OFFICE OF THE REGISTRAR

MEWAR UNIVERSITY, GANGRAR, CHITTORGARH (RAJ.)

Ref. No.:MU/RO/2021/ 805   03rd June 2021

OFFICE ORDER

Sub.: Reconstitution of Board of Studies for Department of Chemistry

The Board of Studies for the Department of Chemistry is reconstituted as per Rule 7 of the Statutes of Mewar University, as under:

1. Mr. D. K. Sharma, Dean Academics — -Chairman
2. Dr. B.V. Kabra, HOD Chemistry, MLV, Govt. College Bhilwara — - External Member
3. Dr.Giriraj Tailor, Assistant Professor — - Internal Member
4. Ms. Firdosh Pathan, Assistant Professor — - Internal Member
5. Mr. Ashwini Kumar Jaiswal — - Alumni
6. Dr. Mohammad Ashid, Head & Assistant Professor — -Convener

The terms of reference for the Board of Studies are as provided in Rule 7 of the Statutes.

The Chairman of the Board of Studies may associate any member in the meeting, as special invitee if it is considered his association will contribute in the task of the meeting with the approval of the President/Vice Chancellor.

The Convener of the Meeting is advised to hold the meeting of the BOS seeking convenience of the Chairman in the third week of June 2021. The proceedings of the meeting may be sent to the VC/Registrar as early as possible.

The External Members shall be entitled for TA/DA and sitting fees as per the norms prescribed by the Mewar University.

Registrar

Registrar
Mewar University
Gangrar, (Chittorgarh)

Copy to:

- PS to Hon'ble Chairperson (for kind information)
- PS to Hon'ble President (for kind information)
- PS to Hon'ble Pro-President (for kind information)
- All concerned Deans/Directors/HoD's (for kind information & necessary action)
- Accounts/Examination/Library/Store/Warden/Security/IT Head.
- Coordinator, IQAC Cell.
- Record file.

MEWAR UNIVERSITY, GANGRAR, CHITTORGARH (RAJ.)

DEPARTMENT OF CHEMISTRY

DATE: 18.06.2021

Minutes of Meeting of Board of Studies

Minutes of the BOS of the Department of Chemistry meeting held on 18-06-2021at 11.30 AM.

The following members were present: **(Annexure 1)**

1.	Mr. D. K. Sharma, Dean Academics	-Chairman
2.	Dr. B.V. Kabra, HOD Chemistry, MLV, Govt College Bhilwara	- External Member
3.	Dr.Giriraj Tailor, Assistant Professor	- Internal Member
4.	Ms. Firdosh Pathan, Assistant Professor	- Internal Member
5.	Mr. Ashwini Kumar Jaiswal	- Alumni
6.	Dr. Mohammad Ashid, Head & Assistant Professor	- Convener

At the outset, Dr. Mohammad Ashid, Head of the Department of Chemistry, warmly welcomed all the board members. The Head also appreciated the presence of outside experts who took the pain and keen interest to attend this meeting.

Agenda 1: To approve minutes of the previous BOS, held on 15-06-2020

Resolution: Minutes of the previous BOS of the Chemistry Department held on 15-06-2020 were discussed and approved.

Agenda 2: Brief presentation of academic activities of the department before the BOS Committee by the convener

Resolution: Dr. Mohammad Ashid (Head, Department of Chemistry) presented the annual report of the department.

Agenda 3: Revision of Existing Programmes/ Courses

Resolution: The committee approves to revision of the syllabus of the M.Sc. Programme. As per the recommendation of the expert committee approves the curriculum of the programme.**(Annexure 2)**

Agenda 4: Introduction of New Programmes/Course

Resolution:

1. Introduces Value added course Hands-On Training on Molecular Docking of 30 Hours in Academic session 2021-22. **(Annexure 3)**

2. Introduce a new course in B.Sc Chemistry (Honors) from the upcoming session 2021-22 on the suggestions received from the previous BOS committee members.**(Annexure 4)**

   - Organic Spectroscopy

3. On the recommendation of the BOS committee members, a new course was introduced in M.Sc Organic Chemistry for the upcoming session 2021-22.

   - Introduction of Nano Science and Green Chemistry **(Annexure 5)**

4. On the recommendation of the BOS committee members, three new courses were introduced in M.Sc Industrial Chemistry for the upcoming session 2021-22. **(Annexure 6)**

   - Introduction of Nano Science and Green Chemistry
   - Analytical Methods in Chemistry
   - Instrumental method for Chemical analysis

Agenda 5: To recommend the approved syllabus to Academic Council.

Resolution: Members of the Board of Studies approved the revised syllabus and recommended the same be forwarded to the Academic Council for their approval.

The meeting was dissolved with thanks to the Chair and all the Board of Studies Members.
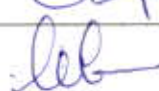
MEWAR UNIVERSITY, GANGRAR, CHITTORGARH (RAJ.)

DEPARTMENT OF CHEMISTRY

DATE: 18.06.2021

Annexure 1: Attendance Sheet

S.NO.	Name & Designation	Designation in BOS	Signature
1	Mr. D. K. Sharma, Dean Academics	Chairman	
2	Dr. B.V. Kabra, HOD Chemistry, MLV, Govt. College Bhilwara	External Member	B.V. Kabra 18.6.2021
3	Mr. Giriraj Tailor, Assistant Professor, Chemistry	Internal Member	Tailor 18/6/18
4	Ms. Firdosh Pathan, Assistant Professor, Chemistry	Internal Member	
5	Mr. Ashwini Kumar Jaiswal	Alumni	
6	Dr. Mohammad Ashid, HOD &Assistant Professor	Convener	18/06/2021

Organic Spectroscopy (Credits: 4)

UNIT-I: UV-VIS, IR and Raman Spectroscopy

UV- Spectrometry: Electronic transitions in enes, enones and arenes. Woodward-Fieser rules. Effect of solvent polarity on UV absorption and its instrumentation.

IR –Spectroscopy: Principle of characteristic group frequency in IR. Identification of functional groups and other structural features by IR. Hydrogen bonding and IR bands. FTIR and its instrumentation.

Raman Spectroscopy: description of Raman scattering, Rayleigh scattering, Stokes and antiStokes scattering , selction rules for rotational Raman spectra of diatomic molecules, rotational Raman spectra, vibrational Raman spectra, Raman spectra of polyatomic molecules

UNIT-II: Mass & EPR Spectroscopy

Mass spectrometry Origin of mass spectrum, principles of EI mass spectrometer. Types of fragments: odd electron and even electron containing neutral and charged species (even electron rule), Nitrogen rule, isotopic peaks, determination of molecular formula, metastable ion peaks. High resolution mass spectrometry. Salient features of fragmentation pattern of organic compounds including β-cleavage, Mclafferty rearrangement, retro Diels – Alder fragmentation and ortho effect.

UNIT-III: NMR Spectroscopy:

Nuclear Magnetic Resonance Spectroscopy: Approximate chemical shift values of various chemically non-equivalent protons and correlation to protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic)Protons bonded to other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides, SH); Chemical exchange, effect of deuteration; complex spinspin interaction between two, three, four and interacting nuclei (first order spectra)

Introduction to Nanoscience and Green Chemistry (CYMS-303-6, Credit-4)

Unit-I

Surface Nanoscience: Introduction to surface active agents. Theory and applications. Types of surfactants. Classification, synthesis of surfactant - Shape, size and structure of surfactants. Micelle, Emulsions, Microemulsions & Gels. Kraft temperature, surfactant geometry and packing.

Unit-II

Colloidal Nanoscience: Introduction to colloidal material, surface properties, origin of colloidal particles, preparation & characterization of colloidal particles. Applications of super hydrophilic hydrophobic surfaces, self-cleaning surfaces. Surface viscosity.

Nanoscience and Interface: Intermolecular Forces, Van der Waals forces (Kessorn, Debye, and London Interactions). Dynamic properties of interfaces. Contact angle. Brownian motion and Brownian Flocculation. Surface free energy.

Unit-III

The essentials of green chemistry: definitions, adverse effects of chemicals on health and the environment, history of the development of Green Chemistry, range of effects green chemists have to design against, sustainability as it relates to GC, ethical awareness. Green chemistry and inherent hazards: risk as a function of hazard and exposure. The Grand challenges for Green Chemistry: Elimination of hazardous substances and pollution, renewable feedstocks, sustainable processes, energy. Green design: toxicity and ecotoxicity, endocrine disruption, steps to design against toxicity and test for toxicity. The definitions of Green Chemistry: implications, strengths, context of the chemical enterprise. The 12 Principles of Green chemistry: application of principles, examples.

Ref. No.: MU/RO/2021/ 765   12th May, 2021

OFFICE ORDER

Sub.: Reconstitution of Board of Studies for Department of Management

The Board of Studies for the Department of Management is reconstituted as per Rule 7 of the Statutes of Mewar University, as under:

1) Prof. (Dr.) Rekha Sharma, Dean, Faculty of Management and Commerce - Chairman
2) Prof. (Dr.) Pradeep Kumar Khicha , Govt. PG College, Nathdwara   -External Member
3) Prof.(Dr.) Abhay Jaroli, Dean, FCM, B.N. University, Udaipur   -External Member
4) Mr. Raj Singh, Assistant Professor   - Internal Member
5) Mr. Vikram Singh Rao, Assistant Professor   - Internal Member
6) Mr. Lavina Sindhi, Asst. HR Manager, Sangam India Ltd., Bhilwara   - Alumni
7) Mr. Rajesh Bhatt, Head & Asst.Professor   - Convener

The terms of reference for the Board of Studies are as provided in Rule 7 of the Statutes.

The Chairman of the Board of Studies may associate any member in the meeting, as special invitee if it is considered his association will contribute in the task of the meeting with the approval of the President/Vice Chancellor.

The Convener of the Meeting is advised to hold the meeting of the BOS seeking convenience of the Chairman in the last week of May 2021. The proceedings of the meeting may be sent to the VC/Registrar as early as possible.

The External Members shall be entitled for TA/DA and sitting fees as per the norms prescribed by the Mewar University.

