies induced by families of functions. Weak and Weak* topologies. Compactness. Adjoint operator . Projection and complementation.

Unit-3. (Marks-15): Convexity: The Hahn- Banach theorem for locally convex spaces. The Banach Alauglu Theorem for topological vector spaces. Krein-Milman theorem.

Unit-4. (Marks-15): Definition of Banach Algebra and Examples Singluar and Non singular elements. The Abstract index. The spectrum of an element. Gelfand Formula. Multiplicative. Linear Function. And the maximal ideal space. Gleason Kahane Zelazko Theorem.

Unit-5. (Marks-15): The Gelfand Transforms. The spectral Mapping Theorem. Isomentric Gelfand Tranform. Maximal ideal spaces for Dise Algebra and the Algebra.

Unit-6. (Marks-10): (C* algebras-Definition and Examples, Self Adjoint. Unitary normed positive and projection elements in (C*-algebras, Commutative (·C*-algebras. (C*-Homomorphisms. Representation of Commutative (·C*- algebras. Subalgebras and the spectrum. The spectrum theorem. The Continuous functional Calculus . Positive linear functionals and slates in (C*- Algebras, The GNS Construction.

Books recommended:

1. Megginson Robert E: An introduction to Banach space theory. Springer verlag.
2. W. Rudin: Functional Analysis Tata McGraw Hills.

M404: Mathematical statistics

Unit1. (marks-16): Probability: Mathematical and statistical definitions. Discrete Samplespace, Axiomatic approach, Theorems of Total and Compound probability, Repeated Trials, Baye's theorem. Random Variable and its distribution, Mathematical Expectaions, Expectation of sum and product of random variables, Expectation of functions of random variables. Distribution of more than one random variables. Tshebysheff's lemma. Weak law of large numbers. Theorems of Markoff and Khintchine, Bernouilli's and Poisson's theorems. Characteristic function. Probability generating unctions, Central limit theorem.

Unit2. (marks-16): Binomial distribution, Poisson, distribution, Normal distribution, Hypergeometric distribution, Multinomial distributions, Beta and Gamma distribution, Pearsonia system of vurves, derivation of the differential equations and its solutions yielding curves of types, I,II,III and IV. Bivariate Normal distribution. Regression and Correlation (including Multiple, partial and Interclass correlation)

Unit3. (marks-16): Principle of least squares of curve fitting (including orthogonal polynomials).

Unit4. (marks-16): Theory of sampling: Random and simple, random sampling, idea of sampling distribution, large sample test, Exact sampling distribution – and T,F,Z and χ^2(with derivations) and associated tests of significance.

Unit5. (marks-16): Estimation: Requirement of a good estimator, Method of maximum likelihood (including Cramer-Rao inequality)

Books Recommended:

1. J.V. Uspensky: An Introduction to Mathematical Probability3.
2. Elderton: Correlation and Frequency curves.
3. Ferzen: Modern Probability and its Application.
4. S. C. Gupta and V. K. Kapur: Fundamentals of Mathematical Statistics, Sultan Chand & Sons Publishers (1983)

5. S. C. Gupta and V. K. Kapur: Fundamentals of Applied Statistics, Sultan Chand & Sons Publishers (1983)
6. J. Medhi: Statistical Methods: An Introductory text, New Age Int. Publishers (2006).
7. Daroga Singh and F. S. Chaudhury: Theory and Analysis to Sample survey and designs, Wiley Eastern LTD (1986).

M404: Dynamical systems and Fractal Geometry

Unit1. (Marks-10): Nonlinear oscillators-Conservative system. Hamiltonian system. Various types of Oscillators in nonlinear system. Solutions of nonlinear differential equations.

Unit2. (Marks-10): Orbit of a map, fixed point, equilibrium point, periodic point, circular map, configuration space and phase space.
Origin of bifurcation, Stability of a fixed point, equilibrium point, Concept of limit cycle and torus.

Unit3. (Marks-10): Hyperbolicity, Quadratic map. Period doubling phenomenon, Feigenbaum's Universal constant.

Unit4. (Marks-10): Turning point, transcritical, pitch fork, Hopfbifurcation.
Phenemenon of losing stability, Quasiperiodic motion. Topological study of nonlinear differential equations, Poincare map.

Unit5. (Marks-10): Randomness of orbits of a dynamical system. Chaos. Starange attractors. Various roots to chaos. Onset mechanism of turbulence.

Unit6. (Marks-15): Construction of the middle third Cantor set, Von Koch Curve, Sierpinski gasket, self similar fractals with different similarity ratio, Julia Set, measure and mass distribution. Hausdorff measure, scaling property, effect of general transformations on Hausdorff measure, Hausdorff dimension and its properties, s-sets, calculation of Hausdorff dimension and its properties, s-sets, calculation of Housdorff dimension in simple cases.

Unit7. (Marks-15):: UnitMeasurement of a set at scale d, box dimension, its equivalent versions, properties of box dimension, box dimension of middle third cantor set and other simple sets, some other definitions of dimension, upper estimate of box dimension, mass distribution principle, generalized cantor set and its dimension.

Books Recommended:

1. Robert C. Hilborn: Non linear Dynamics and Chaos
2. D.K. Arrowsmith: Introduction to dynamical systems, Cambridge University press, 1990.
3. Robert L Devany: An introduction to Chaotic Dynamical Systems, Addision-Wesley Publishing Co. Inc.1989
4. M.F. Barnsley: Fractals everywhere, A.P. 1988
5. K.J.Falconer: The Geometry of Fractal sets, Cambridge University Press, 1985

M405 General Theory of Relativity and Cosmology (Optional)

Unit1. (Marks-20): Geodesics, Derivation of the equation of geodesics, Geodesic co-ordinates, intrinsic derivatives, First Curvature, Parallel transport, parallel vectors. Related theorems of intrinsic derivatives and parallel displacement.

Unit 2. (Marks-15): Riemann Christoffel Curvature tensors and their properties, Riciitensor, Bianchi identities, Einstein tensor Divergence of Einstein tensor, Condition of Flat Space, Riemann Curvature.

Unit 3. (Marks-15): Theory of gravitation, principle of covariance and equivalence, geodesic principle, Simple consequences of the principle of equivalence (i) the equality of inertial and gravitational masses(ii) effect of gravitational potential on the rate of a clock, (iii) The clock paradox, the energy momentum tensor, Energy momentum tensor in case of a perfect fluid, conservation of energy and Momentum.

Unit 4. (Marks-15): The gravitational fluid in empty space in presence of matter and energy. Newtonian equation of motion as an approximation of geodesic equations, . Poission's equation as an approximation of Einstein field equation, Schwarzschid exterior solution and its isotropic form, planertry orbits and analogues of Kepler's laws in general relativity. Relation between M and m, Isotropic co-ordinates. The three crucial' tests (i) The advancee of perihelion (ii) Bending of light rays in a gravitational field (iii) Gravitational red-shift in spectral lines. Schawarzachid interior solutions., Boundary conditions.

Unit 5. (Marks-15): Cosmology, Mach principle, Einstein modified field equations with cosmological term, Static cosmological models of Einstein and de-sitter, their derivations, properties and comparision with the actural universe. Huble's Law, cosmological principles, Wely's postulates. Non-static cosmological models. Derivation of Robertson": Walker metric, Redshift, Redshift versus distance relation Angular size versus red: shift relation and source counts in R.W space time.

Books Recommended:

1. A.S. Eddington: The Mathematical Theory of Relativity, Cambridge Univesity Press-1965.
2. B.F. Shutz: A First course in general relativity, Cambridge University Press, 1990.
3. C.Moller: The Theory of Relativity.
4. G.,E. Weatherburn: An Introduction to Riemannian Geometry and Tensor Calculus, Cambridge University Press, 1950.

M 405: Fuzzy Sets and their application (Optional)

Unit 1. (Marks-10): Fuzzy sets: Basic Definitions. α-level sets. Convex fuzzy sets. Basic operations on Fuzzy sets. Types of Fuzzy sets. Cartesian products. Algebraic products Bounded sum and difference. T-conoroms.

Unit-2. (Marks-10): Extension Principle: the Zadeh extension principle Image and inverse image of fuzzy sets. Fuzzy numbers. Elements of Fuzzy Arithmetic.

Unit-3. (Marks-10): Fuzzy relations and Fuzzy Graphs: Fuzzy relations and fuzzy sets. Composition of Fuzzy relations. Min-max composition and its properties. Fuzzy equivalence relations. Fuzzy compatiability relations. Fuzzy relation equations. Fuzzy graphs, Similarity relation.

Unit-4. (Marks-10): Possibility Theory: Fuzzy measures. Evidence theory. Necessity measure. Probability measure. Possiblity distribution. Possibility theory and fuzzy sets. Possibility theory versus probability theory.

Unit-5. (Marks-10): Fuzzy Logic: An overview of classical logic. Multivalued logic. Fuzzy propositions. Fuzzy quantifiers. Linguistic variable and hedges. Inference from conditonal fuzzy propositions, the compositional rule of inference. Appliction in Civil, Mechanical and Industrial Engineering.

Unit-6. (Marks-10): Approximate reasoning: An overview of fuzzy expert system . Fuzzy implications and their selection. Multiconditional approximate reasoning. The role of fuzzy relation equation.

Unit-7. (Marks-10): Introduction to fuzzy control: Fuzzy controllers. Fuzzy rule base. Fuzzy inference engine. Fuzzification. Defuzzification and the various Defuzzification methods (the centre of area, the centre of maxima and the mean of maxima methods). Introduction of Fuzzy Neural Network, Autometa and Dynamical Systems.

Unit-8. (Marks-10): Decision making in Fuzzy environment: Individual decision making. Multiperson decision makding. Multicriteria decision making. Multi stage decision making. Fuzzy ranking methods. Fuzzy linear programming . Application in Medicine and Economics.

Books Recommended:

1. G.J.Klir and B. Yuan: Fuzzy sets and Fuzzy Logic, Theory and Applications, Prentiee Hall of India, 1995.

2. H.J.Zimmermann: Fuzzy set theory and its application, Allied Publishers Ltd. 1991.

Enclosure: II

ACTIVITY PLANNER
Gauhati University Institute of Distance and Open Learning
Guwahati- 781014, Assam

ADMISSION			
SEMESTER (TRADITIONAL PROGRAMMES)			
A	1	Fresh	July-September
	2	Continuation	July-September
SEMESTER (IT PROGRAMMES)			
B	1	Fresh	July-September
	2	Continuation	Odd Semester (July-September)
			Even Semester (January-February)
ADMISSION TEST FOR M.Sc. IT PROGRAMME			
C	August		
ANNUAL PROGRAMMES			
D	1	Fresh	July-September
	2	Continuation	July- September
DISTRIBUTION OF SLM			
SEMESTER/ANNUAL (TRADITIONAL PROGRAMMES)			
A	1	Fresh	July-September
	2	Continuation	July-September
SEMESTER (IT PROGRAMMES)			
B	1	Odd Semester	July-September
	2	Even Semester	January-February
CONTACT CLASSES			
SEMESTER (TRADITIONAL PROGRAMMES)			
A	1	Odd Semester	September-December
	2	Even Semester	March-June
SEMESTER (IT PROGRAMMES)			
B	1	Odd Semester	September-December
	2	Even Semester	March-June
ANNUAL PROGRAMMES			
C	1	Previous/Final	December-May
EXAMINATION : TERM END			
SEMESTER (TRADITIONAL/IT PROGRAMMES)			
A	1	Odd Semester	February-March (All Sundays)
	2	Even Semester	August-September (All Sundays)
ANNUAL PROGRAMMES			
B	1	Previous	August-September (All Sundays)
	2	Final	February-March (All Sundays)
	Schedule may change as per the directive of the Controller of		

		Examinations, GU/Govt. of Assam	
EXAMINATION: Sessional (OMR based Internal Examination)			
SEMESTER (TRADITIOANL/IT PROGRAMMES)			
A	1	Odd Semester	November-December
	2	Even Semester	June-July
ANNUAL PROGRAMMES			
B	1	Previous	June-July
	2	Final	November-December
DECLARATION OF RESULTS (Term End)			
SEMESTER (TRADITIONAL/IT PROGRAMMES)			
A	1	Odd Semester	May-June
	2	Even Semester	November-December
ANNUAL PROGRAMMES			
B	1	Previous	November-December
	2	Final	May-June

ENCLOSURE-III

SLM covering syllabus

SEMESTER I	
PAPER M101	Real and Lebesgue Measure
PAPER M102	Topology
PAPER M103	Algebra
PAPER M104	Differential Equation
PAPER M105	Tensors and Mechanics
SEMESTER II	
PAPER M201	Complex Analysis
PAPER M202	Functional Analysis
PAPER M203	Hydrodynamics
PAPER M204	Mathematical Methods
PAPER M205	Operation Research
SEMESTER III	
PAPER M301	Computer Programming in C (theory and Practical)
PAPER M302	Number Theory
PAPER M303	Continuum Mechanics
PAPER M304A	Algebra II
PAPER M304B	Space Dynamics
PAPER M305A	Special Theory of Relativity
PAPER M305B	Mechanical Logic
SEMESTER IV	
PAPER M401	Graph Theory
PAPER M402	Numerical Analysis
PAPER M403A	Functional Analysis II
PAPER M403B	Fluid Dynamics
PAPER M404A	Mathematical Statistics
PAPER M404B	Dynamical System
PAPER M405A	Fuzzy sets and their applications
PAPER M405B	General Theory of Relativity and Cosmology