SCHEME & SYLLABUS

Ph. D

Sant Baba Bhag Singh University
Khiala, Padhiana, Jaladhar, Punjab, India
2017

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38.	Mathematics-I	MAT907	42	I
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40.	Lattice Dynamics	PHY903	44	I
41.	Nuclear and Radiation Physics	PHY905	45	I
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Course Scheme for Ph.D

S No.	Sub Code	Subject Name	Contact Hour (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
Paper-I (Compulsory for all)						
1	RM901	Research Methodology	4:0:0	4:0:0	4	4
Paper-II (Departmental 1)						
2		Department Specific-I	4:0:0	4:0:0	4	4
Paper-III (Departmental 2)						
3		Department Specific-II	4:0:0	4:0:0	4	4
Paper-IV(Based on Paper II or III)						
4	RLS902	Ph.D- Review of Literature and Seminar	4:0:0	4:0:0	4	4

Paper-II and III (Department Specific)

1	BT903	Biotechnology	4:0:0	4:0:0	4	4
2	BT905	Fermentation Technology	4:0:0	4:0:0	4	4
Chemistry						
3	CHM903	Macromolecular Science	4:0:0	4:0:0	4	4
4	CHM905	Advanced Spectroscopic and Instrumental Techniques	4:0:0	4:0:0	4	4
Computer Applications /Computer Science & Engineering						
6	CSA903	Advances in Semantics Techniques	4:0:0	4:0:0	4	4
7	CSA905	Digital Image Processing	4:0:0	4:0:0	4	4
8	CSA907	Advancements in Natural Language Processing	4:0:0	4:0:0	4	4
9	CSA909	Cloud Computing	4:0:0	4:0:0	4	4
10	CSA911	Network Security	4:0:0	4:0:0	4	4
Education						
11	EDU903	Comprehensive Study of Education	4:0:0	4:0:0	4	4
12	EDU905	Teacher Education	4:0:0	4:0:0	4	4
Electrical Engineering /Electronics and Communication Engineering						
13	EE903	Computing Techniques for Biomedical Research	4:0:0	4:0:0	4	4
14	EE905	Biomedical Instrumentation and Measurements	4:0:0	4:0:0	4	4
15	EE907	Advanced Wireless Communication	4:0:0	4:0:0	4	4
16	EE909	Digital Image Processing	4:0:0	4:0:0	4	4
English						
17	ENG903	Indian Writing in English	4:0:0	4:0:0	4	4
18	ENG905	Literary Criticism and Critical Approaches	4:0:0	4:0:0	4	4
Physical Education						

19	PED903	Tests and Measurements & Research Method	4:0:0	4:0:0	4	4
20	PED905	Sports Psychology	4:0:0	4:0:0	4	4
21	PED907	Exercise Physiology	4:0:0	4:0:0	4	4
22	PED909	Sports Anthropometry	4:0:0	4:0:0	4	4
Punjabi						
23	PBI903	Punjabi-I (pMjwbI swihq dw ieiqhws)	4:0:0	4:0:0	4	4
24	PBI905	Punjabi-II (AwDuink pMjwbI kwiv)	4:0:0	4:0:0	4	4
Commerce and Management						
25	MNG903	Recent Trends in Commerce & Management	4:0:0	4:0:0	4	4
26	MNG905	Contemporary Issues in Finance and Accounting	4:0:0	4:0:0	4	4
27	MNG907	Contemporary Issues in Marketing Management	4:0:0	4:0:0	4	4
28	MNG909	Contemporary Issues in Human Resource Management	4:0:0	4:0:0	4	4
Zoology						
29	ZOO903	Research Techniques in Biological Sciences	4:0:0	4:0:0	4	4
30	ZOO905	General and Applied Entomology	4:0:0	4:0:0	4	4
Botany						
31	BOT903	Bioinstrumentation	4:0:0	4:0:0	4	4
32	BOT905	Plant Biochemistry	4:0:0	4:0:0	4	4
Environmental Sciences						
33	EVS903	Instrumentation in Lifesciences	4:0:0	4:0:0	4	4
34	EVS905	Basic and Applied Concepts in Environmental Science	4:0:0	4:0:0	4	4
History						
35	HIS903	History and Historical Method	4:0:0	4:0:0	4	4
36	HIS905	Indian History: Approaches and themes	4:0:0	4:0:0	4	4
Mathematics						
37	MAT903	Application of Differential Equation in Cosmology	4:0:0	4:0:0	4	4

38	MAT905	Statistical Techniques	4:0:0	4:0:0	4	4
Physics						
39	PHY903	Lattice Dynamics	4:0:0	4:0:0	4	4
40	PHY905	Nuclear and Radiation Physics	4:0:0	4:0:0	4	4
Mechanical Engineering						
41	ME903	Advanced Manufacturing Technology	4:0:0	4:0:0	4	4
42	ME905	Operations Management	4:0:0	4:0:0	4	4

Paper-I (Compulsory for all)

Subject Code: RM901	Research Methodology

UNIT-I

Objectives and Types of Research: Motivation and objectives – research methods vs. Methodology. Types of research – Descriptive vs. Analytical, applied vs. Fundamental, Quantitative vs. Qualitative, and Conceptual vs. Empirical.

UNIT-II

Research Formulation: Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review– Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

UNIT-III

Research Design and Methods: Research design – Basic Principles- Need of research design — Features of good design – Important concepts relating to research design – Observation and Facts. Prediction and Explanation. Developing a research plan. Data Collection and analysis: Execution of the research - observation and Collection of Data Analysis with Statistical Packages - Hypothesis-testing - Generalization and Interpretation.

UNIT-IV

Reporting and Thesis Writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes – Oral presentation – Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective communication. Application of Results and Ethics - Copy right – royalty - Intellectual property rights and patent law –Plagiarism - Citation and acknowledgement.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
	An introduction to Research Methodology	Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K.	RBSA Publishers
	Research Methodology: Methods and Techniques	Kothari, C.R.,	New Age International
	Research Methodology	Sinha, S.C. and Dhiman, A.K	Ess Ess Publications
	Research Methods: the concise knowledge base	Trochim, W.M.K	Atomic Dog Publishing
	Law relating to patents, trade marks, copyright designs and geographical indications	Wadehra, B.L	Universal Law Publishing

Biotechnology
Paper-II (Departmental I)

Subject Code: BT903	Biotechnology

UNIT-I

Advanced Tools & Techniques Electrophoresis, HPLC, Microscopy, PCR, Biosensors: Types, Application of biosensor, Protein sequencing, DNA sequencing, Radioisotope Techniques

UNIT-II

Quantitative Data Analysis Measures of variability: Standard Deviation, Standard Error, Coefficient of Variation, Correlation and Regression, Test of Significant: t-test, chi-square test, Frequency distribution: Binomial and normal distribution

UNIT-III

Scientific Writing: An Insight into Research: Definition and basic concepts, objectives, significance and techniques of research, finding research materials – literature survey, compiling records. Definition and kinds of scientific documents – research paper, review paper, book reviews, theses, conference and project reports (for the scientific community and for funding agencies).Components of a research paper– the IMRAD system, title, authors and addresses, abstract, acknowledgements, references, tables and illustrations. Dealing with publishers – submission of manuscript, ordering reprints. Oral and poster presentation of research papers in conferences/symposia. Preparation and submission of research project proposals to funding agencies

UNIT-IV

Research Techniques: Enzyme assay, enzyme activity and specific activity determination. Cell disintegration and extraction techniques, separation of proteins by fractionation (ammonium sulphate, organic solvents). Ion exchange chromatography, molecular sieve chromatography, affinity chromatography, paper chromatography, thin layer chromatography, ultra-filtration, Ultracentrifugation. Gel electrophoresis, isoelectric focusing and immunoelectrophoresis, capillary electrophoresis, pulse field electrophoresis.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1.	Biostatistics: A foundation for Analysis in the Health Science	Wayne W. Daniel	Wiley Series in Probability and Statistics
2.	Introductory Statistics	Prem S. Mann	John Wiley and Sons
3.	Bioinformatics Methods and Applications Genomics, Proteomics, and Drug Discovery	Rastogi et al.	
	Introduction to Bioinformatics	Atwood, T. K. and Parry-Smith,	
	Protein Purification by Robert Scopes	Robert Scopes	Springer Publication

Biotechnology
Paper-III (Departmental II)

Subject Code: BT905	Fermentation Technology

UNIT-1

Medium formation & Raw material Isolation and screening of industrially useful microorganisms Strain Improvement Methods of measuring process variation Control system Computer application in fermentation technology

UNIT-2

Various Design and types of fermentors & Bioreactor; Aeration and agitation, oxygen transfer rate, heat control; Batch, fed-batch and continuous culture operations; Starter culture, its importance and preparation; Mass transfer bioprocess Scale up bioprocess

UNIT-3

Extraction and separation techniques; Cell disruption – disintegration, Flocculation & Floatation, Filtration, Centrifugation, Distillation; Enrichment of product by: Thermal process, Membrane filtration and dialysis, Freeze concentration, Chromatographic methods, Purification: Crystallization and drying; Bioassay and fermentation economics

UNIT-4

Alcohol Fermentation Organic acids (Gluconic acid & Citric acid) Vitamins (Vit. B12) Amino acids (Lysine & Glutamic acid) Single cell protein Antibiotics (Penicillin & streptomycin) Enzyme (Amylase, Protease & lipase)

Text /Reference Book:

S. No	Name	Author(S)	Publisher
1.	Principles Of Fermentation Technology Paperback – 2008	by P F Stanbury Dr. A Whitaker (Author)	Elsevier; 2 edition (2008)
2.	Bioprocess Engineering Principles Paperback – 2009	by Pauli. M (Author)	Elsevier (2009)
3.	Bioprocess Engineering Principles Paperback – 2012 by Doran (Author)		Elsevier; Second edition (2012)

Chemistry

Paper-II (Departmental I)

Subject Code: CHM903	Macromolecular Science

Unit-I

Introduction: Basic concepts, nomenclature, Classification and characteristic of polymers, (tacticity, Monomers, repeat units, functionality), Effects of polymer structure on its physical, chemical and mechanical properties, importance of polymers.
Polymerization Techniques: Types of polymerization, degree of polymerization, different types of initiators, polymerization in homogeneous and heterogeneous systems and Polymerization mechanisms i.e. free radical, cationic, anionic and co-ordination polymerization and their applications in different fields.

UNIT-II

Polymer Processing: Introduction to plastics, elastomers and fibers. Constituents of plastics – binders, fillers, dyes and pigments, plasticizers, lubricants and catalysts. Fabrication of plastic articles – casting, blowing, extrusion, lamination and moulding: cold moulding, compression moulding, injection moulding and transfer moulding.
Structure and Properties: Morphology and order in crystalline polymers - configurations of polymer chains, crystallinity , stress-strain behaviour : strain – induced morphology, crystallization and melting, Thermal behaviour polymer structure-property relationship and polymer degradation.

UNIT-III

Polymer Characterization: Polydispersion: Average molecular weight concept - number, weight and viscosity average molecular weights. Various methods for the determination of molecular weights. Measurement of molecular weights - viscosity, light scattering, osmotic and ultracentrifugation methods. Analysis and testing of polymers – chemical analysis of polymers, spectroscopic methods, X- ray diffraction studies, scanning electron microscopy (SEM), transmission electron microscopy (TEM) and atomic force microscopy (AFM). Thermal analysis of polymers – TGA/DTA/DTG, tensile strength. Fatigue, impact resistance, wear resistance, hardness and abrassion resistance.

UNIT-IV

Composites and Biocomposites: Introduction, classification, different types of reinforcing materials and their applications, failure modes, advantages and applications. **Commercial Polymers:** Polyethylene, Polyvinyl chloride, polyamides, polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers - Fire retarding polymers and electrically conducting polymers.
Biopolymers: Introduction, types and their applications as bio-composites, polymers and biopolymers as biomaterials: contact lens, dental polymers, artificial heart, kidneys, skin and blood cells.

Chemical modification of biopolymers, their applications, Functionalized polymers as sustained drug delivery devices, controlled release of nutrients, water and insecticides / pesticides to plants and in water treatment technology.

Text/Reference Books

S. No	Name	Author(S)	Publisher
1	Physical chemistry of polymers	A J Tager	Mir Publishers
2	*Textbook of Polymer Science, 3rd Edition*	F.W. Billmeyer	Jr. Wiley-Intersciences
3	*Thermal Methods of Analysis*, Principles, Application and Problems, **1994.**	J. Haines, Blackie	Academic and Professional,
4	*Principles of Instrumental Analysis*, Fifth edition, ,**1998.**	Skoog, Holder, Nieman,	Thomson Books
5	Polymer Science and Technology, Plastics, Rubbers, Blends and Composites. 2nd Ed. 2002.	Premamoy Ghosh	Tata McGraw-Hill,
6	Polymer science , Ed 2008	V.R. Gowariker, N.V. Viswanathan and J. Sreedhar	Wiley-Eastern, Ed.
7	*Advanced Polymer Chemistry*, Ed. **2000.**	Manas Chanda,	Marcel Dekker

Chemistry

Paper-III (Departmental II)

Subject Code: CHM905	Advanced Spectroscopic and Instrumental Techniques

UNIT-I

Ultraviolet and Visible Spectroscopy : Various electronic transitions (185-800 nm), Beer-Lambert law, Factors affecting electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds. PES and related spectroscopy. Application of UV spectroscopy in structure elucidation.

Infrared Spectroscopy: Principle and instrumentation, sample handling. Characteristic Vibrational frequencies of alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of Vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on Vibrational frequencies, overtones, combination bands and Fermi resonance. FT-IR. Applications of IR spectroscopy.

UNIT-II

Magnetic Resonance Spectroscopy: General introduction and definition, Magnetic resonance-spin angular momentum, Larmor frequency, Relaxation time, NMR spectroscopy of proton and chemical shift, spin-spin interaction, shielding mechanism, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides & mercapto), complex spin-spin interaction between two, three, four and five nuclei (first order spectra), chemical exchange, effect of deuteration, virtual coupling. Stereochemistry and hindered rotation, Karplus cruve-variation of coupling constant with dihedral angle. Simplification of complex spectra. Nuclear magnetic double resonance, contact shift reagents, solvent effects. Fourier transform technique, nuclear Overhauser effect (NOE). Resonance of other nuclei.

Carbon-13 NMR Spectroscopy: General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants. Two dimension NMR spectroscopy – COSY, NOESY, DEPT, INEPT, APT and INADEQUATE techniques.

UNIT–III

Electron Spin Resonance spectroscopy: Introduction to ESR. Hyperfine and fine structure. Double resonance in ESR. Applications of ESR spectroscopy.

Modern Methods of Surfaces Analysis: Basic principle, Instrumentation and applications of SEM, TEM, STM, AFM, XRD.

UNIT–IV

Mass Spectroscopy: Introduction, Ion production & detection – El, Cl, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. Mass spectral fragmentation of organic compounds, common functional groups, High resolution mass spectroscopy. Examples of mass spectral fragmentation of organic compounds with respect of their structure determination, MALDI, APCI & GSI.

Thermo Analysis : Basic principle ,Instrumentation and applications, methodology for thermo gravimetric analysis (TGA), differential thermal analysis (DTA) and differential scanning calorimetry (DSC), Thermometric titrations

Text/ Reference Books

S. No	Name	Author(S)	Publisher
1	Spectroscopy of organic Compounds.	P.S. Kalsi,	New age International Pvt Ltd.
2	Handbook of Molecular spectroscopy, **2015**	D.N. Sathyanarayana	I K International Publishing House Pvt. Ltd.
3	Fundamentals of Molecular Spectroscopy.	C.N Banwell,	McGraw-Hill Education (India) Pvt Limited, 1994
4	Principles of Instrumental Analysis, Fifth edition, ,**1998.**	Skoog, Holder, Nieman	Thomson Books
5	Organic Spectroscopy.	W. Kemp	Macmillan; 2nd edition (1987);
6	Spectroscopic Methods in Organic Chemistry, **1994.**	D. H. Williams and I. Flemings,	Tata McGraw-Hill Publication,
7	Organic Spectroscopy: Principles and Applications	Jag Mohan	Himalaya *Publishing* House, Bombay, 1 992.
8	Inorganic Electronic Spectroscopy	A.B.P. Lever	Elsevier
9	Thermal Methods of Analysis, Principles, Application and Problems, **1994.**	J. Haines,	Blackie Academic and Professional,
10	Instrumental Methods of analysis, **1986.**	Willard, Merritt, Dean and Settle,	CBS Publisher
11	Basic Concepts of Analytical Chemistry	S. M. Khopkar	Wiley Eastern

Computer Applications/ Computer Science & Engineering
Paper-II (Departmental I)

Subject Code:CSA903	Advances in Semantics Techniques

UNIT-I

Semantic Web & Agent Technology: Ontology Engineering, Web Ontology Language (OWL), Architecture and Applications, Knowledge Acquisition, SWRL, (Semantic Web Rule Language), Semantic Web Services.

Multi-Agent System (MAS): Agent Communication Language (ACL), FIPA, Contract Net Protocol (CNP), Knowledge Query Manipulation Language (KQML), Swarm Intelligent, Java Agent Development Environment (JADE).

UNIT-II

Word Sense Disambiguation (WSD): Introduction of Ambiguity, WordNet, ConceptNet, ImageNet, NLP Applications and WSD, Knowledge-Based WSD Algorithm, Supervised Corpus and Unsupervised Corpus Based Methods for WSD.

UNIT-III

Web Mining: Web Content Mining (WCM), Web Structure Mining (WSM), Web Usage Mining (WUM), Semantic Web Mining (SWM), Data Mining, Text Mining, PageRank Algorithm, Web Personalization, Sentiment Analysis.

UNIT- IV

Neuro Linguistic Programming (NLP): Introduction & Applications, Difference between Natural Language Processing and Neuro Linguistic Programming, Semantic Relatedness Algorithm, Semantic Similarity Algorithm, Semantic Distance Algorithm, Semantic Network.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1.	Semantic Web for the Working Ontologist	Dean Allemang and James Hendler	Elsevier
2.	Semantic Web	K. Breitman, W. Truszkowsarco, A. Casanova	Springer Customer Service Center Gmbh
3.	Foundations of Semantic Web Technologies	Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph	Taylor & Francis
4.	Word Sense Disambiguation Algorithms and Applications	Agirre, Eneko, Edmonds, Philip	Springer Netherlands
5.	Web Mining: Applications and Techniques	Anthony Scime	IGI Publishing

Computer Applications /Computer Science & Engineering
Paper-III (Departmental II)

Subject Code: CSA905	Digital Image Processing

UNIT-I

Digital Image Fundamentals: Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT-II

Image Enhancement: Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT-III

Image Restoration: Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT-IV

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

Text/References book:

S. No	Name	Author(S)	Publisher
1.	Digital Image Processing'	Rafael C. Gonzalez, Richard E. Woods	Pearson, Second Edition
2.	Fundamentals of Digital Image Processing'	Anil K. Jain	Pearson 2002
3.	Digital Image Processing	Kenneth R. Castleman	Pearson, 2006.
4.	Multidimensional Digital Signal Processing'	D,E. Dudgeon and RM. Mersereau	Prentice Hall
5.	Digital Image Processing	William K. Pratt,	John Wiley, New York
6.	'Image Processing, Analysis and Machine Vision', Brookes/Cole	Milan Sonka et aI	Vikas Publishing House

Computer Applications/ Computer Science & Engineering

Paper-III (Departmental II)

Subject Code:CSA907	Advancements in Natural Language Processing

UNIT-I

Basics of NLP: Introduction, Application of Natural Language, Various areas of NLP

Understanding NLP Models: Identifying the task, selecting a Model, Building and training a Model, Verifying the Model, Using the Model.

Understanding Part of Speech or Text Processing: Tokenization, Sentence segmentation or Splitting, Normalization.

UNIT-II

POS Tagging: Introduction, Word Classes, Rule Based POS, Stochastic POS, Markov assumption, Markov chain, HMM Tagging, Issues of Ambiguity, Multiple tags, Multiple words and unknown words.

Words and Word Forms : Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.

UNIT-III

Semantics: Introduction, Semantical Analysis, Lexical Semantics.
Machine Translation: Introduction, Different methods of MT.
Speech Processing: Issues in Speech Recognition, the Sound Structure of Language, Signal Processing, Speech Recognition, Prosody and Intonation.

UNIT-IV

Structures: Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1.	Speech and Language Processing	D. Jurafsky and J. Martin	Pearson Education
2.	Natural Language Understanding	James Allen	Pearson Education
3.	Natural Language processing: A Paninian Perspective	Bharati A., Chaitanya V and Sangal R,	Prentice Hall of India

Computer Applications/Computer Science & Engineering

Paper-III (Departmental II)

Subject Code:CSA909	Cloud Computing

UNIT-I

Cloud Computing Basics, History of Cloud Computing, Importance, Characteristics of Cloud Computing, Pros & Cons of Cloud Computing Migration into the cloud, Benefits of Cloud, Payment Procedure

UNIT-II

Types of Cloud: Public Cloud, Private Cloud, Difference between public & private cloud, Status of Cloud Computing in India, Cloud Service Models, Cloud Computing Data Backup & Recovery.

UNIT- III

Cloud Computing Logical Architecture, Developing Holistic Cloud Computing Reference Model,

Virtualization types, Virtualization applications, Pitfalls of Virtualization, CPU virtualization

UNIT -IV

DAS, SAN, NAS, Cloud Storage, Cloud Computing Risks, Cloud Digital Persona and Data Security, Cloud Tools, Cloud Applications, Future Trends, Mobile Cloud, Jungle Computing, Big data-features and applications

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Text/Reference Books:

S. No	Name	Author(S)	Publisher
1.	Cloud Computing Bible	Sosinsky B	Wiley India
2.	Cloud Computing : Principles and Paradigm	Buyya R., Broberg J., Goscinski A	John Wiley & Sons
3.	Cloud Computing – A practical Approach	Velte T., Velte A., Elsenpeter R	Tata McGrawHill
4.	Cloud Computing and SOA Convergence in Enterprise	Linthicium D	Pearson Education India
5.	Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Onlin	Miller Michael	Pearson Education India

Computer Applications/Computer Science & Engineering

Paper-III (Departmental II)

Subject Code:CSA911	Network Security

UNIT-I

Introduction to Ipv6: Basic Protocol, extensions and options, support for QoS, security, etc., neighbor discovery, auto configuration, routing. Changes to other protocols. Application Programming Interface for IPV6.

UNIT-II

Security Trends – Attacks and services, Classical crypto systems, Different types of ciphers, LFSR sequences, Basic Number theory, Congruences, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem, Legendre and Jacobi symbols, Finite fields, continued fractions.

UNIT-III

Simple DES – Differential cryptanalysis, DES - Modes of operation, Triple DES, AES, RC4, RSA, Attacks, Primarily test, Factoring.

Discrete Logarithms – Computing discrete logs, Diffie-Hellman key exchange, ElGamal Public key cryptosystems, Hash functions, Secure Hash, Birthday attacks, MD5, Digital signatures, RSA, ElGamal, DSA, Unwanted traffic: denial of service attacks.

UNIT-IV

Authentication applications – Kerberos, X.509, PKI, Electronic Mail security, PGP, S/MIME, IP security, Web Security, SSL, TLS, SET.

Cryptography : Plain text and Cipher Text, Substitution techniques, Caesar Cipher, Mono-alphabetic Cipher, Polygram, Polyalphabetic Substitution, Playfair, Hill Cipher, Transposition techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks

Text/Reference Books

S. No	Name	Author(S)	Publisher
1	Cryptography And Network Security - Principles and Practices	William Stallings	Prentice Hall of India pvt.ltd. New Delhi
2	Cryptography and Network Security	Atul Kahate	Tata Mc-Graw Hill
3	Computer Networks	A.S Tanenbaum	Pearson

Computer Applications/Computer Science & Engineering

Paper-III (Departmental II)

Subject Code: CSA913	Big Data Analytics

Unit-I

INTRODUCTION TO BIG DATA: Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

Unit-II

INTRODUCTION HADOOP: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

Unit-III

HADOOP ARCHITECTURE: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

Unit-IV

HADOOP ECOSYSTEM, YARN, HIVE & PIG: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN. Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Advance Indexing – PIG

Text/Reference Books

Sr. No.	NAME	AUTHOS(S)	PUBLISHER
1	Big Data Analytics: Turning Big Data Into Big Money	Frank J Ohlhorst	WILEY AND S AS Business Series
2	"Professional Hadoop Solutions"	Boris lublinsky, Kevin t. Smith, Alexey Yakubovich,	Wiley, ISBN: 9788126551071, 2015.
3	"Understanding Big data "	Chris Eaton,Dirk deroos et al.	McGraw Hill, 2012.
4	Big Data, Black Book(covers Hadoop 2, Mapreduce, Hive, Yarn, Pig, R And Data Visualization	DT Editorial Services	WILEY INDIA PVT.LTD

Education
Paper-II (Departmental I)

Subject Code:EDU903	Comprehensive Study of Education

UNIT-I

Modern Concept of Education: Meaning, nature of education, Factors of education, Characteristics of education, Types of education, Scope of education, Importance of education, Functions of education, Aims of education. Education as a Field of Study**:** empirical, interpretive and critical; Critical appraisal of education as discipline; Linking understanding about education drawn from various disciplines like philosophy, sociology, psychology and management with school and classroom practices.

UNIT-II

Pedagogy and Andragogy: Meaning of pedagogy & andragogy, Critical analysis of the pedagogy prescribed in the educational thoughts of Rabinderanath Tagore, Sri Aurobindo, John Dewey and Rousseau and their relevance in contemporary teaching-learning. Critical analysis of the pedagogy prescribed in the educational thoughts of Idealism, Realism, Naturalism and Pragmatism and their relevance in contemporary teaching-learning.

UNIT-III

Education and Social Change: Meaning of Social change, Social change and cultural change, forms of social change, Nature of social change, factors of social change, Methods of social change, Factors resisting social change Role of education, teacher and school in social change, Modernization, Globalization and privatization of education.

UNIT-IV

Universalisation of Education: Universalisation of Elementary Education- Meaning, Problems, Need, Expansion of elementary education and efforts of government for equality of education. Universalisation of Secondary Education: Vision, Justification / reasons for expanding secondary education, principles and norms for universalisation of secondary education. Sarv Shiksha Abhiyan – Meaning, goals, strategies and interventions with special emphasis on target groups. RTE Act- 2009 and its implications.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1.	A Comprehensive Study of Education	S. Samuel Ravi	Prentice Hall of India
2.	Modern Philosophies of Education	John S.	Tata McGraw Hill
3.	Theory & Principles of Education	Aggarwal, J.C	Vikas Publishing House Pvt. Ltd

Education
Paper-III (Departmental II)

Subject Code:EDU905	Teacher Education

UNIT-I

Teacher education—meaning, historical perspectives-Ancient period, Buddhist period, Muslim period, British period and Post-Independence period affective teacher education and competency based teacher education, types of teacher education—in-service, pre-service, distance, Recent trends in research on teacher education. Aims and objectives of teacher education at different levels—elementary, secondary, and college level

UNIT-II

Policy perspectives on teacher education: University Education Commissions, Secondary Education Commissions, Indian Education Commissions, New Education Policy, Revised Education Policy, Educational Organizational in India (UGC, NAAC, NCTE, NCERT, SCERT, DIET).

UNIT-III

Innovations in teacher education: teacher controlled instruction, learner controlled instruction, group controlled instruction—meaning, nature and strategies, Teacher education and teacher freezingness, Evaluation mechanisms in teacher education, Competency based teacher education, types of teacher education—in-service, pre-service, distance; recent trends in research on teacher education. Teacher education and teacher freezingness, Evaluation mechanisms in teacher education

UNIT-IV

Curriculum development: Construction and development of curriculum on teacher education—meaning, importance and principles, NCF for Teacher Education, 2009, Comparative analysis of curriculum implemented by Govt, aided and private teacher education institutions, Curriculum Evaluation- meaning, characteristics of curriculum evaluation, methods and models curriculum evaluation , Teaching as a profession, Professional development and faculty training programme for teacher education, performance appraisal

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1.	*Teacher Education*	Saxena, N. R. , Mishra, B. K. & Mohanty, R. K	R.Lall:Meerut
2.	Teacher Education- Principles, Theories and Practices	Sharma, S. P	Kanishka Pub.:New Delhi
3.	Principles and Practices of Teacher Education	Janardan Prasad	Kanishka Pub.:New Delhi
4.	Teacher Education	Mohanty, J	Deep and Deep Publication: Delhi

Electrical Engineering/ Electronics and Communication Engineering
Paper-II (Departmental I)

Subject Code:EE903	Computing Techniques for Biomedical Research

Unit-I

Biostatistics: Introduction and scope of biostatistics, population and sample, types of data and methods of data collection, measures of central tendency: computation of mean, median and mode from grouped and ungrouped data, measure of dispersion: computation of variance, standard deviation, standard error and their coefficients, probability rules, binomial, poison and normal distribution, hypothesis testing: student's t test, chi-square test, analysis of variance, correlation and regression.

Unit-II

Neuro-Fuzzy Modeling: Neural Networks and Fuzzy Logic, Fuzzy Neuron, Fuzzy Perceptron, Fuzzy classification Networks using Back propagation, Fuzzy Neural Inference System, Fuzzy Adaptive Resonance Theory, Fuzzy Associative Memory, Neural-Fuzzy Systems, Neuro Fuzzy Evolutionary Integration.

Unit-III

Genetic Algorithms: Biological background of Genetic Algorithms; Simple Genetic Algorithm, Chromosome representations; crossover operations; Mutation operations, Operational Rates; concept of exploration and exploitation , Selection Schemes; Fitness function design; Population size; Replacement Schemes; Parameter tuning and control, Convergence of algorithm, Application of Genetic Algorithms.

Unit-IV

Artificial Neural Networks: Introduction to Biological Neuron, Architecture, Learning: Supervised and Unsupervised, Back-propagation and Feed-forward Networks, Perceptron, Adaline, Back-propagation Multilayer Perceptrons, Back-propagation Learning Rule, Methods of Speeding, Radial Basis Function Networks, Support Vector Machine. Competitive Learning Networks, Kohonen self-organizing networks, The Hopfield Network.

Text/Reference Books:

Sr. No.	Name	Author(s)	Publisher
1.	Neural Networks	Satish Kumar	TMH
2.	Fuzzy Sets and Fuzzy Logic: Theory and Applications	George J, Bo Yuan	PHI
3.	Genetic Algorithms: Concepts and Designs	Man and Kwong	Springer Verlag
4.	Statistics for Biologists	Campbell, R.C.	Cambridge University Press

Electrical Engineering/ Electronics and Communication Engineering
Paper-III (Departmental II)

Subject Code:EE905	Biomedical Instrumentation and Measurements

UNIT-I

Human Body Subsystems: -Brief description of neuronal, muscular, cardiovascular and respiratory systems, their electrical, mechanical and chemical activities.

Biomedical Sensors:- Principle and classification of transducers for biomedical applications, electrode theory different types of electrodes, selection criteria for transduces and electrodes.

UNIT-II

Measurement and Recording of Bioelectric Signals:- Electrocardiogram (ECG), Electromyogram (EMG), Electroencephalogram (EEG), Electro-retinogram (ERG), Electro-occulogram (EOG) and instruments for picking up and reproducing bioelectric signals, specific design characteristics, sources of noise and its removal.

UNIT-III

Measurement and Recording of Non-Electric Signals:-Measurement and recording of pressure, temperature, respiration rate, pulse rate and blood flow. Electromagnetic blood flow meter, thermography, pH measurements, gas analysis, ESR (erythrocyte sedimentation rate) measurement, plethysmograph, X-Ray, tonometer and dialysis. Ultrasonics and echoencephalography radiography imaging isotopes and nuclear medicine.

UNIT-IV

Biotelemetry:-Physiological parameters adaptable to bio-telemetry, Components of a biotelemetry system, Implantable units, Applications of telemetry system in patient care. **Introduction to Telemedicine**:- Telemedicine System's classification, input and output peripherals, Characteristic of available transmission media, introduction to communication system for telemedicine. Medical image format standards, introduction to DICOM and PACs technologies various image compression techniques, loss less and lossy image compression for biomedical application. Telemedicine and law, confidentiality of telemedicine records, security in medical methods.

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1	Handbook of Biomedical Instrumentation	Khandpur R. S.	TMH Publication
2	Biomedical Instrumentation	Pratt Cromwell	Prentice Hall
3	Medical Instrumentation, Applications &Design	Webster John G	John Wiley
4	Principles of Applied Biomedical Instrumentation	Geddes, Baker	John Wiley

Electrical Engineering/ Electronics and Communication Engineering
Paper-III (Departmental II)

Subject Code:EE907	Advanced Wireless Communication

UNIT-I

Introduction: Fundamentals of Wireless communications, Cellular communication from 1G to 3G, Teletraffic engineering: Introduction, Service Level, Traffic usage, Traffic measurement units, GSM and CDMA 2000 Evolution: Wide area networks , GSM evolution for Data, 3G wireless systems, UMTS network reference architecture – Evolution, WCDMA – Evolution, Wireless Application Protocol (WAP), WAP and WWW, The WAP programming model, Architecture, Wireless Personal Area Network : WLAN and Wi-MAX

UNIT-II

Mobile fundaments: Multiple access techniques: frequency division multiple access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA), space division multiple access (SDMA) - Space-time processing: multiple antenna techniques, diversity and multiplexing gains, multiple-input multiple-output (MIMO) systems. Mobile radio channels - Pathloss, large-scale fading, small-scale fading; Power budge of mobile links - Doppler spread and coherent time, delay spread and coherent bandwith; flat fading and frequency selective fading.

Mobile management and Security in wireless networks: Mobile management functions, Security in GSM, GPRS and UMTS, Data Security, Mobile network and transport layer, transmission control protocol/Internet protocol suite in Internet, Network layer in the internet, , Mobile IP and Session Initiation Protocol

UNIT-III

MIMO Technology: Introduction and fundamentals, diversity and multiplexing gains, beamforming gain, SDMA based multi user system - Vertical Bell Lab layered space-time (V-BLAST), space-time block codes (STBCs), Linear dispersion codes (LDCs), spatial modulation (SM) and space-shift keying (SSK), and spacetime shift keying (STSK) - A unified MIMO - Acquisition of MIMO channel state information (CSI). Existing and future wireless systems and standards - 1G system, 2G system, 3G system, and 4G system. - Beyond 4G system, massive MIMO, millimeter wave communication, optical wireless.

UNIT-IV

Space Time Codes: Space Time Block Codes: Alamoti Space Time Code – Maximum Likelihood Decoding Maximum Ratio Combining. Transmit Diversity Space Time Block Codes For Real Signal Constellation And Complex Signal Constellation - Decoding Of STBC.

Space Time Trellis Codes: Space Time Coded Systems, Space Time Code Word Design Criteria, Design Of Space Time T C On Slow Fading Channels, Design Of Sttc On Fast Fading Channels, Performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

Practical channel coding schemes - The fundamentals of forward error correction (FEC) coding, convolutional coding, linear block coding, hard-decision channel decoding, soft-decision channel decoding - Turbo principle, turbo coding, turbo decoding-detection, near-capacity three-stage concatenated turbo transceiver.

Text/Reference Books:

S.No.	Name	Author(s)	Publisher
1	Advanced Wireless Communications and Networking	Dr. Vijay. K Garg	MK Publishers
2	Wireless Communication	William Rappaport	Pearson
3	Fundamentals of Wireless Communication	David and Viswanath	Cambridge University Press
4	Space-time codes and MIMO systems	Mohinder Jankiraman	Artech House
5	Introduction of space time wireless communication systems	Paulraj Rohit Nabar, Dhananjay Gore	Cambridge University Press

Electrical Engineering/ Electronics and Communication Engineering
Paper-III (Departmental II)

Subject Code: EE909	Digital Image Processing

UNIT-I

Digital Image Fundamentals: Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT-II

Image Enhancement: Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT-III

Image Restoration: Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT-IV

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

Text/References book:

S. No	Name	Author(S)	Publisher
1.	Digital Image Processing'	Rafael C. Gonzalez, Richard E. Woods	Pearson, Second Edition
2.	Fundamentals of Digital Image Processing'	Anil K. Jain	Pearson 2002
3.	Digital Image Processing	Kenneth R. Castleman	Pearson, 2006.
4.	Multidimensional Digital Signal Processing'	D,E. Dudgeon and RM. Mersereau	Prentice Hall
5.	Digital Image Processing	William K. Pratt,	John Wiley, New York
6.	'Image Processing, Analysis and Machine Vision', Brookes/Cole	Milan Sonka et aI	Vikas Publishing House

English
Paper-II (Departmental I)

Subject Code:ENG903	Indian Writing in English

UNIT-I

Post- colonial literature: Major characteristics.

UNIT-II

Social and moral aspects of life in the Indian novels in English, with particular reference to R.K. Narayan, Mulk Raj Anand and women novelists.

UNIT-III

Feminist perspectives in the novels of women novelists , with special reference to Kamala Das, Anita Desai, Kiran Desai, Shobha Dey and Arundhati Roy.

UNIT-IV

Major trends in the Indian English poetry, with special reference to Nissim Ezekiel, A. K. Ramanujan and Jayant Mahapatra.

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Three Indian Poets	King, Bruce Alvin	Oxford University
2.	Indian Writing In English	Bijender Singh	
3.	Indian Writing in English Revised		Lyenger K R Srinivas
4.	A Critical Appreciation	Walash,Willam R.K. Narayan	Heinemann,London
5.	The Short Stories of R.K. Narayan	Percy D. Westbrook	
6.	Chakravarty Joya(ed)		
7.	Indian Literature in English	Murali Sivaramakrishnan	

English
Paper-III (Departmental II)

Subject Code:ENG905	Literary Criticism and Critical Approaches

Unit-I

Critical concepts and perspective: Affective fallacy Hermeneutics and interpretation Allegory , Ideology , Aporia , Intentional fallacy , Binary opposition , Motif and Theme Carnival , Patriarchy . Contradiction, Readerly/Writerly , Conventions , Semiotics Desire , Structure . Discourse , Syntax , Empathy and Sympathy , Text Form and Conent , Feminist Criticism , F.R. Leavis and Twentieth Century British Criticism Marxist Criticism , Narratology , New Historicism , Phenomenological Criticism , Psychoanalytic Criticism , Reader Response Criticism , Russian Formalism
Structuralism, Post-Structuralism

UNIT-II

Roland Barthes: "**The Death of the Author**" from Roland Barthes, Image, Music, Text Also in David Lodge (ed.) Modern
Raymond Williams: "**Base and Superstructure"; and "Dominant, Residual and Emergent."** From Raymond Williams, Marxism & Literature

UNIT–III

The following two excerpts from The Postcolonial Studies Reader edited by Ashcroft, Griffiths, and Tiffin (Routledge 1995)
i) Gayatri Spivak: "**Can the Subaltern Speak**", 24-28.
ii) Edward Said: "**Orientalism"**, 87-91.

UNIT–IV

Elaine Showlter : "**Feminist Criticism in the Wilderness**" in David Lodge (ed.) Modern Criticism and Theory: A Reader (London and New York: Longman, 1988): 331-53.
Helene Cixous : "**Castration or Decapitation"** (The Prescribed essays can be found in the anthology named " Contemporary literary criticism- Literary and Cultural Studies, eds.
Robert con Davis and Ronald Schleiper, Longman New York, 1989

Text/Reference Books

S. No	Author(S)	Title	Publisher
1.	Wilfred L. Guerin	A Handbook of Critical Approaches to Literature	Oxford University Press
2.	Robyn R. Warhol	Feminisms: An Anthology of Literary Theory and Criticism	Rutgers University Press
3.	David Mikics	A New Handbook of Literary Terms	Oxford University Press
4.	M.S. Nagarajan	English Literary Criticism and Theory	Orient BlackSwan
5.	Jerilyn Fisher and Ellen S. Silber	Women in Literature: Reading Through The Lens Of Gender	Westport, Conn. Greenwood Press
6.	Mary Eagleton	Feminist Literary Theory: A Reader	Wiley-Blackwell

Physical Education
Paper-II (Departmental I)

Subject Code:PED903	Tests and Measurements & Research Method

UNIT- I

Meaning and definition of Tests, Measurement and Evaluation, Place of Measurement and Evaluation in Sports, Trends in Measurement and Evaluation in Sports, Characteristics of Measurement, Reliability and Methods to establish Reliability, Validity, its types and Methods to establish Validity, Economy, Test Construction, Organization and Administration

UNIT- II

Common types of Norms and their Characteristics, Criteria for Development of Norms, Use of Norms, Grades, Considerations in the Assignments of Grades, Norm Referenced Grading System, Normal Curve, Natural Break Method, Criterion Referenced Grading System.

UNIT – III

Importance and meaning of Research - Research in our civilization – An overview and historical concepts. Definition and characteristics of Research, different steps in Research, formation of Hypothesis, Qualities of workable hypothesis, Research in Physical Education, Present status: Need for research training, **The Research Problem** - General Introduction : Location of problem : Criteria in selecting a problem: Definition and delimitation problems- Limitations, Delimitation; Evolving the problem statement; the basic purpose and method of research; Basic Versus Applied Research; the field of knowledge in physical education, **Literature Search** - General Introduction : Need to survey related literature: major sources of literature. Critical literature and applied literature; justification and understanding of tests used; Library Sources- Bibliographics and Indexes and abstracts. Library reading working bibliography, card system, classification, skimming and obstructing.

UNIT – IV

Survey and Case Studies – General Introduction: Board survey by questionnaire type of information, status, studies, expert opinion, construction of the questionnaire, appearance of questionnaire, development initial writing, trial run tabulation, rewriting; the sample, aids to response, interview survey characteristics of the interview, the interview; sampling process, testing techniques, subject motivation, analysis of data; case studies and profiles (Collection of data). **Laboratory and Experimental Research** - Experimental methods, control of experimental factors, experimental designs, sampling, and instruments/tests. **Writing of Research/Review Reports** - Thesis-Paper writing,Use of Sources, tables, figures, footnotes, bibliography.

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Rosemary A Practical Approach to Measreuemt in Physical Education	Barrow M: Hareld and Me Ghee	Philadelphia Lea nad Febhiger
2.	Measrement and Evaluation in Physical Fitness and Sports	Bosco S. James and Gustafson F. William	Englewood Cliffs, Prentice Hall
3.	Application of Measurement to Physical Education	Clarks, H. David and Clarke Hanson. H.	Englewood Cliffs. Prentice Hall Inc
4.	Research Method in Health, Physical Eduction and Recreatio	Hubbard W. Alfred	Association of Health Physical and Recreation.

Physical Education

Paper-III (Departmental II)

Subject Code:PED905	Sports Psychology

UNIT – I

Sport Psychology as an applied branch of Psychology., Write about the dimensions of Human behavior. Name the methods Definition and concept of Sports Psychology, of assessing sports behavior, Factor of developing sports psychology in India and all over the world, Which are the current concerns and future directions in Sport Psychology.

Psychology of Motor Learning, Concept of and its definitions, The concept of motor learning: Psycho motor and perceptual motor learning, What are the stages in acquisition of motor skills, Definition of Primary and secondary laws of learning, How many Factors ,which are affect the motor learning, What is the transfer of training, how many its types and its application in sports?, Measurement of motor learning and define the term learning curves. Define plateau, its phenomena in motor learning, its causes and remedies.

Cognitive Processes in Sports: What is the meaning and mechanism of cognitive processes?. Define the terms sensation, perception, thinking, attention, concentration, intelligence and decision making and their role in sports, Techniques of cognitive control and cognitive behavior modifications

UNIT - II

Emotional processes in Sports: Meaning and behavioral manifestations of emotion, Emotions in psycho psychology, Theories of arousal and its applications in sports, Anxiety, pre competition anxiety its assessment and remedies.

Psychology of Peak Performance: Goal setting and motivation., Various psychological , explanations of sports motivation, Types of motivation – Intrinsic v/s Extrinsic, Achievement motivation and achievement goal orientation, Maslow's need hierarchy theory of motivation, Peak performance , Flow and self efficacy, Techniques of motivation for obtaining peak level performance.

Personality development through Sports, Meaning, definition and structure of Personality, The concept of Athletic Personality, Role of sports in personality development

UNIT - III

Psycho Diagnostics in Sports: Psycho Diagnostics its meaning importance in sports, Nature and types of Psychological tests: General and Sport specific tests, Administration and interpretation of psychological tests scores, Construction of Psychological tests and inventories, **Stress:** Mechanism of stress, Define stress its causes and symptoms, Psychological stress, its affect on performance, Techniques of Stress management.

Psycho regulation in Sports: Meaning and importance of Psycho-regulation in sports, Psychological Counseling and Psycho therapeutic methods, Conditioning methods: Systematic Desensitization, Thought Stopping, Flooding and Modeling, Relaxation Techniques: Simple

relaxation, progressive muscular relaxation, Autogenic Training, Meditation and yogic exercises, Biofeedback: Concept, Types of biofeedback and its use in relaxation training and monitoring, Role of Imagery in Sports- Types of Imagery and its importance for enhancing performance.

UNIT – IV

Psychological preparation for competitions: Psychological preparation in Sports, meaning and definition, Various steps of Psychological preparation, Immediate, short term and long term Psychological preparation

Psycho social dimensions of Sports: Psycho social nature of sports, Psychosocial dynamics of sports: Co-action, Cooperation and competition, Team Cohesion and Sociometry, Leadership and Communication in sports teams, Sports Audience, nature, types and influence on sports performance

Psychological Research in Sports: The aims and importance of psychological research in sports, Nature of Psychological research, Current areas of research in Sport Psychology
Tests and equipments available in India to conduct such research

Text/ Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Psychology of Contempormy sports", Human Kinetics Publishers	B.J. Cratty	Chaampaign IIinois
2.	Psychological Foundations, of Sport	John M. Silva & Roberts	Human Kinetics Publishers,Champaign llinois
3.	Psychological Dynamics of sports	Diane Gills	Human Kinetics Publishers, Champaig Ilionis
4.	Sports Psychology	Cox	Human Kinetics Publishers, Champaign IIinois
5.	Psychology in Sports, Methods & Application	Richard M. Sumin	Surjeet Publication, Kolhapur Road, Kamla Nagar
6.	But, Lusan Dorcas	Psychology of Sports	Network:Van Nostrand Reinhold Company
7.	Moement Behaviour and Motor Learning	Cratty, Braynat. J	Philadelphia : Lea and Febiger
8.	Pscyhology of Physical Education and sports	Kamlesh M. L	Boston Routleoge
9.	Really Sports and exercise	Linda K. Binket, Robert J. Ratella and Ann	

Physical Education
Paper-III (Departmental II)

Subject Code:PED907	Exercise Physiology

UNIT – I

Meaning, Nature and Scope of Exercise Physiology: Importance of physical activity in health and fitness, Relevance of exercise physiology in the enhancement of performance.

Muscular system and Exercise: Adaptive changes in the muscle to specific training programme, Concept of Motor unit, The concept of muscle fiber types and its importance in sports performance, Effects of specific training on muscle fiber type, Muscle force velocity and power velocity relationship, Proprio-receptors, Receptors in muscles, Joints and tendons, Role of muscle spindle, The stretch reflexes and importance of Golgi tendons organs and Pacinian causes and sites (Local, muscular fatigue), Methods of recovery from fatigue

Cardiovascular system and Exercise: Adaptive changes in the heart and cardiovascular system. Effect of specific Aerobic and Anaerobic training, Transportation of blood during exercise, Changes in pressure and resistance in blood flow during exercise, Autonomic and cortical control of the cardiovascular system during exercise.

UNIT – II

Respiratory system and Exercise: Adaptive changes in the respiratory system to exercise and regular physical activity, Effect of exercise in augmenting in the cellular respiration levels, Ventilation during rest and exercise, Static and Dynamic Lung Volumes and importance, Second wind and Stitch in the side, Control of Pulmonary ventilation during exercise.

Nervous system and exercise: Introduction, Motor Skills, Neural control of voluntary movements, Role of cerebellum, learning specialized motor skills, Mechanism of action of the ANS during rest and exercise, Entrainment of ANS to regular physical activity

Physiological determinants in physical performance: Theoretical concepts of the anaerobic threshold, Ventilatory threshold & lactate threshold, Physiological changes at the anaerobic threshold, Anaerobic threshold as performance marker, Importance of enhanced lactate tolerance and performance, Maximum Oxygen Uptake Capacity, the early concept of VO_2 max and performance, Factors controlling VO_2 max, Relevance of aerobic components in different games and sports

UNIT-III

The Process of Recovery: The alactate and lactate phases of recovery, The concept of Oxygen debt and Excess post exercise oxygen consumption, Factors controlling recovery process, Replenishment of energy stores during recovery, Removal and fate of lactic acid, Restoration of phosphagen stores and myoglobin stores, Role of massage, steam and sauna bath in recovery, and practical guidelines.

Environment and Exercise: Regulation of body temp during exercise, Body heat and exercise, Heat disorders, Training in the hot, humid environment, Special measure to counter dehydration

and mineral loss, Physiological and behavioral adaptation, Exercise in the cold, wind chill, acclimation to cold,

Measurement of Work, Power and Energy: Energy, work and power, ergometry, Direct and indirect estimation of energy expenditure, Measurement of energy cost of exercise during actual activity by telemetry, Concept of MET. **Exercise and Training for Health and Fitness:** Effects of exercise and training on health and fitness, Exercise and aging, longevity

UNIT - IV

High Altitude Training and Performance: Physiological basis of altitude training, Immediate physiological responses at altitude, Long term changes in altitude training, Advantages and Disadvantages of altitude training, Altitude acclimatization, The oxygen dissociation curve at altitude.

Physiological Effects of Sprint and Endurance Training: Changes in skeletal muscle following endurance training and Sprint training, Effect of training on neural structures, Changes in oxygen transports system due to sprint and endurance training, Factors influencing effects of training: intensity, Frequency, Duration, Genetic influences. **Exercise and training in female:** Body size and composition, Structural differences, Strength differences, Effect of weight training, Physical trainability and physiological changes following training, Gynecological consideration, Guidelines for female participation

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Athletic Injuries	Sharma. O.P	Khel Sahitya Kendra
2.	Sports Medicine	P.K. Pande	Khel Sahitya Kendra
3.	Physiology of Sports and Exercise	Wilmore Jack H	Human Kinetics:and Costill Champaign
4.	Exercise Physiology	MeArdle William D	Lea and Febiger: Philadelphia

Physical Education

Subject Code:PED909	Sports Anthropometry

Paper-III (Departmental II)

UNIT- I

Kinanthropometry: Introduction, definition and scope of Kinanthropometry, General consideration of Anthropometry and Sports Anthropometry, Application of Anthropometric data in sports, Analysis within and between sports, Kinanthropometry Measurements and Scope, Landmarks and their importance, Anthropometry, Techniques and their importance, Kin anthropometric, Measurements and their scopeThe O-scale system and sports.

Body Proportions and Indices : Body proportions and Body Indices, Height Weight Ratio and importance in sports, Ponderal Index and its importance, Application of Phantom stratagem in Sports

UNIT-II

Human Growth and its importance in Sports: Introduction, definition and Scope of Human Growth, Growth at Adolescence, Distance and velocity Growth curves, Factor effecting growth – Hormonal, Genetically and Environmental

Physiological Maturation: Introduction, definition and scope of Physical Maturation, Decimal age and concept of physiological maturity, Various measures of maturity- Morphological age, Dental age , Skeletal age and Secondary Sex Characteristics, Age based competitions and the maturity status.

Adult Height Predictions: Method of Height Prediction, Application of Height Prediction in sports, Height prediction and talent selection, Application of RUS method of height prediction.

UNIT-III

Athlete's Body composition and performance: Introduction, definition and general consideration of body composition, Approaches to the study of the body composition, conceptual models, **Somatotype,** Introduction, Historical prospective of somatotype, Sheldon's method of somatotype, **Somatotypes of Athletes,** Somatotype Distribution, Somatochart and Somatoplot, Classification of somatotypes,Somatotype in different Sports

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Research in Education	Best,john W	Prentice Hall of India
2.	Test and Measurement in Sports and Physical Education	Kansal, D.K	DVS Publications, New Delhi
3.	Text Book of Science and Medicine in Sports	Bloomfield, J. and Fricker, P.	Human Kinetics, USA
4.	Methodology of Research in Physical Education and Sports	Kamlesh, M.L	Metropolitan, New Delhi
5.	Periodization: Theory and Methodology of Training	Bomba, Tudor O	Human Kinetics, USA

Punjabi
Paper-II (Departmental I)

Subject Code:PBI903	pMjwbI swihq dw ieiqhws

pihlw Bwg :
pMjwbI swihq dy smucy ieiqhws : sMKyp jwxkwrI
pMjwbI swihq dy smucy ieiqhws : ivAwiKAw Aqy pRsMg
pMjwbI swihq dy smucy ieiqhws : smW Aqy idSwvW
pMjwbI swihq dy smucy ieiqhws : vrxn Aqy mulwkx
dUsrw Bwg:
swihq dI ieiqhwskwrI: ivAwiKAw Aqy pRsMg
swihq ieiqhws lyKn dIAwˆ sm`isAwvwˆ
swihq ieiqhws ivc kwl-vMf Aqy nwmkrn dIAwˆ sm`isAwvwˆ
swihq Swsqr Aqy ieiqhws dw AMqr sbMD
qIsrw Bwg :
pMjwbI swihq dw ieiqhws :Awid kwl
pMjwbI swihq dw ieiqhws :m~Dkwl
pMjwbI swihq dw ieiqhws :AwDuink kwl
coQw Bwg :
pMjwbI swihq dw ieiqhws :pRivrqIAW dy pVwA
pMjwbI swihq dw ieiqhws :pihlw pVwA
pMjwbI swihq dw ieiqhws :dUsrw pVwA
pMjwbI swihq dw ieiqhws :qIsrw pVwA

shwiek pusqkwˆ

lyKk	**swl**	**isrlyK**	**pbilSr**
Aqr isMG	1971	pMjwbI swihq dw ieiqhws (Bwg pihlw)	BwSw ivBwg, pMjwb, pitAwlw
ikrpwl isMG ksyl	1974	pMjwbI swihq dI auqpqI qy ivkws	lwhor bu`k Swp, luiDAwxw
jIq isMG sIql	1976	pMjwbI swihq dw Awlocnwqmk ieiqhws	pYpsU bu`k ifpo, pitAwlw
jgbIr isMG	2000	pMjwbI swihq dw ieiqhws (Awid kwl Aqy BgqI kwl)	gurU nwnk dyv XUnIæ, AMimRqsr

Punjabi
Paper-III (Departmental II)

Subject Code:PBI905	AwDuink pMjwbI kwiv

Bwg-pihlw

pRmu`K ruJwx
a) kivqw:pRivrqIAW Aqy ivcwrDwrw
A)AwDuink qy AwDuink kwiv sMvydnw
e)AwDuink pMjwbI kwiv DwrwvW dw inrDwrx

Bwg-dUsrw

pRmu`K JukwA
a) pRgqIvwdI kwiv-Dwrw
A)pRXogvwdI kwiv-Dwrw
e)AwDuinkvwdI kwiv-Dwrw

Bwg-qIsrw

isDwˆqk AiDAYn
a) juJwr ivdrohI kwiv-Dwrw
A) ivSvIkrn qy auqr-AwDuink kwiv-Dwrw

Bwg-coQw

pwTgq AiDAYn
a) surjIq pwqr
A) jsvMq dId

Koj-pusqkW

lyKk	Swl	isrlyK	pbilSr
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Commerce and Management
Paper-II (Departmental I)

Subject Code:MNG903	Recent Trends in Commerce & Management

UNIT- I

Global Financial environment, Constituents of Financial Sector, Reforms measures in Financial Institutions and Markets, Risk and return analysis in Financial Management, Capital Market and Money Market., Sub-prime crisis- Reasons, impact, Mergers and Acquisitions, Divestiture, Contracting Out, Outright Sale, Disinvestments, Leveraged buyout, Rationale, Significance, types of financial risks. Role of derivatives in managing financial risk

UNIT- II

Marketing Tasks and Approaches to Modern Marketing, Marketing Environment and Environment Scanning, 4Ps & beyond, Marketing Challenges, Marketing information system and Marketing Research, Factors Influencing Consumer Buying Behavior Process, Market Segmentation, Targeting and Positioning, Components of Supply Chain Management, Physical Distribution System; Retail Organization Structures, Green Marketing, Network Marketing, Event Marketing

UNIT -III

Human Resource Management in the global context, Performance management, Competency Mapping. Managing Diversity: Diversity and discrimination issues at workplace & Gender Issues, Work Life Balance, Occupational Stress, Job Satisfaction, Job Involvement, Motivation, Group dynamics. Leadership: theories

UNIT- IV

Identifying the underlying conceptual elements of the research issue; Analyzing a Research Issue; The aims of research, Theoretical Approaches to Research, Research Designs, Questionnaire Design; Interviews; Other techniques, Research population, Sampling techniques, Measurement error, General steps in a Statistical test; Understanding statistical significance, Parmetric and non parametric tests used in business research

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Principles of Marketing	Kotler Philip & Keller	Prentice-Hall
2.	Marketing Management	Saxena Rajan	Tata McGraw-Hill Publ.
3.	Financial Management	Khan and Jain	Tata McGraw-Hill Publ.
4.	Introduction to Management Accounting	Charles T. Horngren	Prentice-Hall
5.	Personnel Management,	Edwin B. Flippo	McGraw-Hill
6.	Human Resource Management – Gaining A Competitive Advantage	Raymond Noe, Wright, Gerhart & Hollenbeck	Tata McGraw-Hill Publ.
7.	Research Methods for Business Students	Saunders M	Prentice Hall

Commerce and Management
Paper-III (Departmental II)

Subject Code:MNG905	Contemporary Issues In Finance and Accounting

Unit- I

An Overview of Financial Management and Policy: Conceptual Framework, Global Financial environment, Constituents of Financial Sector, Reforms measures in Financial Institutions and Markets, Risk and return analysis in Financial Management

Emerging Trends in Financial markets: Capital Market and Money Market., Sub-prime crisis-Reasons, impact, Pricing of IPOs : Conceptual and research issues, Integration of capital markets: Reasons and techniques to measure such integration.

Unit- II

Issues in Corporate Restructuring: Need, Methods of restructuring, Mergers and Acquisitions, Divestiture, Contracting Out, Outright Sale, Disinvestments, Leveraged buyout, Mergers and Acquisitions: motives, considerations in M & A decisions, Synergy Value, Due Diligence Process, Business Valuation Methods, Evaluation of Mergers and Acquisitions and regulations, Behavioral finance; Conceptual and research Issues, Micro Financing in India; Financial inclusion and role of banks,

Unit- III

Contemporary Accounting: Human Resource Accounting, Environment Accounting, Social Accounting and Value added Accounting, Strategic Cost management: Rationale, Significance, techniques-Activity Based Costing, Life Cycle Costing and Target Costing, Financial risk management-Rationale, Significance, types of financial risks. Role of derivatives in managing financial risk.

Unit IV

Financial Reporting: Indian GAAP, An overview of International Financial Reporting Standards, Convergence of Accounting Standards and IFRSs. Need for online reporting. Performance Measurement: Residual Income, Economic Value Added, Market Value Added; Balanced Score Card

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Financial Management	Khan and Jain	Tata McGraw-Hill
2.	Introduction to Management Accounting	Charles T. Horngren	Prentice-Hall
3.	Cost Accounting: A Managerial Emphasis	Charles T. Horngren, George Foster and Srikant M. Datra	Prentice-Hall
4.	Financial Decision Making: Concepts, Problems and Cases	J.J. Hamton	Prentice-Hall

Commerce and Management
Paper-III (Departmental II)

Subject Code:MNG903	Contemporary Issues in Marketing Management

UNIT- I

Orientation of Modern Marketing and Analyzing Market Opportunities: Marketing Tasks and Approaches to Modern Marketing, Marketing Environment and Environment Scanning, Analyzing Market Environment, Role of Marketing in Corporate sector in Recent era: 4Ps & beyond, Marketing Challenges, Marketing information system and Marketing Research, Strategic Planning in Marketing Management, Consumer Behavior: Factors Influencing Consumer Buying Behavior Process, Models and Scaling Techniques; Market Segmentation, Targeting and Positioning, Measurement Process in Marketing Research: Measurement in Marketing, Difficulties in Measurement, Concepts of Validity and Reliability; Attitude Measurement: Importance of Attitude in Marketing, Nature of Attitudes and their Measurement, Attitude Scaling Procedures, Thurston Scale, Likert Scale, Paired Comparison Scale, Semantic Differential Scale and Multi-Dimensional Scale (MDS) and Their Applications.

UNIT -II

Applied Marketing Research: Demand Measurement and Forecasting, Product Research, Advertising Research, Distribution Research, Sales Control Research, Pricing Research, Motivation Research. Use of Statistical Package for Social Sciences (SPSS) in Marketing Research, Managing Service: Idea, Institution, Person, Place and Event, Customer Evaluation of Service Quality: Gaps Model for improving the Quality of Service - knowledge gap, standards gap, delivery gap, Communications gap, Service Recovery.

UNIT -III

Supply Chain Management: Components of SCM, Physical Distribution System; Distribution Channels, Types & Functions, Selection, Cooperation and Conflict Management

Retail Marketing: Forms of Retail organization – levels of organization. Retail Organization Structures; Geographic Analysis in Retailing: Regional market, metro geography, non-metro geography. Gaining Strategic advantage through customer service – nature of customer service, customer service strategies

UNIT -IV

Global Marketing: Rationale, India and World trade, Foreign Trade policy in Indian context, Constraints in Global marketing, Destination wise and Commodity Wise Trends; Outsourcing and its marketing Implications for home and host countries.

Emerging Issues in Marketing: Green Marketing, Holistic Marketing, Network Marketing, Event Marketing, Mergers and Acquisitions: Regulatory Framework, Marketing Issues and Relevance in 21st century business Enterprises, Competing through e-Marketing – Components of e-marketing, Impact of e-Marketing on marketing Strategy.

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	Principles of Marketing	Kotler Philip & Armstrong, G	Prentice-Hall
2.	Marketing Management	Kotler Philip	Prentice-Hall
3.	Principles of Marketing	Kotler Philip & Keller	Prentice-Hall
4.	Marketing Management	Saxena Rajan	Tata McGraw-Hill

Management

Paper-III (Departmental II)

Subject Code:MNG905	Contemporary Issues in Human Resource Management

UNIT- I

An overview of Human Resource Management: Framework of HRM in the present day corporate sector. Human Resource Management in the global context Role of HRM in strategy implementation. HRM in case of mergers and acquisitions..

UNIT -II

Performance management, Competency Mapping. Managing Diversity: Diversity and discrimination issues at workplace. Gender Issues: Glass Ceiling and Job segregation. Work Life Balance, Occupational Stress. Organizational Justice. Aggression at work place: Consequences.

UNIT -III

Attitudes and their measurement, Job Satisfaction, Job Involvement, Organizational Commitment, Organizational Citizenship Behaviour. Personality: measurement and implications. Emotional Intelligence.

UNIT- IV

Human values and Ethics. Motivation, Role of Equity and Equity Sensitivity. Emotions; Emotional Labour, consequences. Politics in organizations: group dynamics. Leadership: theories. Managing Attrition. Expatriate Adjustment Issues.

Text/Reference Books:

S. No.	Name	Author(s)	Publisher
1.	*Human Resource Management*	Garry Desseler	Prentice-Hall
2.	*Personnel Management*	Edwin B. Flippo	McGraw-Hill
3.	*Human Resource Management – Gaining A Competitive Advantage*	Raymond Noe, Wright, Gerhart & Hollenbeck	Tata McGraw –Hill
4.	*Organizational Behaviour*	Robbins, Judge & Sanghi	Pearson Education

Zoology
Paper-II (Departmental I)

Subject Code:ZOO903	Research Techniques in Biological Sciences

UNIT-I

Microscopy and Spectrophotometry: Principle, structure and application of **TEM and SEM**; Histological preparations of tissues for SEM & TEM; Principle and applications of **Florescence microscopy**, **Confocal microscopy** and **atomic force microscopy**; Principle and application of UV visible and IR Spectrophotometer; Flame photometer; Atomic absorption spectroscopy

UNIT-II

Electrophoresis and Centrifugation: Electrophoresis: Principle, types and applications, Setting of Instrument for Paper electrophoresis and staining of chromatogram, Setting of Instrument for Gel electrophoresis and factors affecting migration, Staining in Gel Electrophoresis; Preparation of gel tubes; Types of Gel Electrophoresis; **Centrifugation:** Principle, Determination of centrifugal force; Sedimentation; Types of centrifuge

UNIT-III

Chromatography: Principle and types of chromatography; Two dimensional chromatography and its usefulness; Preparation of plates, activation and spotting for TLC; Different solvent media used in TLC; Developing agents used in TLC; Quantitative estimation of spots; Preparation of columns and fraction collection in column chromatography; Difference between TLC and Column Chromatography

UNIT IV

Biochemical Assay Techniques and Radiation: Microtomy: Tissue processing, Fixation and Staining, Types of Microtome; **Blotting Techniques**: Western, Southern and Northern; **RIA**: Principle and application; **ELISA:** Principle and application; Types of radiations; **Auto-radiography**- Principle and application, Radioactivity counters

Text/Reference Books:

S.No.	Name/Title	Author	Publisher
1	Principles and Techniques of Biochemistry and Molecular Biology	Wilson and Walker	Cambridge University Press, New Delhi
2	Bioinstrumentation	John G. Webster	Wiley Publishers
3	Research methodology for biological sciences	N. Gurumini	MJP Publishers
4	Bioinstrumentation	L. Veerakumari	MJP Publishers

Zoology
Paper-III (Departmental II)

Subject Code:ZOO905	General and Applied Entomology

UNIT- I

General Entomology and Taxonomy of Insects: Insect diversity and their outline classification; **Insect collection:** Significance and insect nets and traps; General organization of a typical insect body; Different types of mouth parts and relationship with feeding habits of insects; Classification of **Apterygota** with distinctive feature, economic importance and example of various orders and their sub divisions; Classification of of **Exopterygota** upto orders with distinguishing characters and examples; Classification of **Endopterygota** upto orders with distinctive features and examples

UNIT- II

Applied Entomology-I: Role of insect as vectors of human diseases; **Mosquitoes** as pests of public health importance and their control; **Housefly:** A human health hazard and its control; Live-stocks pests and their control; **Sericulture:** Life cycle of *Bombyx mori*, Silkworm rearing technology, Pests and Diseases of Silkworm

UNIT -III

Applied Entomology-II: Detailed information and classification of insecticides and their mode of action; Merits and demerits of chemical insecticides and development of against them; Biological pest control; Integrated pest management; **Account of the following:** (a) Catalysts and synergists of insecticides (b) Systemic insecticides (c) Antifeedants (d) Attractants and repellents (e) Aerosols (f) Biopesticides (g) Microbial insecticides (h) Male sterility techniques (i) IGRs, third & fourth generation pesticides (j) Chitin synthesis inhibitors

UNIT- IV

Applied Entomology-III: Insect pests: Classification and categories of pests; Structure, life history, nature of damage and control methods of following pests of mulberry**:** (a) *Glyphodes pyloalis* (b) *Maconellicoccus hirsutus* (C) *Hemerophila atrilineata* (d) Mites; **Diseases of mulberry plants:** Leaf spot, Powdery mildew, Root Knot, Root Rot; Structure, life history, significance, nature of damage and control methods of following pests of sugarcane: (a) *Scirpophaga* (b) *Chilotracea* (C) *Pyrilla* (d) *Aleurolobus*; Structure, life history, significance, nature of damage and control measures of following general pests: (a) grasshoppers & locusts (c) termites (d) aphids (e) hairy caterpillars

Text/Reference Books:

S.No.	Name/Title	Author	Publisher
1	Modern Entomology	B.D. Tembhare	Himalaya Publ. House
2	A Text Book of Fundamental and Applied Entomology	Alam et al.	Kalyani Publishers
3	Textbook of Applied Entomology	Srivastava & Dhaliwal	New central book Agency
4	The Insects: An Outline of Entomology	J. Gullan and P. S. Cranston	Wiley Publishing house

Botany

Paper-II (Departmental I)

Subject Code:BOT903	Bioinstrumentation

UNIT-I

INSTRUMENTATION: Definition of instrument, Parts of an instrument**,** Techniques for instrumentation

UNIT-II

MICROSCOPY: Principle and application of Florescence microscopy**;** Principle, structure and application of TEM**;** Principle, structure and application of SEM**;** Histological preparations of tissues for SEM & TEM**;** Principle and application of Confocal microscopy**;** Principle and application of atomic force microscopy

UNIT-III

CHROMOTOGRAPHY AND ELECTROPHORESIS: A general idea of chromatographic techniques, theories and applications**;** High performance liquid chromatography (HPLC)**;** Electrophoresis techniques and applications**;** Centrifugation: general theory; instrumentation and application

UNIT-IV

SPECTROPHOTOMETRY: A general study of instrumentation and application of colorimetry Principle and application of Spectrophotometer; UV visible and IR spectrophotometer; Flame photometer; Atomic absorption spectroscopy; NMR and ESR spectrophotometry

Text/Reference books:

S.No.	Name/Title	Author	Publisher
1	Physical Biochemistry: Principles and Applications	Sheehan, D. (2000)	John Wiley and Sons Ltd., Chicester, England..
2	Instrumental Methods of Analysis	Wliard, Merritt, Dean, Settle	Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3	Principles and Techniques of Biochemistry and Molecular Biology,	Wilson and Walker (2010).	Cambridge University Press, New Delhi.
4	Bioinstrumentation	Veerakumari (2011)	MJP Publishers
5	Research methodology for biological sciences	N. Gurumini (2006)	MJP Publishers

Botany
Paper-II (Departmental I)

Subject Code:BOT905	**Plant Biochemistry**

UNIT-I

Nitrogen Metabolism: Introduction, Overview of nitrogen in the biosphere and in plants, overview of nitrogen fixation, enzymology of nitrogen fixation, symbiotic nitrogen fixation, ammonia uptake and transport, overview of nitrate and nitrite reduction, interaction between nitrate assimilation and carbon metabolism,

UNIT-II

Carbohydrates: Classification, occurrence and structure of monosaccharides, oligosaccharides and polysaccharides (Starch, cellulose and pectin); Proteins: Amino acids, structure and characteristics, peptides and protein structure, functions of proteins; Gluconeogenesis vs glycolysis; Role of Kreb's cycle

UNIT-III

Lipid Metabolism**:** Biosynthesis of fats, fatty acids and glycerol, condensation of fatty acids and glycerol; Fat oxidation - hydrolysis of triglycerides by lipase; metabolism of glycerol; Oxidation of Fatty Acids – β-oxidation, α- oxidation, ω- oxidation; conversion of fat into carbohydrates (glyoxylate cycle).

UNIT-IV

Secondary Metabolites and Plant Defense**:** Role of secondary metabolites in plants, biosynthetic pathways and functions of terpenes, phenolic compounds and nitrogen containing compounds; induced plant defences against insect herbivores, plant defences against pathogens.

Text and Reference books:

S.No.	Name/Title	Author	Publisher
1	Physical Biochemistry : Principles and Applications,	Buchanan, B.B., Gruissem, W., and Jones, R.L. (2000))	Biochemistry and Molecular Biology of Plants.
2	Plant Physiology	Taiz, L., and Zeiger, E. (2010)	Sinauer Associates, Inc., Publishers, Massachusetts.
3	Plant Physiology,	Salisbury, F.B., and Ross, C.W. (1992).	Wadsworth Publishing Co., California.

Environmental Sciences
Paper-II (Departmental I)

Subject Code:EVS903	Instrumentation in Lifesciences

UNIT-I

INSTRUMENTATION: Definition of instrument, Parts of an instrument**,** Techniques for instrumentation

UNIT-II

MICROSCOPY: Principle and application of Florescence microscopy**;** Principle, structure and application of TEM**;** Principle, structure and application of SEM**;** Histological preparations of tissues for SEM & TEM**;** Principle and application of Confocal microscopy**;** Principle and application of atomic force microscopy

UNIT-III

CHROMOTOGRAPHY AND ELECTROPHORESIS: A general idea of chromatographic techniques, theories and applications**;** High performance liquid chromatography (HPLC)**;** Electrophoresis techniques and applications**;** Centrifugation: general theory; instrumentation and application

UNIT-IV

SPECTROPHOTOMETRY: A general study of instrumentation and application of colorimetry Principle and application of Spectrophotometer; UV visible and IR spectrophotometer; Flame photometer; Atomic absorption spectroscopy; NMR and ESR spectrophotometry

Text and Reference books:

S.No.	Name/Title	Author	Publisher
1	Physical Biochemistry : Principles and Applications,	Sheehan, D. (2000)	John Wiley and Sons Ltd., Chicester, England..
2	Instrumental Methods of Analysis	Wliard, Merritt, Dean, Settle	Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3	Principles and Techniques of Biochemistry and Molecular Biology,	Wilson and Walker (2010).	Cambridge University Press, New Delhi.
4	Bioinstrumentation	Veerakumari (2011)	MJP Publishers
5	Research methodology for biological sciences	N. Gurumini (2006)	MJP Publishers

Environmental Sciences
Paper-III (Departmental II)

Subject Code:EVS905	Basic and Applied Concepts in Environmental Science

UNIT-I

Fundamentals of Environmental Science: Definition: Principles & Scope of Environmental Science. Earth–Man & Environment – Ecosystems – pathways in Ecosystems. Physico – Chemical & Biological factors in the environment. Structure & composition of atmosphere – hydrosphere, lithosphere & biosphere. Natural resources – conservation – sustainable development.

UNIT-II

Dispersion of Pollutants in Water: Physical transport in surface water, dispersion of pollutants in ground water, biochemical processes in water involving microorganisms. **Dispersion of Pollutants in Soil**: Adsorption and decomposition of organic pollutants in soil, fate of soil pollutants, sorptive properties of soil, colloids, cation exchange capacity, anion retention, absorption of organics, detrimental effects of soil pollution and soil erosion, siltation of lakes, methods to minimize soil pollution, soil pollution monitoring. **Natural and anthropogenic sources of air pollution**. Primary and Secondary pollutants, Transport and diffusion of pollutants. Gas law governing the behaviour of pollutants in the atmosphere. Methods of monitoring and control of air pollution SO2, NOx, CO, SPM. Effect of pollutants on human beings, plants, animals, materials and on climate. Acid rain, Air Quality standards.

UNIT-III

Threats to Biological Diversity: Spatial pattern of biological diversity in the world, Variation in climate, environment, topography and habitat size, Ecological Succession and ecosystem dynamics, Principals of community organization, Extinctions (Past mass extinctions and current human caused extinction, extinction rates on islands, extinction rates in aquatic environments, local extinctions, estimating extinction rates with island biogeography model), Vulnerability to extinction (Endemic species and extinction, species vulnerable to extinction)

UNIT-IV

Habitat Destruction, and Global Climate Change: Human population growth and its effect, Habitat destruction (threatened rain forests, other threatened habitats, marine coastal areas, desertification); habitat fragmentation , edge effect, habitat degradation and pollution, global climate change (changes in temperate and tropical climates; plants and climate change, rising sea levels and warmer waters, overall effect of global warming)

Text and Reference books:

S.No.	Name/Title	Author	Publisher
1	Chemical Principles of Environmental Pollution.	Alloway, B. J., Ayres, D.C. (1997).	Blackie Academic and Professional, London.
2	Air Pollution.	Rao, M. N. & Rao, H. V. N. (1989).	Tata McGraw-Hill Publishing Company Limited, New Delhi. Massachusetts.
3	Conservation Biology: The Science of Scarcity and Diversity.	Soulé, M. E.(1996). and Ross, C.W. (1992).	Sunderland, MA: Sinauer & Associates.
4	Environmental Chemistry	Manahan, S.E. (1991).	Lewis Publishers, Chelsea, