RAJAH SERFOJI GOVERNMENT COLLEGE (AUTONOMOUS), THANJAVUR-5

PG AND RESEARCH DEPARTMENT OF MATHEMATICS

Minutes of the Board of Studies Meeting

Date: 05.01.2021

Time: 2:00 PM

Venue: Room No.:62, Staff Room, Department of Mathematics

Resolutions Passed

The committee completely revised syllabus for UG, PG and M.Phil., Mathematics courses and passed the following resolutions.

1. To rectify the new theory paper entitled "Advanced Mathematics" instead of the theory paper "Stochastic processes and Graph Theory" for M.Phil., Students from 2018-19 onwards.
2. To rectify the revised syllabus of the Non-Major Elective Theory paper entitled "Graph Theory" for III year B.Sc., physics students as specified in the enclosure.
3. Resolved to follow the content of the remaining papers as it is.

MEMBERS PRESENT

1. Dr. S. CHANDRASEKARAN (University Representative)
2. Dr. C. DURAIRAJAN (Subject Expert)
3. Dr. Ke. SATHAPPAN (Subject Expert)
4. Dr. G. NIRMALA (Alumini)

Dr.S.Chandrasekaran
Associate Professor and Head
PG & Research Department of Mathematics
Research Advisor(9606/Maths/R.A/9.5.12/Bharathidasan)
Khadir Mohideen College,Adirampattinam-614 701

5. Dr. A. SAIVARAJAN (Chairman)		
6. Prof. V. RAJAM	Assistant Professor	
7. Dr. K. ELANGOVAN	Assistant Professor	
8. Dr. P.GOMATHISUNDARI	Assistant Professor	
9. Prof. K. RATHIKA	Assistant Professor	
10. Prof. SUGANTHI MARIYAPPAN	Assistant Professor	
11. Dr. N. RAJESH	Assistant Professor	
12. Prof. K.S.KRISHNA MOHAN	Assistant Professor	
13. Dr. K. MUTHU GURU PAKKIAM	Assistant Professor	
14. Dr. B. MOHAMED HARIF	Assistant Professor	
15. Dr. P. SENTHIL KUMAR	Assistant Professor	
16. Dr. R. THANGAPPAN	Assistant Professor	
17. Dr. S. SHANMUGA PRIYA	Assistant Professor	
18. Dr. S. ANBALAGAN	Assistant Professor	

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA1	Research Methodology	6	4	English

Course objectives : The main purpose of this course is to help researchers and students of the science in our discipline to prepare manuscripts that will have a high probability of being accepted for publication and of being completely understood when they are published.

UNIT I: Learning in higher education: Learning Hierarchy – Information Processing – Learning Events – Learning Outcomes – Motivation. Teaching technology –Designs: Technology – Teaching Technology – Instructional Technology and Education Technology – Instructional Designs – Combination of Teaching Strategies and Instructional Designs.

UNIT II: Teaching technology large groups: Psycho – Dynamics of Group Learning – Lecture Method – Modified Forms of Lecture – Seminar – Symposium – Panel Discussion – Team Teaching – Project Approach – Workshop. Teaching in small groups: Small Group Instruction – Group Discussions – Simulation Approach – Role Playing - Buzz Group Technique – Brainstorming – Case Discussions – Assignment.

UNIT III: Class room management: Teacher and Class Room Management – Class Room Management: A Conceptual Analysis – Discipline – A component of Class Room Management – Strategies for Class Room Management – Behavior Problems of Students in Colleges – Human Relations in Educational Institutions. Professional Growth: Need and Importance of Professional Growth – Professional Ethics.

UNIT IV: Communication skills: Introduction to life skills – Communication – Emotional – Functional – Personality skills. Public speaking – Welcome speech- Introducing guests – Vote of Thanks – Speech on current topics like use of cell phones, beauty contests, pollution etc., Personality Development Soft skills – Body language – Goal setting – Positive attitude – Emotional intelligence, leadership qualities – Problem solving Conversation in selected context – Introduction, permission, request, offer, greetings, sympathy, apology, suggestion, permission, telephonic conversation, compliant, warning, gratitude. Communication for career – Preparation – Resume- Group Discussion - Interview – standard, Panel, walk-in, group, stress, mock interview (practice)

UNIT V: Introduction – Bibliographies and catalogues – Journals for the history of Mathematics- Books and editions –Libraries and catalogues – Manuscripts and Archives Societies – the open.

Text Books

1. E .C. Vedanayagam, Teaching Technology For College Teachers, Striling Publishers Private Limited (1988).
UNIT I: Chapter 2 and 3
UNIT II: Chapter 4 and 5
UNIT III: Chapter 8 and 12

2. K. Alex, Soft Skills, S. Chand & company Ltd., New Delhi, First Edition (2009).
UNIT IV: Chapter 1 (Sec 1.1 - 1.4, 1.6 - 1.6.5)

3. A.R.Darling, Use of mathematical Literature, Butter worth's and Co-London (1977).
Unit V: Chapter 5 (page no.60 to 75)

References

1. Cheryl Hamilton, Communicating for results, Wads Worth cenage learning, Ninth Edition, USA (2005).

2**.** LeenaSen, Verbal and non verbal communication, Eastern Economy Editions, Prentice Hall of India Learning, SecondEdition (2011).

3. S.A.W.Bukari, Soft Skills Competencies for Success, Sanjee Book House, Trichy (2009).

Course Outcomes : Make use of variety of Teaching - learning strategies, Instructional Designs in higher education. Apply the domain knowledge of teaching and technology in Lecture, Seminar, Symposium, Panel Discussion, Team Teaching, Project and workshop. Identify the effective teaching methods for classroom management. Demonstrate pursuit of knowledge as a character formation and interpersonal skills.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Semester	Subject Code	Title of the Paper	Hours/ Week	No. of Credits	Medium of instruction
I	S1MMA2	Advanced Mathematics	6	4	English

Course objectives: Understand the concept of Galois theory and its applications to solve model real world problems. Learning about the topology maps and its convergence to do computational exercise. Master the skills of reasoning about Groupoids, group of sphere and homotophy groups. Understand the definition of branching process in a particular markov process.

UNIT I: Galois theory: independence of characters- Galois Extensions- The Fundamental Theorem of Galois Theory- Applications - Galois's Great Theorem.

UNIT II: Spaces of Maps: The space Map(X, Y) – Admissible topologies-Maps on topological products- Injection and Projections – Topology of Uniform convergence.

UNIT III: Fundamental Groups: Equivalence classes of paths – Groupoids – Fundamental Groupoids – Induced Homomorphisms - Fundamental groups of spheres - Higher homotophy groups.

UNIT IV: Branching Processes – properties of Generating Functions of Branching Processes – Probability of extinction – Distribution of the Total Number of Progeny – conditional limit Laws- generalizations of the Classical Galton –Watson Process.

UNIT V: Graph Coloring: Vertex Colorings- Critical Graphs- Triangle-Free Graphs, Edge Colorings of Graphs – Chromatic Polynomials

Text Books

1. Joseph Rotman, Galois theory, second edition, Springer(1998). Unit I: (Sec 14 – 18)

2. Elements of General Topology,Sze-Tsen Hu, Holden – Day,Inc

Unit II: Chapter 5 (Sec 1 - 5)
Unit III: Chapter 6 (Sec 1 - 6)

3. Stochastic Processes, J.Medhi, New Age International Publishers, New Delhi, - Second Edition. Unit IV: Chapter 9 (Sec 9.1- 9.6)

4. A Text Book of Graph Theory, R. Balakrishnan and K. Ranganathan, Springer, New Delhi.

Unit V: Chapter 7 (Sec 7.1-7.4, 7.7)

Signature of the HOD

References

1. I. N .Herstein, Topics in Algebra, John Wiley & Sons, 2^{nd} Edition.
2. George L. Cain, Introduction to General Topology, Addison – Wesley Publishing Company.
3. Oliver Knill, Probability and Stochastic processes with Applications, Overseas Press, 2009.