Registrar
Registrar
Mewar University
Gangrar, (Chittorgarh)

Copy to:
- PS to Hon'ble Chairperson (for kind information)
- PS to Hon'ble President (for kind information)
- PS to Hon'ble Pro-President (for kind information)
- All concerned Deans/Directors/HoD's (for kind information & necessary action)
- Accounts/Examination/Library/Store/Warden/Security/IT Head.
- Coordinator, IQAC Cell.
- Record file.

MEWAR UNIVERSITY
THE DEPARTMENT OF MANAGEMENT

MINUTES OF THE MEETING OF THE BOARD OF STUDIES IN DEPARTMENT OF MANAGEMENT HELD ON SATURDAY, May 22, 2021, 12.30 P.M. AT MEWAR UNIVERSITY, ROOM NO. 233, GANGRAR, CHITTORGARH-312901

The following members attended the meeting: **(Annexure 1)**

1) Prof. (Dr.) Rekha Sharma, Dean, Faculty of Management and Commerce - Chairman
2) Prof. (Dr.) Pradeep Kumar Khicha , Govt. PG College, Nathdwara -External Member
3) Prof.(Dr.) Abhay Jaroli, Dean, FCM, B.N. University, Udaipur - External Member
4) Mr. Raj Singh, Assistant Professor - Internal Member
5) Mr. Vikram Singh Rao, Assistant Professor - Internal Member
6) Mr. Lavina Sindhi, Asst. HR Manager, Sangam India Ltd., Bhilwara - Alumni
7) Mr. Rajesh Bhatt, Head & Assistant Professor - Convener

At the outset, Mr. Rajesh Bhatt, Head of the Department of Management, warmly welcomed all the board members. The Head also appreciated the presence of outside experts who took the pain and keen interest to attend this meeting.

Agenda 1: To approve minutes of the previous BOS, held on 08-09-2020

Resolution: Minutes of the previous BOS of the Management Department held on 08-09-2020 were discussed and approved.

Agenda 2: Brief presentation of academic activities of the department before the BOS Committee by the convener

Resolution: Mr. Rajesh Bhatt, (Head, Department of Management) presented a departmental activity report mentioning all the activities conducted related to curricular development, research and development, and faculty development.

Agenda 3: Review of Existing Programmes/Courses

Resolution: The scheme and syllabus for courses BBA, MBA, and BBA-MBA were reviwed and discussed. From October 2021 modified course curriculum as discussed by the committee will be applied to the new batch of BBA, MBA, and BBA-MBA. **(Annexure 2)**

Agenda 4: Introduction of New Programmes/Course

Resolution:

1. As per the recommendation of the previous BOS committee, it has been decided to add one new course to BBA 5th semester students for the upcoming session 2021-22. The courses are mentioned below. **(Annexure 3)**

   - Manpower Management

2. As per the recommendation of the previous BOS committee, it has been decided to add two new courses to MBA 4th semester students for the upcoming session 2021-22. The courses are mentioned below. **(Annexure 4)**

   - International Marketing
   - Financial Institutions and Markets

Agenda 5: To recommend the approved syllabus to Academic Council.

Resolution: Members of the Board of Studies approved the revised syllabus and recommended the same be forwarded to the Academic Council for their approval.

The meeting was dissolved with thanks to the Chair and all the Board of Studies Members.

There being no other matter, the meeting was concluded with a vote of thanks to the chair.
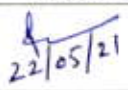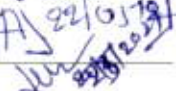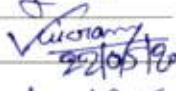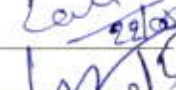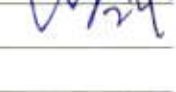
MEWAR UNIVERSITY
DEPARTMENT OF MANAGEMENT

Date of the meeting: 22-05-2021

Venue: Room No: - 333

Members present:-

SN	Name	Designation	Post	Signature
1	Dr.Rekha Sharma, Dean-Management	Professor	Chairman	22/05/21
2	Prof (Dr) Pradeep Kumar Khicha	Govt. PG College, Nathdwara	External Member 1	22/05/21
3	Dr.Abhay Jaroli	Dean, FCM, B.N. University, Udaipur	External Member 1	AJ 22/05/21
4	Raj Singh	Asst Professor	Internal Member 1	
5	Vikram Singh Rao	Asst Professor	Internal Member 1	22/05/21
6	Ms Lavina Sindhi	Asst HR Manager, Sangam India Ltd. Bhilwara	Alumni	22/05
7	Mr Rajesh Bhatt	Head-Dept of Management	Convener	

MANPOWER MANAGEMENT

Unit 1 –

Introduction – Manpower Management – Objectives, present status in Indian industry, Proactive Vs Reactive approach, Role of personnel executives in Indian Organisations. Recruitment Selection – Manpower Planning recruitment & selection process, Different types of tests. Train ing & Development – meaning & types of programs.

Unit 2 –

Performance Appraisal – Definitions, standards, measure, methods (P.A. Techniques) Process of job evaluation. Compensation Management. Friage benefits, incentives objectives of wage & salary administration.

Unit 3 –

Job Satisfaction & Quality of work life – Job satisfaction – Meaning, factors governing impact of job/satisfaction. Over performance. QWL – meaning, approaches, Quality circle, Team building.

Reference:
Personnel Management – Tripathi P. C.
Industrial Relations – Tripathi P. C

MEWAR UNIVERSITY, GANGRAR, CHITTORGARH

International Marketing

Unit 1

Nature and Importance of International marketing – process of International marketing, International dimensions of marketing and benefits of international marketing, steps of development of the transnational corporation.

Unit 2

Global marketing information system and research – nature of marketing research, sources of information and marketing research – primary and secondary global market segmentation, targeting and positioning. Foreign market entry strategy – market analysis, export, licensing, joint ventures, Manufacturing, management contracts turn key operations, acquisition and mergers, analysis of entry strategy.

Unit 3

Global marketing mix – International product decision, what is product development, product positioning, theory of IPLC, Product standardization and product adaptation, branding and packaging, International pricing decision – role of price supply and demand, international channel decisions – importance and scope of channel decision, direct and indirect selling channel sales and promotion, advertising.

Reference:

Global marketing management by Warren J Keepen
Global marketing management by Varshney and Bhattacharya.

MEWAR UNIVERSITY, GANGRAR, CHITTORGARH

Financial Institutions and Markets

Unit 1

Financial System – financial activities, meaning, one markets, features, commercial paper, certificate of deposits, primary and secondary markets, unorganized financial, system, bullion market and financial sector. Financial Institutions – meaning, purpose, IDBI – establishment, purpose, working, limitations andsources of finances.

Unit 2

IFCI – establishment, purpose, working, schemes, sources, limitation, authorities etc. Investment institution structure – Insurance companies – purpose, working types, LIC & GIC, establishment, purpose, working, schemes, sources of funds ad utilization, public sector, mutual funds.

Unit 3

Security, mobilization of services, primary issues and derivative securities, security and exchange boardof India (SEBI) – Introduction, objectives, powers, free pricing of equity shares. Reserve Bank of India (RBI) – introduction, objective, powers implementation, financial schemes etc.

Reference:

Financial Institutions and markets by L M Bhole.

DEPARTMENT OF MANAGEMENT

OFFICE OF THE REGISTRAR
MEWAR UNIVERSITY, GANGRAR, CHITTORGARH (RAJ.)

Ref. No.:MU/RO/2021/ァァァ   24th May 2021

OFFICE ORDER

Sub.: Reconstitution of Board of Studies for Department of Mathematics

The Board of Studies for the Department of Mathematicsis reconstituted as per Rule 7 of the Statutes of Mewar University, as under:

1. Mr. D. K. Sharma, Dean Academic	- Chairman
2. Dr. R K Laddha , Assistant Professor, MLV, Govt College, Bhilwara	- External Member
3. Mr. Sanjeev Sharma, Assistant Professor	- Internal Member
4. Dr. Jyoti Singh Raghav, Assistant Professor	-Internal Member
5. Ms. Priyanka Dhaker	- Alumni
6. Dr. Pramod Mehta, Assistant Professor & Head	- Convener

The terms of reference for the Board of Studies are as provided in Rule 7 of the Statutes.

The Chairman of the Board of Studies may associate any member in the meeting, as special invitee if it is considered his association will contribute in the task of the meeting with the approval of the President/Vice Chancellor.

The Convener of the Meeting is advised to hold the meeting of the BOS seeking convenience of the Chairman in the third week of June 2021. The proceedings of the meeting may be sent to the VC/Registrar as early as possible.

The External Members shall be entitled for TA/DA and sitting fees as per the norms prescribed by the Mewar University.

Registrar
Registrar
Mewar University
Gangrar, (Chittorgarh)

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- PS to Hon'ble President (for kind information)
- PS to Hon'ble Pro-President (for kind information)
- All concerned Deans/Directors/HoD's (for kind information & necessary action)
- Accounts/Examination/Library/Store/Warden/Security/IT Head.
- Coordinator, IQAC Cell.
- Record file.

MEWAR UNIVERSITY, GANGRAR, CHITTORGARH (RAJ.)

DEPARTMENT OF MATHEMATICS

DATE: 15.06.2021

Minutes of Meeting of Board of Studies

Minutes of the BOS of the Department of Mathematics meeting held on 15-06-2021 at 10.30 AM.

The following members were present:(Annexure 1)

1. Mr. D. K. Sharma, Dean Academic — - Chairman
2. Dr. R K Laddha, Assistant Professor, Govt PG College Chittorgarh — - External Member
3. Mr. Sanjeev Sharma, Assistant Professor, Mathematics. — - Internal Member
4. Dr. Jyoti Singh Raghav, Assistant Professor, Mathematics. — -Internal Member
5. Ms. Priyanka Dhaker — - Alumni
6. Dr. Pramod Mehta, Assistant Professor & Head — - Convener

Dr. Pramod Mehta, Head, of the Department of Mathematics, presented the report of research work done by the faculty members of the department in front of the committee,

Agenda 1:To approve minutes of the previous BOS, held on 18-06-2018

Resolution: Minutes of the previous BOS of the Mathematics Department held on 18-06-2018 were discussed and approved.

Agenda 2: Introduction of New Courses in M.Sc. Mathematics as an open elective paper. (Annexure 2)

Resolution: On the recommendation of BOS members 7 new courses were introduced as open elective papers in the M.Sc Mathematics Programme. The list of the courses are enclosed here.

1. Mathematical Modeling in Biology and Medicine
2. Operator Theory
3. Bio- Mechanics
4. Module Theory
5. Cryptography
6. Galois Theory
7. Theory of Partitions

Agenda 3: To recommend the approved syllabus to Academic Council.

Resolution: Members of the Board of Studies approved the revised syllabus and recommended the same be forwarded to the Academic Council for their approval.

The meeting was dissolved with thanks to the Chair and all the Board of Studies Members.

MEWAR UNIVERSITY, GANGRAR, CHITTORGARH (RAJ.)

DEPARTMENT OF MATHEMATICS

DATE: 15.06.2021

Annexure 1: Attendance Sheet

S.NO.	Name & Designation	Designation in BOS	Signature
1	Mr. D. K. Sharma, Dean Academic,	Chairman	15/6/21
2	Dr. R K Laddha , Assistant Professor, MLV, Govt College Bhilwara	External Member	
3	Mr. Sanjeev Sharma, Assistant Professor	Internal Member	
4	Dr. Jyoti Singh Raghav, Assistant Professor	Internal Member	
5	Ms. Priyanka Dhaker	Alumni	
6	Dr. Pramod Mehta, Head & Assistant Professor	Convener	15/6/21
		Special Invitee (if any)	

Scheme &Syllabus

For

M. Sc. (Mathematics)

TWO YEAR FULL-TIME PROGRAMME

SESSION 2021-2022

Mewar University
Knowledge to wisdom

DEPARTMENT OF MATHEMATICS

FACULTY OF SCIENCE& TECHNOLOGY

MEWAR UNIVERSITY, CHITTORGARH, RAJASTHAN

Department of Mathematics

Semester-I

S. N.	Subject Code	Subject Name	Credits
1	MTMS-101	Abstract Algebra	4
2	MTMS-102	Analysis	4
3	MTMS-103	Topology	4
4	MTMS-104	Complex Analysis	4
5	MTMS-105	Elective-I	4
6	MTMS-106	Elective-II	4

Electives for semester-I

1. Optimization Techniques-I
2. Mathematical Theory of Statistics- I
3. Viscous Fluid Dynamics-I
4. Number Theory-I
5. Astronomy-I
6. Computer Programming in C
7. Theory of Partitions

Semester-II

S. N.	Subject Code	Subject Name	Credits
7	MTMS-201	Special Functions	4
8	MTMS-202	Differential Geometry	4
9	MTMS-203	Functional analysis	4
10	MTMS-204	Discrete Mathematics – I	4
11	MTMS-205	Elective-I	4
12	MTMS-206	Elective-II	4

Electives for semester-II

1. Computer Programming of Numerical Methods
2. Optimization techniques-II
3. Mathematical Theory of Statistics- II
4. Viscous Fluid Dynamics-II

Department of Mathematics

5. Number Theory-II
6. Astronomy-II
7. Mathematical modeling in biology and medicine
8. Galois Theory

Department of Mathematics

Semester-III

S. N.	Subject Code	Subject Name	Credits
13	MTMS-301	Mechanics	4
14	MTMS-302	Tensor Analysis	4
15	MTMS-303	Numerical Analysis	4
16	MTMS-304	Discrete Mathematics – II	4
17	MTMS-305	Elective-I	4
18	MTMS-306	Elective-II	4

Elective Paper for III Sem

1. Relativity and Cosmology
2. Numerical solutions of Partial differential equations
3. Integral Equations
4. Advanced Topology
5. Financial Mathematics
6. Fourier Transform and theory of distributions
7. Operator Theory
8. Bio-Mechanics

Semester-IV

S. N.	Subject Code	Subject Name	Credits
19	MTMS-401	Research Methodology	4
20	MTMS-402	Elective-I	4
21	MTMS-403	Elective-II	4
22	MTMS-404	Project (Research Work/ Training)	12

Electives for semester-IV

1. Fractional Calculus
2. Fuzzy sets and their applications
3. Integral Transforms
4. Computational Bioinformatics
5. Continum Mechanics
6. Modeling and Simulation
7. Module Theory
8. Cryptography

Note: More electives can be included in scheme as per the resources and availability of subject experts in the department.

Mewar University, Gangrar, Chittorgarh

Department of Mathematics

SEMESTER I

ABSTRACT ALGEBRA

CO-1: students are able to understand for the concept of Algebra.

CO-2: Students are able to understand solvable group, nilpotent group.

CO-3: Select the challenging problems in modern mathematics and find their appropriate solutions using algebra.

CO-4: Able to research in the field of pure mathematics.

Unit-I

External and Internal direct product of two and finite number of subgroups; Commutator subgroup, Cauchy's theorem for finite abelian and non abelian groups.

Unit-II

Sylow's three theorem and their easy applications, Subnormal and Composition series, Zassenhaus lemma and Jordan Holder theorem.

Unit-III

Solvable groups and their properties, Nilpotent groups, Fundamental theorem for finite abelian groups.

Unit-IV

Annihilators of subspace and its dimension in finite dimensional vector space, Invariant, Projection, adjoints, Singular and nonsingular linear transformation, quadratic forms and Diagonalization.

Recommended books:

1. Surjeet Singh and QuaziZameeruddin : Modern Algebra,
2. Herstein, I. N. : Topics in algebra,
3. Agrawal, R. S. : Algebra,
4. Jacobson, N. : Basic Algebra Vol. I, II,
5. Lang, S. : Algebra III Edition,
6. Bhattacharya, P. B., Jain, S. K. and Etc. : Basic Abstract Algebra (II Edition).

Mewar University, Gangrar, Chittorgarh

Department of Mathematics

ANALYSIS

CO1: The student will gain confidence to prove theorems and solutions.

CO2: Student will understand the concept of measure theory and integration

CO3: Student will understand the concept of supremum and infinmum.

CO4: Able to apply the concept of real analysis in other mathematical problem.

Unit-I

Measure Theory: Outer measure of a subset of R'Lebesgue outer measure of a subset of R , Existence, non-negativity and monotonicity of Lebesgue outermeasure; Relation between Lebesgue outer measure and length of an interval; Countable sub additivity of Lebesgue outer measure; translation invariance Lebesgue outer measure, (Lebesgue) measurable sets

Unit-II

(Lebesgue) measure; Complement, union, intersection and difference of measurable sets; denumerable union and intersection of measurable sets; countable additivity of measure; the class of measurable sets as a algebra the measure of the intersection of a decreasing sequence of measurable sets.

Unit-III

Measurable functions; Different equivalent definition of a measurable function; Scalar multiple, sum, difference and product of measurable functions of measurable function, Measurability of a continuous function and measurability of a continuous image of measurable function.

Unit-IV

Supremum, infimum, limit superior, limit inferior and limit of a sequence of measurable functions, Convergence pointwise and convergence in measures of a sequence of measurable functions, Lebesgue Integral; Characteristic function of a set; simple function; Lebesgue integral of a simple function; Lebesgue integral of a bounded measurable function; Lebesgue integral and Riemann integral of a bounded function defined on a closed interval; Lebesgue integral of a non-negative function; Lebesgue integralof a measurable function; Properties of Lebesgue integral, Convergence Theorems and Lebesgue integral.

Recommended books:
1. George F- : Introduction to Topology and
   Simmons   Modem Analysis, McGraw Hill
                      Book Co,

2. S. I. Hu   : Elements of Real Analysis,

3. H. L. Royden   : Real Analysis,

4. G. N. Purohit   : Lebesgue Measure and
                           Integration.

Department of Mathematics

TOPOLOGY

CO1: Understand the concept of base and topological spaces.

CO2: Understand the concept of separation axioms.

CO3: Understand the concept of compactness and connectedness.

CO4: Understand the importance of several theorem like weirstrass approximation theorem, stone-weirstrass theorem.

Unit-I

Base, sub base, open bases, open sub bases, first countable space, second countable space, separable space, continuous functions in topological spaces, sequentially topological spaces.

Unit-II

Separation Axioms: T_0, T_1, T_2- space, separation axioms, normal spaces, Regular spaces, completely regular space, tychonoff space, Housdorff space.

Unit-III

Compactness: Cover, open cover, finite sub cover, compact sets, Lindelof space, locally compact, sequentially compact, Bolzano Weirstrass property and sequentially compactness, compactness for metric spaces, Lindelof theorem, Product spaces.

Unit-IV

Connectedness: Connectedness and continuity, components of a space, product of connected topologic al spaces, Locally connected Spaces, Approximation: The Weirstrass approximation theorem, function algebra, C(X, R) and C (X, C), the real Stone-Weirstrass theorem, The Complex Stone-Weirstrass theorem.

Recommended books:
1. George F. Simmons: Introduction to Topology and modern analysis, McGraw Hill Co,
2. S.I. Hu: Elements of Real Analysis,
3. H.L. Royden: Real Analysis,
4. W.J. Thron: Topological Structure,
5. J. Kelley: General Topology,
6. Malik S.C. &Arora: Mathematical Analysis (Third Revised Edition) Savita

Department of Mathematics

COMPLEX ANALYSIS

CO-1: Understand the fundamental concepts of complex analysis.

CO-2: Understand the concept of mapping

CO-3: Understand the concept of complex integration also the poles and residues

CO-4: Able to research in the field of pure mathematics.

Unit I

Complex numbers, Algebra of complex functions, differentiability of complex function, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Power series, radius of convergence, circle of convergence.

Unit II

Conformal transformation, Linear & Bilinear transformations, fixed points, cross ratio, inverse points, critical points Exponential, and Trigonometric transformations.

Unit III

Complex integration : Riemann definition of integration, complex integral as the sum of line integrals, Cauchy's fundamental theorem, extension of Cauchy's theorem to multi-connected region, Cauchy's integral formula, Cauchy's integral formula for multi-connected region, Cauchy's integral formula for higher order derivatives.

Unit IV

Morera's theorem, Liouville's theorem, Maximum Modulus theorem, Poisson integral formula, Development of Analytic function as power series: Taylor's Series, Laurent's Series, Singularities and Zeroes of an Analytic function, residues, Cauchy's theorem of residues and Evaluation of definite integrals.

Recommended Books:

1. E. G. Phillips   : Functions of a complex variable.
2. E. T. Copson   : An introduction to the Theory of functions of a Complex variable.
3. Zill Shanahan   : A First Course in Complex Analysis with Application
4. T. Pati   : Functions of a Complex Variable

Department of Mathematics

ELECTIVES FOR SEMESTER I

OPTIMIZATION TECHNIQUES-I

Unit-I

Dual simplex method, Bounded value algorithm, Parametric linear Programming.

Unit-II

Sensitivity Analysis: (i) Changes in the coefficients of the objective function, (ii) Changes in the components of vector b, (iii) Changes on the component (a_{ij}) of the matrix A.

Unit-III

Addition of the new variable, Addition of a new constraint, Deletion of a variable, Deletion of constraint, Project Management by PERT and CPM, cost time, trade off, Resource leveling.

Unit-IV

Dynamic Programming Problem: Bellman's principle of optimality, multiple stage decision problems, characteristics of DPP, Solution of finite number of stages problems by DPP, Network flow problems: Maximal flow, minimal flow, shortest route problem.

Recommended books:

1. Kantiswaroop, : Operation Research,
   Mak-Mohan, P. K. Gupta.

2. Hamdy A. Taha : Operation Research

3, S. D. Sharma : Operation Research,

4. S. I. Gass : Linear-Programming,

5. K. V. Mittal : Optimization Methods in Operations Research and systems analysis

MATHEMATICAL THEORY OF STATISTICS-I

Unit-I

Elements of theory of probability; sample space, various definitions of probability, addition and multiplication laws of probability, conditional probability and statistical independence of events, Baye's theorem and its applications.

Unit-II

Mathematical expectations, conditional expectations, Moments and cumulates, Moments generating and characteristic functions, Inversion theorem, Chebyshev's inequality, Central limit theorem, Random variables.

Unit-III

Negative -binomial, and Hyper geometric distributions, Rectangular, Normal, Cauchy, Gamma and Beta distributions Elementary idea of Exponential and Laplace distributions.

Unit-IV

Curve fitting and principle of least squares, Scatter diagram, linear regression and correlation.

Note: Candidates who have offered Mathematical Statistics / Statistics / Applied Statistics as an optional subject in their B.A. /B.Sc. examination will not be permitted to offer this course.

Recommended books:

1. Gupta and Kapoor   : Fundamentals of Mathematical Statistics,
2. Kapur and Sexena   : Mathematical Statistics,
3. Goon and Others   : Outline of Statistical Theory, Vol. I, II.

Department of Mathematics

VISCOUS FLUID DYNAMICS –I

Unit-I

Viscosity, Analysis of stress, Relation between stress and rate of strain, Navier-stokes equations and equation of energy in cartesian system of coordinates, vorticity and circulation, Reynolds law of similarity, Physical importance of non-dimentional parameters

Unit-II

Reynolds number Froude numbers, Mach number, Prandtl number, Eckert number, Some exact solutions of Navier-stokes equations-steady, motion between parallel plates.

Unit III

Hagen poiseuille flow a circular pipe flow between coaxial circular pipes, flow between two concentric rotating cylinders, Pulsatile flow between parallel surfaces, flow in convergent and divergent channels (Jaffery-Hamel flow).

Unit IV

Flow in the vicinity of stagnation point, unsteady motion of a plate, Theory of very slow motion of a sphere in viscous fluid Osceen's, improvement of stoke's theory.

Recommended books:

1. G. Schfichting : Boundary Layer Theory,
2. S.I. Pai : Viscous Flow Theory, Vol.I, Laminar flow,
3. J. L. Bansal : Viscous Fluid Dynamics,
4. M. D. Raisinghania : Fluid Dynamics,
5. Shanti Swarup : Fluid Dynamics.

Department of Mathematics

NUMBER THEORY-I

Unit-I

Divisibility: GCD and LCM of two or more integers, Euclidean, algorithm, the linear diophantine equation ax + by = c, Prime Numbers, composite numbers, infinitude of primes, fundamental theorem of arithmetic.

Unit-II

Congruences: Basic properties, divisibility congruences: Fermat's little tests, linear congruences, application of theorem, Euler's remainder theorem, generalization, wilson's theorem Chinese.

Unit-III

Number Theoretic functions: T.J, and, Multiplicative functions, Mobius inversion formula, the greatest integer function, Primitive Roots and Indices, Primitive roots, characterization of natural numbers having primitive roots, theory of indices, solution of certain congruence, through indices.

Unit-IV

Quadratic Residues: Quadratic residues and quadratic non residues of an integer in general and of a prime in particular, Gauss Lemma and its applications, the quadratic reciprocity law, Special Numbers: Fibonacci numbers, Fermat's numbers, Perfect numbers, Diophantine Equations: Representation of integers as sums of 2, 3 and 4 squares.

Recommended books:

1. Donald M. Burton   : Elementary Number Theory, Allyn and Bacon Inc,
2. Niven& H.S. Zuckerman : An Introduction to the Theory of Numbers,
                            Willey eastern India Ltd,
3. Lang, S.   : Algebraic Number theory, GTM Vol. 110,
                            Springer-Verlag 194.

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Department of Mathematics

ASTRONOMY- I

Unit-I

Spherical Trigonometry- Great and small circular spherical triangles and their properties, various spherical trigonometrically formula-Cosine, sine, supplemental cosine, sine cosine, contingent, half of an angle and side Napier's analogies.

Unit-II

Delambe's analogies, their identities formulae for, right angled triangles and their solutions, Celestial sphere, diurnal motion, Hour angle rising and setting of stars motion of sun, Zenith distance and Azimuth, Twilight.

Unit-III

Refraction: Laws, effect of refraction on sun rise and sun set, Simpson's Hypothesis, effect of refraction in right ascension and declination etc, Time: Equation of time, seasons and their lengths, precession and Nutation and their effects on right ascension and declination, planetary precession double stars.

Unit-IV

Aberration and its effect of longitude, latitude, right ascension and declination, position of apex, diurnal aberration and its effect in declination, right ascension and hour angle.

Recommended books:
1. Astronomy by Gorakh Prasad,
2. Astronomy by Smart.

Department of Mathematics

COMPUTER PROGRAMMING IN C

Unit I

Definition and properties of algorithm, flow chart, conversion of flow chart to language, examples of algorithms and flow charts, introduction to program design, errors, syntax error, logical error, runtime error.

Unit II

Character set of C, constants and variables in C, arithmetic expressions in C, assignment and multiple assignment and mode of statements in C, built in functions and libraries in C, input and output statements in C, data types, structure of C program, elementary programs in C.

Unit III

Logical if statements in C: if- else, nested if, switch, break, continue, GOTO statements in C For, while and do-while loops in C, nested loops, Defining and accessing a function, passing arguments to a function, specifyingarguments data types.

Unit IV

Functions : Function prototypes, Scope rules of functions, call by value, call by reference, Array : introduction of array, Classification of arrays, functions with arrays, Pointers in C, pointers and arrays, File input/output: create, open, write, delete, close.

Recommended books:

1. Introduction Information Technology: Satishjain, BPB Publication, New Delhi.

2. Fundamentals of computers : P. K. Sinha

3. The C-Programming Language: B. W. Kernyharn& D. M. Ritche - PHI Ltd.

4. Computer Programming in C: Y Kanetkar-B. P. B. Publication, New Delhi.

5. Programming in ANSI C: E Balagurusamy.

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Department of Mathematics

Theory of Partitions

Unit I

Partitions - partitions of numbers, the generating function of $p(n)$, other generating functions, two theorems of Euler, Jacobi's triple product identity and its applications.

Unit II

summation formula and its applications, combinatorial proofs of Euler's identity, Euler's pentagonal number theorem, Franklin's combinatorial proof.

Unit III

Congruence properties of partition function, the Rogers - Ramanujan Identities.

Unit IV

Elementary series - product identities, Euler's, Gauss', Heine's, Jacobi's identities. Restricted Partitions – Gaussian, Frobinius partitions.

Recommended books:

1. G. H. Hardy and E. M. Wright – An Introduction to Theory of Numbers, Oxford University Press, 1979, 5th Ed.,

2. I. Niven, H. S. Zuckerman and H. L. Montgomery – An Introduction to the Theory of Numbers, New York, John Wiley and Sons, Inc., 2004, 5th Ed.,

3. Bruce C. Berndt – Ramanujan's Note Books Volumes-1 to 5.

4. G. E. Andrews – The Theory of Partitions, Addison Wesley, 1976.

5. A. K. Agarwal, Padmavathamma, M. V. Subbarao – Partition Theory, Atma Ram & Sons, Chandigarh, 2005

Department of Mathematics

SEMESTER II

SPECIAL FUNCTIONS

CO-1: Understand the concept of power series the radius of convergence.

CO-2: Discuss various kinds of special functions with properties and relations.

CO-3: Understand the concept of classical orthogonal polynomials.

CO-4: Able to research in the field of applied mathematics.

Unit-I

Series solutions and Hypergeometric equations: Singularities in second order ordinary differential equations with constant coefficients and variable coefficients, radius of convergence, Series solutions of second order homogeneous ordinary differential equations, Frobenius method, Hypergeometric Series, Hypergeometric functions, Confluent Hypergeometric function and solution of confluent Hypergeometric equation.

Unit-II

Legendre's polynomial Functions: Legendre's differential equation and associated Legendre's differential equations.

Unit-III

Simple properties of Legendre's functions of first and second kind and the associated Legendre's function of integral order.

Unit-IV

Bessel functions, Generating function, Integral formula, Recurrence relations; addition formula and other properties of Bessel functions, Classical Orthogonal Polynomials, Generating functions and other properties, associated with the Laguerre, Legendre and Hermite Polynomials.

Recommended books:
1. Rainville, E. D.   :   Special Functions,
2. Sneddon, I. N.   :   Special Functions,
3. S. P. Goyal   :   Special Functions,
4. Bansal, J. L.   :   Differential Equations Vol. II

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Department of Mathematics

DIFFERENTIAL GEOMETRY

CO-1: Understand the concept of axes of plane sections.

CO-2: Understand the concept of generating lines.

CO-3: Aware with the concept of generators and projection of generators.

CO-4: Understand the concept of conicoid

Unit-I

The Axes of Plane Sections: Circular sections, Axes of central sections of a central conicoid, Axes of non central section of a central conicoid, Axes of any section of a central conicoid, Circular sections.

Unit-II

Generating Lines: Introduction, properties of generating line, intersection of generators of hyperboloid of one sheet, generators through any point of hyperboloid, direction cosines of generating line, the section of a surface by a tangent plane.

Unit-III

Systems of generators of a central hyperboloid, Locus of the points of intersection of perpendicular, generators, The projection of generators, Generators' of the hyperbolic paraboloid, Confocal Conicoids: The three confocals through a point,- Elliptic coordinates, confocal touching a given plane, confocal touching a given line.

Unit-IV

The parameter of the confocals through a point on a central conicoid, the normals, The self polar tetrahedron, The axes of an enveloping cone, Conoids; Equation to a conoid, surface in general, The degree of a surface, tangents and tangent planes, The inflexional tangents; the equations $z=f(x,y)$, The indicatrix and representation by parameters.

Recommended books:
1. Robert, J. T. Bell   : Coordinate Geometry of the three dimensions,
2. Bansal& Sharma   : Differential Geometry,
3. N. Saran & R. S. Gupta   :   Analytical Geometry of Three Dimensions.

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Department of Mathematics

FUNCTIONAL ANALYSIS

CO-1: Understand the concept of functional analysis and there roles in moders mathematics.

CO-2: Explain the concept of Hilbert and Banach spaces.

CO-3: Understand how to use the theorem s.

CO-4: Understand the concept of Gram Schmidt Orthogonalization process.

Unit-I

Normed linear spaces; Banach spaces, Riesz Lemma, Quotient space of normed liner space and its completeness and examples Continuous linear transformations.

Unit-II

Hahn-Banach theorem; the natural embedding of a normed linear space into its second conjugate, the open mapping theorem; the closed graph theorem, the uniform boundedness theorem.

Unit-III

Inner product spaces, Hillbert spaces; Schwartz's inequality: Bessel's inequality, orthogonality, Parallelogram law, Polarization identity with examples, Pythagoras theorem, orthonormal sets, Orthonormal basis and Parseval's identity.

Unit-IV

Complete Orthonormal sets, Gram Schmidt Orthogonalization process with examples, conjugate space, Riesz representation theorem, Adjoint of an operator, self adjoint operator, Normal operator, unitary operator, Matrix representation of a linear operator.

Recommended books:

1. George F. Simmons : Introduction to Topology and modern analysis, McGraw Hill Book Co,
2. S.I.Hu : Elements of Real Analysis,
3. H.L. Royden : Real analysis,
4. W.J. Thron : Topological structure,
5. J. Kelley : General Topology.

Department of Mathematics

DISCRETE MATHEMATICS –I

CO-1: Understand that the lattices and Boolean algebra are used as tools.

CO-2: Understand the concept of finite machine.

CO-3: Understand the concept of phase structure grammar.

CO-4: Able to use the concept of discrete mathematics research in the field of mathematics as well computer science also.

Unit-I

Lattices: Partially ordered sets and Lattices, Hasse Diagrams, lattices as algebraic systems sub-lattices, Complete lattices, Modular lattices, distributed lattices, the complemented lattices, convex sub lattices, Congruence relations in lattices.

Unit-II

Conversion of Boolean Algebra into Boolean rings and vice versa, Boolean Algebras asLattices, Various Boolean identities, The Switching Algebra, Sub algebras, Direct Products and Homomorphism, Join irreducible elements, Atoms and Minterms, Boolean Forms, Applications of Boolean algebra to Switching Theory.

Unit-III

Introductory computability theory: Finite state machines and their transition, Table diagrams, equivalence of finite state machine, reduced machine, homomorphism finite automata, acceptors, non-deterministic finite automata and equivalence of its power to that of deterministic finite automata, Moore mealy machines, turning machine and partial recursive functions.

Unit-IV

Phrase structure Grammar, Rewriting Rules, Derivations, Sentential forms, Language generated by a Grammar, Regular context – free, and context sensitive Grammars and Languages, Regular sets, Regular expressions and pumping Lemna, Kleene's Theorem stamens.

Recommended books:
1. Elements of Discrete Mathematics by C. L. Liu, McGraw-Hill Book Co,
2. Discrete mathematical structures by Kolman, Busby and Ross, 4th edition. PHI, 2002,
3. Mathematical Structures for Computer Science by J. L. Gersting, (3rd edition), Computer Science Press, New York,
4. Discrete Mathematics with Graph Theory by Goodaire and Parmenter, Pearson edition.2nd edi,
5. Graph Theory with Applications to Engineering and Computer Sciences by N. Deo, PHI,
6. Discrete Mathematics by Harikrishna, Sandeep Kumar, PragatiPrakashan.

Department of Mathematics

ELECTIVES FOR SEMESTER II

COMPUTER PROGRAMMING OF NUMERICAL METHODS
(PRACTICAL ORIENTED)
Unit-I

Algorithm, Flowchart and Computer Programming in C on: Arithmetic operations with normalized floating point numbers, Number system conversions.

Unit-II

Algorithm, Flowchart and Computer Programming in C for numerical solution of algebraic and transcendental equations: bisection, false position, Newton-Raphson, secant method.

Unit-III

Algorithm, Flowchart and Computer Programming in C for numerical solution of simultaneous linear equation: Gauss Elimination method, Gauss-Seidel method, Algorithm, Flowchart and Computer Programming in C for Differentiation & Integration: Simpson's rule, Trapezoidal rule, Gaussian Quadrature formula.

Unit-IV

Algorithm, Flowchart and Computer Programming in C for Numerical Solutions of differential equations: Eulers method, Taylor's series 4th order method, RungeKutta 4th order method, Predictor-corrector method.

Recommended books:
1. The C-Programming Language: B.W. Kernyharn& D.M. Ritche - PHI Ltd,
2. Computer Programming in C : Y Kanetkar-B.P.B. Publication, New Delhi,
3. Programming in ANSI C: E Balagurusamy,
4. Computer oriented Numerical Methods: V. Rajaraman PHI Ltd.

Note: Two theory lectures per week are required for this paper and at least two programs from each unit must be practiced in computer laboratory.

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Department of Mathematics

OPTIMIZATION TECHNIQUES-II

Unit-I

Classical Optimization Techniques: Unconstrained problems of Maxima-Minima global maximum, Local maxima method of Lagrange's Multipliers for constrained with equality constraints, Constraints in the form of inequalities: Kuhn Tucker Theorem Kuhn-Tucker necessary and sufficient conditions, saddle point.

Unit-II

Quadratic programming problem: Wolfe's algorithms and Beale's algorithm, Fractional Programming problem.

Unit-III

Job sequencing, Project management by PERT-CPM: Introduction, Basic steps in PERT/CPM techniques, Applications of PERT/CPM techniques.

Unit-IV

Markov Analysis: Introduction, Stochastic process, Markov process, transition probability matrix, First order and higher order markov process, n-step transition probabilities, Markov chain, Steady state condition.

Decision Theory: Introduction, types of decisions, components of decision making, decision models, EMV, Steps for calculating EMV, EVP, EOL, Decision tree analysis.

Recommended books:

1. Kantiswaroop, Mak-Mohan, : Operation Research,
   P. K. Gupta.

2. Hamdy A Taha : Operation Research,

3. S. D. Sharrna : Operation Research,

4. S. I. Gass : Linear-Programming,

5. K. V. Mittal : Optimization Methods in Operations
   Research and systems analysis,

6. J. K. Sharma : Operation Research.

Department of Mathematics

MATHEMATICAL THEORY OF STATISTICS-II

Unit-I

Chi-square and t sampling distribution with derivations, properties and applications.

Unit-II

F sampling distribution with derivations, properties and applications, large sample theory and applications, Determination of sample size, Elements of theory of estimation: Point estimation, criterion of good estimators for one parameter; Consistency, Efficiency, sufficiency and unbiasedness.

Unit-III

Method of maximum likelihood estimation properties of maximum likelihood estimators (without proof), M.L.E. for Binomial, Poisson and Normal populations, Interval estimation for mean and variance in case of Normal population.

Unit-IV

Elements of testing of hypothesis: Two kinds of error in testing of hypothesis, Critical region, Neyman-Pearson Lemma and determination of BCR in Neyman sense for testing simple v/s simple hypothesis in uniform and normal populations.

Note: Candidates who have offered Mathematical Statistics / Statistics / Applied Statistics as an optional subject in their B.A. /B.Sc. examination will not be permitted to offer this course.

Recommended books:
1. Gupta and Kapoor   Fundamentals of Mathematical Statistics,
2. Kapur and Saxena   : Mathematical Statistics,
3. Goon and Others   : Outline of Statistical Theory, Vol. I, II.

Department of Mathematics

VISCOUS FLUID DYNAMICS-II

Unit-I

Boundary layer Theory: Boundary layer equations for two dimensional flows over a plane wall, Boundary layer on a flat plate (Blasius, Topper solution), Characteristic boundary layer parameters, Similar solutions of the boundary layer equations, Exact solutions of the steady state boundary layer equation in two dimensional motion, Boundary layer along a flat plate.

Unit II

Flow past a wedge, Flow past a convergent channel, Boundary layer separation, Blasius series solution, Gortler, new series method, Prandtl-mises transformation, Axial symmetrical and three dimensional boundary layer: - Boundary layer on a Yawed cylinder.

Unit III

Approximate methods for the solution of the boundary layer equations Karman momentum integral equation, Karman-Pohlhousen method, Energy integral equations, Walz-Thwaites method based on energy integral equation, Thermal Boundary Layer in Two Dimension Flow, Thermal boundary layer equation for a plane wall.

Unit IV

Forced convection in a laminar boundary layer on a flat plate (i) Crocco's first integral (ii) Reynolds's analogy (iii) Crocco's second integral for Pr =1, Free convection from a heated vertical plate: Thermal energy integral equation, Approximate solution of the Pohlhousen's problem of free convection from a heated vertical plate.

Recommended books:

1. G. Schfichting   : Boundary Layer Theory,
2. S. I. Pai   : Viscous Flow Theory, Vol.I, Laminar flow,
3. J. L. Bansal   : Viscous Fluid Dynamics,
4. M. D. Raisinghania   : Fluid Dynamics,
5. Shanti Swarup   : Fluid Dynamics.

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Department of Mathematics

NUMBER THEORY-II

Unit-I

Continued Fractions: Finite and infinite continued fraction convergent of a given continued fraction and their properties.

Unit-II

Uniqueness of a continued fraction Periodic continued fraction, Pell's equation in general, characterization of solutions of x-dy = 1 in terms of its smallest positive solution.

Unit-III

Algebraic number fields and their rings of integers, Calculations for quadratic and cubic cases, Localization ,Glois extension.

Unit-IV

Dedikind rings, discrete valuation rings completion, unramified and ramified extensions, Different discriminates, cyclotomie fields, roots of unity.

Recommended books:

1. Donald M. Burton : Elementary Number Theory, Allyn and Bacon Inc,
2. Niven& H. S. Zuckerman : An Introduction to the Theory of Numbers,
   Willey eastern India Ltd,
3. Lang, S. : Algebraic Number theory, GTM Vol. 110,
   Springer-Verlag 194.

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Department of Mathematics

ASTRONOMY-II

Unit-I

Parallax: shape of each, geocentric parallax, distance of Moon, Parallax in declination and Hour angle and geocentric parallax in zenith dist, azimuth, right ascension and declination annual parallax in longitude, and latitude, Parallactic angle and stellar parallax in right ascension and declination.

Unit II

The meridian circle: the three errors, Besell's formula, correction for level and collimation error, total correction to the observed time of transit.

Unit III

Kepler's Laws and planetary motion: Various definitions and laws, relation in elliptic motion, anomaly V in terms of eccentric anomaly, true anomaly V in terms of mean anomaly M, Euler's theorem.

Unit IV

Planetary phenomena: Sydereal period and synodic period and their relation, elongation phases of moon, brightness, maximum brightness, Eclipses: Eclipses of moon angular radius of earth's shadow, duration of eclipses, the ecliptic limits, eclipses of sun and their Limits, frequency of eclipse, the metonic cycle,

Proper motions of stars and their relation, tangential velocity and parallax, radial velocity at different epochs, the solar motion and parallactic motion, determination of solar apex form proper motions.

Recommended books:

1. Gorakh Prasad : Astronomy
2. Smart : Astronomy

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Department of Mathematics

Mathematical Modeling in Biology and Medicine
Unit-I

Discrete Population Growth Models Arithmetic Growth Model - Geometric Growth Model - Generalizations - Age Structured Populations.

Unit-II

Continuous Growth Models The Linear Model - The Exponential Model - Model for the Distribution of drugs in the body - Coalition Models.

Unit-III

Continuous Growth Models (contd.) (Environmental Resistance - A Model for the Spread of Technological Innovations - The Gomertz Model - Bertalanffy Growth Model.

Unit-IV

Qualitative behavior of Populations Autonomous Equations - Steady and Equilibrium State - Stability of Equilibrium State - Logistic Model with Harvesting - Fixed Points and their stability - The Logistic Map. Mathematical Models in Epidemiology) Plant Epidemics - Some features of Human Epidemics - A Simple Deterministic Epidemic Model - A more General Epidemic: SIR Disease. Recommended Text: C. R. Ranganathan, A First Course in Mathematical Models of Population Growth (with MATLAB Program), Associated Publishing Company, New Delhi, 2006.

Reference Books:

1. Pundir, Bio Mathematics, A Pragati Edition, 2006.

2. J.N. Kapur, Mathematical Models in Biology and Medicine, Affiliated East-West Press Pvt. Ltd., New Delhi, 1985.

3. Nicolas F. Britton, Essential Mathematical Biology, Springer International Edition, First Indian reprint, 2004.

4. Murray, Mathematical Biology, Springer International Edition, First Indian reprint, 2004

Department of Mathematics

Galois Theory

Unit I

Algebraically closed fields and algebraic closures, The existence of an algebraic closure, The basic isomorphisms of algebraic field theory, Automorphisms and fixed fields, The Frobenius automorphism, The isomorphism extension theorem

Unit II

The index of a field extension, Splitting fields, Separable extensions, Perfect fields, Normal extensions

Unit III

Galois theory - the main theorem of Galois theory, Galois groups over finite fields, Symmetric functions, Cyclotomic extensions, Constructible numbers

Unit IV

The impossibility of certain geometrical constructions, constructible polygons, Subnormal and normal series, the Jordan - Holder theorem, Radical extensions and solution of equation by radicals, The insolvability of the quintic.

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Department of Mathematics

SEMESTER III

MECHANICS

CO-1: Understand the concept of equation of continuity.

CO-2: learn about the concept of rotational and irrational motion.

CO3: Understand the concept of orbit and Kapler's law.

CO-4: Understand the concept of Lorentz transformation.

Unit-I

Hydrodynamics: Lagrange's and Euler's, Methods; Acceleration, Equation of Continuity, Boundary surface, Stream lines, velocity potential.

Unit-II

Euler's dynamical Equations, Bernoulli's Theorem, Lagrange's Equations under conservative forces, and the motion once irrotational is always irrotational.

Unit-III

Central Orbit, Kapler's Law of Planetary motion, Michelson-Morley experiment, Lorentz-Fitgerald contraction, postulates of special theory of Relativity,

Unit-IV

Lorentz transformations, Mass-Energy formula, transformation formulas for momentum and energy, Minkowski's 4-dimensional continuum space, Space like and time like intervals, Relativistic Hamiltonian and Lagrangian.

Recommended books:
1. Gaur, Mathur&Goyal   : Hydrodynamics,
2. Ray, M,   : Dynamics of a particle,
3. Roy & Bali   : Theory of Relativity.
4. Ramsay, A. S.   : A Text book of Hydrodynamics,
5. Ray, M.   : Hydrodynamics,

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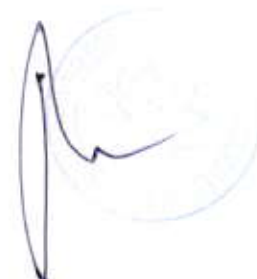
TENSOR ANALYSIS

CO-1: Understand the concept of Tensor and it's properties.

CO-2: Understand the concept of Christoffel symbols.

CO-3: Understand the cncept of Riemannian curvature tensor.

CO-4: Understand the concept of Maxwell's equation.

Unit-I

Tensors; Transformation of coordinates, Contravariant and covariant vectors, second order tensors, higher order tensors, Addition, subtraction and multiplication of tensors, Contraction, Quotient Law, symmetric and skew symmetric tensors: Conjugate symmetric tensors of the second order, Fundamental tensor, and associated tensors.

Unit-II

Christoffel symbols, Transformation law of Christoffel symbols, Covariant differentiation of vectors and tensors, Geodesics, Null Geodesics, Tensor form of gradient, divergence, Laplacian and curl, Intrinsic derivative, Riemannian and Normal Coordinates, Gaussian Coordinates, Parallel transport, Geodesics are auto parallel curves, Parallel propagation.

Unit-III

Riemannian curvature tensor, Symmetric properties of $R_{ljk}{}^{i}$, Covariant curvature tensor R_{hljk}, Number of independent components of R_{hljk} in a V_n, Ricci tensor, Bianchi indentities, Conformal Curvature tensor, Condition for flat space.

Unit-IV

Maxwell's equations in empty space, Transformation of vector and scalar potentials, Transformations of electric and magnetic intensities, Lorentz invariance of Maxwell's equations, Maxwell's equations in Tensor form, Energy momentum tensor for electromagnetic field, Einstein-Maxwell equation in General Relativity.

Recommended books:

1. P. G. Bergman   :   Introduction to Theory of Relativity,
2. J. L. Synge   :   Relativity, The special Theory,
3. B. Spain   :   Tensor Calculus,
4. J.L. Bansal   :   Tensor Analysis,

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5. Roy & Bali   :   Theory of Relativity,
6. Raj Bali   :   Advanced Tensor Analysis.

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Department of Mathematics

NUMERICAL ANALYSIS

CO-1: Apply the knowledge of numerical methods for curve fitting.

CO-2: Understand the concept of Numerical method for solving the differential equation.

CO-3: Understand the concept of solving the BVP using difference methods.

CO-4: Extend the knowledge of students to do research work using hese methods and similar type of other methods.

Unit-I

Curve fitting and Function Approximations: Least square principle, fitting a straight line, exponential functions, parabola and polynomial of nth degree, Approximation of functions by Chebyshev Polynomials.

Unit-II

Numerical Solutions of ordinary differential equations using Taylor series method, Picard's method, Euler's method, modified Euler's method.

Unit-III

Solutions by Runge-Kutta method up to fourth order, solutions by multi step method: Milne's method, Adams Moulton's method, Stability Analysis of Single and Multi step methods.

Unit-IV

Difference method for solving linear boundary value problem of ODE's: Finite difference method and shooting method, Numerical integration by Trapezoidal, Simpson's and Gauss Quadrature rule, Finite Difference scheme for non-linear boundary value problems of the type $y' \Box f(x, y)$,

$y'' \Box (x, y, y')$ and $y^{iii} \Box f(x, y, y', y'')$, $\qquad y^{iv} \Box f(x, y, y', y'' y \Box \Box \Box)$

Recommended books:

1. Jain, Iyenger and Jain : Numerical Analysis,
2. Jain, M. K. : Numerical solutions of differential equation.

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DISCRETE MATHEMATICS-II

CO-1: Learn the concept of Graph theory and tree.

CO-2: Understand the importance of the concepts Matching's and Colourings.

CO-3: Understand the concept of connectivity and network flow.

CO-4: Understand the concepts Planarity.

Unit-I

Graph theory: Definition of (Undirected) graphs, Paths, Circuits, Cycles and Sub graphs, Induced Subgrapha, Degree of vertex, Connectivity, Planer graphs and their properties, Trees: Spanning trees and enumeration, Cut sets, Fundamental cut–sets, and Cycles, Minimal spanning trees and Kruskal's Algorithm.

Unit-II

Matching: Matching and Maximum Matching, Hall's Matching condition, Minimax Theorems, Independent Sets and Covers, Dominating Sets, Euler's theorem on the existence of eulerian paths and circuits, Directed graphs, in degree and out degree of a vertex, Weighted undirected graphs, Dijkstra's Algorithm, Strong connectivity, Directed trees, Search trees, Tree traversals.

Unit-III

Connectivity: Connectivities of graphs, Cut-sets, Edge Connectivity and Vertex Connectivity, Menger's Theorem, Network Flow problem, maximum network flows, flow augmenting paths, Ford-Fulkerson Theorem.

Unit-IV

Coloring of graphs: Chromatic number and chromatic polynomial of graphs, Brook's Theorem, Four Color Theorem, Planarity: Planar Graphs, Testing of Planarity, Kuratowski Theorem for Planar graphs, Random Graphs.

Recommended books:
1 D. B. West, Graph Theory, Pearson Publ. 2002,
2 F. Harary, Graph Theory, Narosa Publ. ND,
3 R. Diestel, Graph Theory, Springer, 2000.

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ELECTIVES FOR SEMESTER III
RELATIVITY and COSMOLOGY

Unit-I

Geodesics, Null Geodesics, Geodesics Coordinates, Equation of Geodesics for the given metric, Riemann christoffel tensors and its significance, Curvature tensor, Ricci-tensor, Bianchi Identity, Principle of covariance, principle of equivalence, Mach- Principle, geodesic postulates, Newton's Potential, Newtonian approximation of relativistic equation of motion, Einstein field equations with derivation and its Newtonian approximation.

Unit-II

Clock paradox, Schwarzchild exterior solution for empty space, singularities and related problems, isotopic form of Schwazchild line element, Energy momentum tensor and its expression for perfect fluid, Principle of covariance, principle of equivalence, condition for flat space time, Newtonian approximation of relativistic equation of motion, Einstein field equations and its Newtonian approximation.

Unit-III

Planetary orbit, Three crucial tests, Advance of perihelian, Gravitational, deflection of light, shift in spectral lines, Weyl postulates, Franhaufer lines, Radar echo delay, Hubble law, Machs principle.

Unit-IV

Static cosmological models of Einstein and De-Sitter, their derivation, properties and comparison with the actual universe, Non static cosmological models, Hubble's law, Weyl's postulate, Derivation of Robertson-Walker Metric, Geometrical features of R-W metric, Surface brightness, source counts, Red shift, Particle and event Horizons, Expressions for FRW model upto non zero pressure.

Recommended books:

1. P. G. Bergman   : Introduction to Theory of Relativity

2. J.L.Synge   : Relativity, The special Theory,

3. B.Spain   : Tensor Calculus,

4. J.L.Bansal   : Tensor Analysis,

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5. J.V.Narlikar   : Lecture on general Relativity,

NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Unit-I

Numerical solutions of parabolic PDE in one space: two and three levels explicit and implicit difference schemes, Convergence and stability analysis.

Unit-II

Numerical solution of parabolic PDE of second order in two space dimension: implicit methods, alternating direction implicit (ADI) methods, Non linear initial BVP.

Unit-III

Difference schemes for parabolic PDE in spherical and cylindrical coordinate systems in one dimension, Numerical solution of hyperbolic PDE in one and two space dimension: explicit and implicit schemes, ADI methods, Difference schemes for first order equations.

Unit-IV

Numerical solutions of elliptic equations, approximations of Laplace and biharmonic operators, Solutions of Dirichlet, Neuman and mixed type problems, Finite element method: Linear, triangular elements and rectangular elements.

Recommended books:
1. M. K. Jain, S. R. K. Iyenger and R. K. Jain, Computational Methods for Partial Differential Equations, Wiley Eastern, 1994,
2. M. K. Jain, Numerical Solution of Differential Equations, 2nd edition, Wiley Eastern,
3. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice-Hall of India, 2002,
4. D. V. Griffiths and I. M. Smith, Numerical Methods of Engineers, Oxford University Press, 1993,
5. C. F. General and P. O. Wheatley Applied Numerical Analysis, Addison- Wesley, 1998.

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INTEGRAL EQUATIONS

Unit-I

Classification, modeling of problems as integral equations, Conversion of initial and boundary value problem into integral equations, Conversion of integral equations into differential equations, Volterra integral equations and their numerical solutions.

Unit-II

Fredholm Integral equations, Fredholm first theorem, Degenerate kernels, symmetric kernels, Hadamard's theorem, Fredholm Integral equation of second kind, Numerical Solutions of Fredholm Integral equations.

Unit-III

Applications of Integral equations: Initial and boundary value problem, Green's function, influence function.

Unit-IV

Singular integral equations: Abel integral equation, Integral equation is an infinite integral, fredholm operation, Cauchy Principal integral, plemelj formula, application of the calculus of residues, Hilbert kernel.

Recommended books:

1. Abdul J. Jerry, Introduction to Integral Equations with applications, Marcel Dekkar Inc. NY,
2. L. G. Chambers, Integral Equations: A short Course, Int. Text Book Company Ltd. 1976,
3. R. P. Kanwal, Linear Integral Equations,
4. Harry Hochsdedt, Integral Equations,
5. Murry R. Spiegal, Laplace Transform (SCHAUM Outline Series), McGraw-Hill.

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ADVANCED TOPOLOGY

Unit-I

Nets and filters: directed set, Net, Limit and cluster point of a net subnet, Filter, Base and sub-base of a filter limit and cluster point of filter, subfilter Characterization of open sets; continuous functions; Hausdroff spaces and compact spaces in terms of nets and filters, The limited equivalence of nets and filters.

Unit-II

Ultra filter, the various sets of necessary and sufficient conditions for a filter to be an ultrafilter, important results on ultra-filter, Embedding and metrization: Evaluation map, Meaning of embedding, embedding lemma; embedding theorem.

Unit-III

Meaning of metrization, Urysohn'sMetrization theorem, Nagata-SmirnowMetrization theorem Compactification: Meaning of compactification, Alexandroff one point compactification, Stone-coach compactification.

Unit-IV

Function space: Meanings of a function space, topology of pointwise convergence or point open topology, topology of compact convergence or compact open topology, topology of uniform convergence on compact spaces, relation between these three properties of Y which a space of functions from a set X to a top space Y possesses.

Recommended books:
1. Thron, W.J.   : Topological Structure,
2. Pervin, V.J.   : Foundations of General Topology,
3. Kelley; J.   : General Topology.

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FINANCIAL MATHEMATICS

Unit-I

Introduction to options and markets: types of options, interest rates and present values, Black Sholes model, arbitrage, option values, pay offs and strategies, putcall parity.

Unit II

Black holes equation, similarity solution and exact formulae for European options, American option, call and put options, free boundary problem.

Unit III

Binomial methods: option valuation, dividend paying stock, general formulation andimplementation, Monte Carlo simulation: valuation by simulation, Lab component: implementation of the option pricing algorithms and evaluations for Indian companies.

Unit IV

Finite difference methods: explicit and implicit methods with stability and conversionsanalysis methods for American options- constrained matrix problem, projected SOR, time stepping algorithms with convergence and numerical examples.

Recommended books:
1. D. G. Luenberger, Investment Science, Oxford University Press, 1998,
2. J. C. Hull, Options, Futures and Other Derivatives, 4th ed., Prentice- Hall, New York, 2000,
3. J. C. Cox and M. Rubinstein, Option Market, Englewood Cliffs, N. J.: Prentice-Hall, 1985. C, P. Jones, Investments, Analysis and Measurement, 5th ed., John Wiley and Sons, 1996.

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FOURIER TRANSFORM AND THEORY OF DISTRIBUTIONS

Unit I

Fourier Transforms in L^1 (-00, 00): Definition and simple properties, Riemann-Lebesgue lemma, inversion formula. Analogues of Dini's and Jordan's tests for convergence-Derivatives and their trans-forms.

Unit II

Uniqueness of a fourier transform, summability theorems, Convolution of two functions and its transform. Analytic functions of Fourier transforms, Fourier Transforms In L^2 (-00,00): Fourier plancherel transform, plancherel's theorems, Parseval's theorem, convolution and its transform.

Unit III

Fundamental sequences, distributions, distributions as a generalization of the notion of functions, Operations on distribution. Derivative of distributions, locally integrable functions as distributions by functions, compositions, Equality of distributions in intervals.

Unit IV

Derivative as the limit of a difference quotient, the value of a distribution at a point, existence theorems for value of distributions, the value of a distribution in infinity, The integral of a distribution, periodic distributions, distributions of infinite order.

Recommended books:

1. Relevant topics form the book : Theory of distributions, The sequential approach by P. Antosik, J. Mikusinaki and R. Sikorski.

2. Elsevier Scientific Publishing Company, Amsterdam, Pwn-Scientific Publishers Warszawa, 1973.

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Operator Theory

Spectral Theory of Linear Operators in Normed Spaces, Spectral Theory in Finite Dimensional Normed Spaces, Basic Concepts, Spectral properties of Bounded Linear Operators, Further Properties of Resolvant and Spectrum, Use of Complex Analysis in Spectral Theory. Banach Algebras, Further properties of Banach Algebra. Gelfard- Naimark theorem.

Recommended Books:

1 E. Kreysyig, Introductory Functional Analysis with Applications, John Wiley and Sons.

2 John B. Coway, A Course in Operator Theory: A Graduate Studies in Mathematics, Springer.

3 G.Bachman, L. Narici, Functional analysis, Academic Press, N.Y.

4 G. F. Simmons, An Introduction to Topology and Modern Analysis, Tata McGrawHill.

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Bio-Mechanics

External Flow: Fluid Dynamic forces acting on moving bodies. Flying and swimming. Blood flow in Heart, Lung, arteries and veins. Micro and Macro Circulation. Respiratory gas flow. The Laws of Thermo dynamics. Molecular diffusion. Mechanism in Membrances and Multiphasic structure. Mass transport in Capillaries, Tissues, Interistitial spaces. Lymphatics, Indicator dilution method and Peristlsis. .

Recommended Books:

1 Y.C.Fung, Bio Mechanics, Springer Verlag, NY 1990.

2 S.I. Rubinow, Introduction to Mathematical Biology, John Wiley, 1975.

4 Riccilardi, Biomathematics and Related Computational Problems, Kluwer Publ. 1988

5 . 4 J. Keener, J. Sneyol, Mathematical Physiology, Springer, 2001

6 5 J.N.Kapoor, Mathematical Models in Biology and Medicine, EWP New Delhi, 1992

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Semester IV

RESEARCH METHODLOGY

Unit 1

Basic concepts of research: Research-definition and types of research (Descriptive vs analytical; applied vs fundamental; quantitative vs qualitative; conceptual vs empirical).Research methods vs methodology, Library research; field research; laboratory research.

Selecting and defining a research problem:

Need for problem formulation, Criteria for selecting a problem. Choosing a Methodology. Evaluating problems. Hypothesis and its Functions

Literature Review in research-its importance and process.

Unit 2

Research Design: Concept and Importance in Research —Features of a good research design — Exploratory Research Design —concept, types and uses, Descriptive Research Designs —concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

Data Collection-Methods of data collection —direct and indirect methods

Data Analysis- Analysis and Interpretation in Quantitative and Qualitative Research.

Unit 3

Data Presentation - Central Tendency and Dispersion, Associations, Tests of Significance.

Interpretation of Data and Paper Writing —Layout of a Research Paper, Journals in Science, Impact factor and other indices of Journals, When and where to publish ?Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

Suggested Readings:

1. Research Methodology-Methods and Techniques By C.R.Kothari-New Age International Publishers, New Delhi
2. Research methodology, a step-by-step guide for beginners by Ranjit kumar,Sage publications
3. Writing and Presenting Scientific Papers, by Birgitta Malmfors, Phil Garnsworthy and Michael Grossman , Nottingham University Press

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ELECTIVES PAPER FOR SEMESTER IV

FRACTIONAL CALCULUS

Unit I

The Riemann Liouville Fractional Calculus: Fractional Integrals of some functions namely binomial function, exponential, the hyperbolic and trigonometric functions, Bessel's functions, Hyper-geometric function and the Fox's H-function.

Unit II

Dirichlet's Formula, Derivatives of the Fractional Integral and the Fractional Integral of Derivatives. Laplace Transform of the Fractional integral, Leibniz's Formula for Fractional Integrals. Derivatives, Leibniz's Formula of Fractional Derivatives.

Unit III

The Weyl Fractional Calculus – Definition of Weyl Fractional Integral Weyl Fractional Derivatives, A Leibniz Formula for Weyl Fractional Integral and simple applications.

Unit IV

Fractional Differential Equations: Introduction, Laplace Transform, Linearly Independent Solutions, Solutions of the Homogeneous Equations, Solution of the Non-homogeneous Fractional Differential Equations, Reduction of Fractional Differential Equations to ordinary differential equations. Semi Differential equations.

Recommended Books:

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FUZZY SETS AND THEIR APPLICATIONS

Unit-I

Basic Concepts of Fuzzy Sets and Fuzzy Logic: Motivation, Fuzzy sets and their representations, Membership functions and their designing, Types of Fuzzy sets, Operations on fuzzy sets, Convex fuzzy sets, Alpha-level cuts, Geometric interpretation of fuzzy sets, Linguistic variables, Possibility measure and distribution, Fuzzyrules, Fuzzy Relations and Fuzzy Arithmetic: Composition of fuzzy relations.

Unit-II

Fuzzy numbers, Arithmetic operations on fuzzy numbers, Fuzzy reasoning Fuzzy mapping rules and fuzzy implication rules, Fuzzy rule-based models for function approximation, Types of fuzzy rule-based models (the Mamdani, TSK, and standard additive models).

Unit-III

Fuzzy Implications and Approximate Reasoning:Fuzzy Logic and Probability Theory: Possibility versus probability, Probability of a fuzzy event, Baye's theorem for fuzzy events, Probabilistic interpretation of fuzzy sets, Fuzzy measure.

Unit-IV

Decision making in Fuzzy environment: Fuzzy Decisions, Fuzzy Linear programming, Fuzzy Multi criteria analysis, Multiobjective decision making, Fuzzy databases and queries: Introduction, Fuzzy relational databases, Fuzzy queries in crisp databases.

Recommended books:

1. J. Yen and R. Langari: Fuzzy Logic: Intelligence, Control, and Information, Pearson Education, 2003,

2. G. J. Klir and B. Yuan: Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice-Hall of India, 1997,

3. H. J. Zimmermann, Fuzzy Set theory and its Applications, Kluwer Academic Publ, 2001.

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INTEGRAL TRANSFORMS

Unit-I

Applications of Laplace transform to the solutions of ordinary differential equations with constant and variable coefficients, Applications to integral equation and simple boundary value problems.

Unit-II

Fourier Transform: Definition and properties of Fourier sine and cosine and complex transforms, Convolution theorem, Inversion theorems and Fourier transform of derivations.

Unit-III

Applications of Fourier transforms to the solutions of partial differential equations, Mellin Transform: Definition and elementary properties, Mellin transforms of derivations, Integrals inversion theorem and convolution theorem.

Unit-IV

Infinite Hankel transform: Definition and Elementary Properties, Hankel transform of derivations, Inversion theorem and parseval theorem, Application to the Solution of simple boundary value problems.

Recommended books:
1. Ranville, E. D.   : Laplace and Fourier Transforms,
2. Sneddon, I. N.   : The use of Integral Transforms,
3. Zemanian, A. H.   : Generalized Integral transforms,
4. Lowit   : Linear Integral equations,
      Goyal, S. P. &Goyal,
5. A.K.   : Integral Transforms.

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COMPUTATIONAL BIOINFORMATICS

Unit-I

Introduction to bioinformatics, Definitions, important contributions, Aim and task of Bioinformatics, Introduction to DNA as information storage molecules for cells.

Unit-II

Data Searches and pair wise alignments: Dot plots, Gaps, Alignment, Dynamic Programming: Needleman and Wunch Algorithm, Global and Local Alignments.

Unit-III

Substitution Patterns: Estimating Substitution Numbers, Phylogenetics: Distance–Based Methods: Phylogenetic trees, Distance Matrix Method, Character Based Methods: Parsimony, Searches, Tree confidence.

Unit-IV

Computer Programming and Data structure: Programming fundamentals, Variables and Basic operations, Control and Looping, Structures, Data structure, Functions, Simple Program Creation in C and Execution, Introduction to Genetic Algorithms: Introduction, Coding of Parameters, Reproduction, Cross Over, Mutation, Simple algorithm at work.

Recommended books:
1. D. E. Krane, Michael L. Raymer, Fundamental Concept of Bio-informatics, Pearson Education Ltd. 2003,
2. T. K. Attwood, D. J. P.Smith, Intoduction to Bio-informatics, Pearson Education Ltd. 2003,
3. Bryan Bergaron, Bio-informatics computing, Pearson Education Ltd. 2003.

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CONTINUM MECHANICS

Unit-I

Cartesian tensors, index notation and transformation, law of cartesian tensors, addition, subtraction and multiplication of cartesian tensor, gradient of a scalar function, divergence of a vector function and curl of a vector function using the index notation, The identity, Stocks Gauss and Green's theorem.

Unit-II

The continuum approach classification of continuous media, Body forces and surface forces, components of stress tensor, force and moment equation of equilibrium, The stress quadric, Principal stresses and Principal axes, stress invariants and the stress deviator tensor, Maximum shearing stress.

Unit-III

Lagrangian and Eulerian description of deformation of flow, The comoving derivative, Velocity and acceleration, the continuity equation, Strain tensors, the linear rotation tensor and rotation vector, Analysis of rotation displacement, Geometrical meaning of the components of the linear strain tensor, Principal axis theory for the linear strain tensor.

Unit-IV

Properties of linear strain tensors, The linear cubical dilation, Compatibility equations for the linear strain components, the rate of strain tensor, the vorticity tensor, the rate of rotation vector and vorticity, Properties of the rate of strain tensor.

Recommended books:
1. Q. Fredenic& T.S. Chang   : Continuum mechanics: Allyn and Bacon, Inc, Boston,
2. Sommer Field A   : Mechanics of Deformable bodies,
3. Mortone E. Gurtin   : An Introduction to Continuum Mechanics (Academic Press),

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MODELING AND SIMULATION

Unit-I

Introduction to modeling and simulation, Definition of System, classification of systems,classification and limitations of mathematical models and its relation to simulation, Methodology of model building Modeling through differential equation.

Unit-II

linear growth and decay models, non linear growth and decay models, Compartment models, Checking model validity, verification of models.

Unit-III

Stability analysis, Basic model relevantto population dynamics, Ecology, Environment Biology through ordinary differential equation, Partial differential equation and Differential equations.

Unit-IV

Basic concepts of simulation languages, overview of numerical methods used forcontinuous simulation, stochastic models, Monte Carlo methods.

Recommended books:
1. D. N. P. Murthy, N. W. Page and E. Y. Rodin, Mathematical Modeling, Pergamon Press,
2. J. N. Kapoor, Mathematical Modeling, Wiley Estern Ltd,
3. P. Fishwick: Simulation Model Design and Execution, PHI, 1995, ISBN 0-13-098609-7,
4. A. M. Law, W. D. Kelton: Simulation Modeling and Analysis, McGraw-Hill, 1991, ISBN 0-07-100803-9,
5. J. A. Payne, Introduction to Simulation, Programming Techniques and Methods of Analysis, Tata McGraw Hill Publishing Co. Ltd,
6. F. Charlton, Ordinary Differential and Differential equation, Van Nostarnd.

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Module Theory

Modules. Linear mapping. Transpose of a module, Homomorphism. Bimodules, Bilinear maps. Tensor product of modules. Exact and split-exact sequences. Small and essential submodules and their properties. Free modules, Projective modules, projective covers. Injective modules and injective envelopes.

Recommended Books :

1 F.W.Anderson and K. R. Fuller, Rings and Categories of Modules. Springer, Verlag.

2 J. Lambek, Lectures on Rings and Modules, Blaisdell Publ. Co.

3 J.S. Golan, Modules and Structures of Rings, Marcel Dekkar Inc.

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Cryptography

Unit-I

Time estimates for doing arithmetic. Divisibilty and Euclidean algorithm. Congruencies. Some applications to factoring. Finite Fields and quadratic residues:

Unit-II

Finite Fields, Quadratic Residues and Reciprocity. Cryptography: Some simple crypto Systems. Enciphering matrices. Public Key: The Idea of Public key Cryptography.

Unit-III

RSA. Discrete log. Knapsack. Zero-knowledge protocols and Oblivious Transfer.

Unit-IV

Pseudo Primes, Rho Method, fermat factorization and Factor bases.

Recommended Books:

1. Neal Koblitz, A Course in Number Theory and cryptography: A Graduate Text, Springer (Second Ed).