4. V.K. Balakrishnan, Theory and problems of Graph Theory, Schaum's outline series, McGraw Hill, New Delhi.

5. Introduction to Graph Theory, Douglas B. West, PHI Learning Private Limited, New Delhi.

Course outcomes: Use computational techniques and algebraic skills essential for the study of Galois theory and its Applications. Analysis and construct mathematical arguments that relate to the study of groups. Demonstrate an understanding of the concept of topological maps and familiarity with the range of Examples. Classifying a branching process according to where it operation its or discrete time whether it has a continues or discrete state space and give examples of the process. Graph coloring provides a helpful tool or quantity and simplify the many moving parts dynamic systems.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MPTL3	Teaching and Learning Skills	6	4	English

Course objectives: Acquaint different parts of computer system and their functions. Develop skills of ICT and apply then in teaching learning content and research.Understand the terms communication technology and computer mediated teaching and develop Multimedia / e-content in the respective subject. Develop different teaching skills for putting the content across to targeted audience.

UNIT I: Computer application skills – computer system: characteristic, parts and their functions. Different generations of computer information and communication technology (ICT): Definition, meaning, features, trends, integrations of ICT in teaching and learning – ICT applications: using word processors, spread sheet, power point slides in the class room – ICT for research : online journals, e-books, courseware, tutorials, technical reports, thesis and dissertations.

UNIT II: Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

UNIT III: Communication Technology : Bases, trends and developments – skills of using communication technology. Computer mediated teaching: Multimedia, E-content – satellites based communication : EDUSAT and ETV channels, communication through web : audio and video applications on the internet, interpersonal communication through the web.

UNIT IV: Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion – Models of teaching : CAI, CMI and WBI.

UNIT V: Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills

Text Books

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi.
2. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh

3. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
4. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
5. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
6. Michael,D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.
7. Pandey,S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
8. Ram Babu,A abd Dandapani,S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
9. Singh,V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.

Course outcomes: After completing the course the students will: Develop skills of ICT and apply them in teaching learning content and research. Appreciate the role of ICT in teaching learning and research. Learn how to use instructional technology effectively in a classroom. Develop different teaching skills for putting the content across to targeted audience. Have the ability to use technology for assessment in a classroom.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4A	Queuing and Reliability Modeling	6	4	English

Course objectives: To understand the significance of advanced queuing models. A course in reliability help in probabilistic modeling of the reliability of systems with components and Modeling of reliability of individual components based on lifetime data.

UNIT I: Queuing Systems: Queuing Processes – Poisson Arrivals, Exponential Service Times – General Services Times Distributions – Variations and Extensions – Open Acyclic Queuing Networks – General Open Networks.

UNIT II: Component Reliability and Hazard Models: Introduction – Component Reliability From Test Data – Mean Time to Failure Time – Dependent Hazard Models – Filed – Data Curves – Constant – Hazard Model – Linear Hazard Model – Non-Linear Hazard Model – Gamma Model – Other Model – Stress – Depend Hazard Models.

UNIT III: System Reliability Models: Introduction – System with Components in series – System with Parallel Components – K-Out – of – M System – Non series – Parallel Systems.

UNIT IV: Maintainability and Availability Concepts: Introduction – Maintainability Function – Availability Function – Frequency of Failure – Two – Unit Parallel System with Repair – System Reliability – System Availability.

UNIT V: Human and Medical Device Reliability: Introduction – Human and Medical Device Reliability Terms and Definitions – Human Stress – Performance Effectiveness , Human Error Types , and Causes of Human Error – Human Reliability Analysis Methods – Probability Tree Method – Fault Tree Method – Markov Method – Human Unreliability Data Source – Medical Device Reliability Related facts and Figures – Medical Device Recalls and Equipment Classification – Human Error in Medical Devices – Tools for Medical Device Reliability Assurance – General Method – Failure Models and Effect Analysis – Fault Tree Method – Markov Method – Data Sources for Performing Medical Device Reliability Studies – Guidelines for Reliability Engineers with respect to Medical Devices

Text Books

1. Howard M. Taylor , Samuel Karlin , " An Introduction to Stochastic Modeling" Third Edition, Academic Press – San Diego London Boston – New York Sydney Tokyo Toronto.
2. Balagurusamy E, " Reliability Engineering" , Tata Mc Gram Hill Publishing Company Limited , New Delhi, 1984.

Course outcomes: The successful completion of the course, student will be able to : The required mathematical support in real life problems and develop probabilistic models which can be used in several areas of mathematics.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4B	Modern Topology	6	4	English

Course objectives: To understand the concept of compact and Euclidean spaces, hyperspaces, Multifunctions and topological Dimensions

UNIT I: Sequences- Sequences and Compact Spaces - Nets.

UNIT II: Complete Pseudometric Spaces: Cauchy Sequences and Complete Spaces - Baire Category Theorem – uniform Continuity – Completion of a pseudometric Space – Banach Fixed Point Theorem.

UNIT III: Euclidean Spaces: Euclidean n- spaces – Space-Filling Curves - Pseudonorms – Spheres.

UNIT IV: Hyperspaces and Multifunctions: Hyperspaces –Quotient Spaces and Hyperspaces – The Hausdorff Metric – Multifunctions – Functions Induced by Multifunctions.

UNIT V: Dimension: Topological Dimension – Dimension of Subspaces – Dimension in R^n – Hausdorff Dimension.

Text Book

George L. Cain, Introduction to General Topology, Addison – Wesley Publishing Company.

Unit I: Chapter 7 (Sec 7.1 to 7.3)
Unit II: Chapter 8 (Sec 8.1 to 8.5)
Unit III: Chapter 9 (Sec 9.1 to 9.4)
Unit IV: Chapter 11 (Sec 11.1 to 11.5)
Unit V: Chapter 12 (Sec 12.1 to 12.4)

Course Outcomes: The successful completion of the course, student will be able to : understand the concepts of sequence and compact spaces, uniform continuity, space filling curves etc. Knowing the various topological dimensions.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4C	Advanced Graph Theory	6	4	English

Course objectives: To enable the students to acquire the knowledge and proof techniques in matching, planar graphs, labeling and dominations in graph.

UNIT I: Matchings – System of Distinct Representatives and Marriage Problem – Covering – 1 – Factor – Stable Matchings.

UNIT II: Independence: Independence and Covering- Edge colouring –Vizing's Theorem - Vertex colouring –uniquely colourable Graphs- critical Graphs.

UNIT III: Planar Graphs: Planar Embedding - Euler's Formula – Maximal Planar Graphs – Geometric Dual – Characterisations of Planar Graphs.

UNIT IV: Labelings: Predecessor and Successor – Algorithm – Graceful labeling – Sequential Functions – Application- Magic graphs – Conservative graphs.

UNIT V: Domination: Domination Number –Minimal Dominating Sets – Independent Dominating Sets – Bounds for the Domination Number – Global Dominating Sets – Total Domination – Connected Domination.

Text Book

Topics in Graph Theory and Algorithms, M.Murugan, Muthali Publishing House, Chennai.

Unit I: Chapter 6 (Sec 6.1 – 6.5)
Unit II: Chapter 7 (Sec 7.1, 7.2, 7.4 – 7.7)
Unit III: Chapter 8 (Sec 8.1 – 8.5)
Unit IV: Chapter 10 (Sec 10.1 – 10.7)
Unit V: Chapter 11 (Sec 11.1 – 11.7)

Reference

Introduction to Graph Theory, Douglas B. West , PHI Learning Private Limited, New Delhi.

Course outcomes: Upon successful completion of this course, student will be able to : Understand the concept in matching, independence and covering. Knowing the proof techniques in labeling and dominations.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4D	Metric Topology	6	4	English

Course objectives: To comprehend high levels of abstraction in the study of mathematics.

UNIT I: Metric Contraction Principles - Banach's Contraction Principle- Further extensions of Banach's Principle - The Caristi-Ekeland Principle - Equivalents of the Caristi-Ekeland Principle.

UNIT II: Set-valued contractions -Generalized contractions – Hyper convex Spaces - Introduction – Hyper convexity- Properties of hype rconvex spaces.

UNIT III: A fixed point theorem - Structure of the fixed point set - Uniform normal structure- Uniform relative normal structure-Quasi-normal structure - Stability and normal structure.

UNIT IV: Continuous Mappings in Banach Spaces - Brouwer's Theorem - Further comments on Brouwer's Theorem - Schauder's Theorem - Stability of Schauder's Theorem.

UNIT V: Banach algebras: Stone Weierstrass Theorem - Leray-Schauder degree - Condensing mappings - Continuous mappings in hyper convex spaces.

Text Book

Mohamed A. Khamsi, W.A. Kirk., An introduction to metric spaces and fixed point theory, John Wiley & Sons, 2001.

References

1. Ravi P. Agarwal, Maria Meehan, DonalO'Regan, Fixed point theory and applications, Cambridge University Press 2004.
2. Kim C. Border, Fixed point theorems with applications to economics and game theory, Cambridge University Press, 1999.

Course Outcomes: Examine how the study of fixed point theory helps to solve problems which are theoretical as well as practical and Realize contraction, contractive maps have elegant results on the existence and uniqueness of fixed points. Analyze the theory of non-expansive fixed point theorems and understand the geometry of the spaces involved. Describe the generalizations of Brouwer's fixed point theorem, viz., Schauder and the use of it in analysis and differential equations. Recognize the ideas behind Applications to Michael's selection theorem.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4E	Fuzzy Mathematics	6	4	English

Course objectives: To comprehend high levels of abstraction in the study of mathematics.

UNIT I : Fuzzy sets- Height of Fuzzy set – Normal and Subnormal fuzzy sets- Support level sets – Fuzzy points - Cuts

UNIT II: Standard fuzzy operations- Union, intersection and complement – Properties – DeMargan's Laws

UNIT III: α cuts of fuzzy operations – Representations of fuzzy sets – Image and inverse of fuzzy sets

UNIT IV: Various definitions of fuzzy operations – Generalizations – Fuzzy relations – α cuts of fuzzy relations

UNIT V: Fuzzy sub groups- Intersection and α cuts of fuzzy subgroups

Text Book

M.Mrugalingam, S.Palaniammal, Fuzzy Algebra, Sivam Publications, Vickramasingapuram (2006).

Reference

George J.Klir and Bo Yuan, Fuzzy Sets and fuzzy Logic Theory and Applications, Prentice Hall of India (2004).

Course Outcomes: Recognize the concept of fuzzy sets and their properties. Apply the domain knowledge for Standard fuzzy operations and DeMargan's Laws in fuzzy sets. Build the domain knowledge for the Representations of fuzzy sets, Image and inverse of fuzzy sets. Analyze the various definitions of fuzzy operations and fuzzy relations. Show the concept of Fuzzy sub groups.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4F	Mathematical Modeling And its Applications	6	4	English

Course objectives: Critical understanding of the differential equation methods in mathematical biology. Exposure to specialized mathematical and computational techniques which are required to study ordinary differential equations that wise in mathematical biology. Develop and analyze production and inventory planning/control systems and scheduling techniques by using mathematical techniques for a complete production facility. To understand the new technologies with mathematical model HUB equations.

UNIT I: Continuous population models for single species: Continuous growth models – Insect outbreak model: spruce budworm – delay models –linear analysis of delay population models: Periodic solutions – delay models in physiology: Periodic dynamic diseases: Harvesting a single natural population – Population model with age distribution.

UNIT II: Models for Interacting Populations : Predator – Prey models : Lotka – volterra systems – complexity and stability – realistic predator – prey models –analysis of predator – prey model with limit cycle periodic behavior: Parameter domains of stability – competition models : Competitive exclusion principle – mutualism of symbiosis – general models cautionary remarks – threshold phenomena – discrete growth models for interacting populations –predator prey models :Detailed analysis.

UNIT III: Production Planning and Inventory: The model – viscosity solutions of the HJB equations – classical solutions – optimal production planning .

UNIT IV: Optimal consumption / Investment Models: The model HARA utility –HJB equations – optimal policies.

UNIT V: Optimal exploitation of renewable resources: The model – viscosity solutions of HJB equations – concavity and regularity – optimal exploitation - examples.

Text Books

1. J .D. Murray, Mathematical Biology 1 An introduction, Third Edition , Springer, 2001.
2. Hiroaki Morimoto, Stochastic control and mathematical modeling, First Edition, Cambridge University Press, 2010.

References

1. J.D. Murray, Mathematical Biology 2 Spatial Models and Bio Medical Applications, Third Edition, Springer, 2003.
2. J.P. Aubin, Mathematical methods of Game and Economic Theory, Amsterdam: North Holland, 1979.

Course outcomes: At the end of the course, students should Have an enhanced knowledge and understand of mathematical modeling and statistical methods in the Analysis of biological systems. Be able to analysis dater from experiments and draw sound conclusion about the underlying processes using their understanding of mathematics. Applying mathematics equations and find the benefits of production planning.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD

Semester	Subject Code	Title of the Paper	Hours/ Week	No.of Credits	Medium of instruction
I	S1MMA4G	Fuzzy Algebra and its Applications	6	4	English

Course objectives: To learn the fuzzy set and differentiate with script set. To understand the operations of fuzzy sets. To study the research concepts regular, schur compliment of block fuzzy matrices and their applications.

UNIT I: Fuzzy Set Theory: Fuzzy sets - Fuzzy set: definition - Different Types of Fuzzy sets - General Definitions and Properties of Fuzzy Sets – Other Important Operations - General Properties: Fuzzy Vs Crisp.

UNIT-II: Operations on Fuzzy Sets: Introduction - Some Important Theorems - Extension Principle for Fuzzy Sets - Fuzzy Compliments – Further Operations on Fuzzy Sets.

Unit III: Regular Matrices – Semi-Inverse – Minimum Norm g-inverses, Least Square g-Inverses and Moore-Penrose Inverse – Characterization of set of g-inverses – Spectral Inverses.

Unit IV: Schur Complements in Block Fuzzy Matrices – Regular Block Fuzzy Matrix – Generalized Inverse Formulae for Block Fuzzy Matrices.

Unit V: Applications of Fuzzy Matrices: Document Retrieval System – Medical Diagnosis – Decision Making.

Text Books

1. Pundir and Pundir, Fuzzy sets and their Applications, A Pragati Edition, (2006).
2. H. J. Zimmermann, Fuzzy set theory and its applications, Springer Fourth Edition(2001).
3. AR Meenakshi, Fuzzy Matrix Theory and Application, MJP Publication (2008).

Course outcomes: Knowing some of the research topics in fuzzy algebra. Enrich the knowledge in algebraic properties of fuzzy algebra and its applications.

Question Paper Pattern

Maximum Marks: 75 Examination Duration: 3 Hours

Part A : $10 \times 2 = 20$ (Two Questions from each unit)
Part B : $5 \times 5 = 25$ (Either / Or type – One question from each unit)
Part C : $3 \times 10 = 30$ (Three out of Five - One question from each unit)

Signature of the HOD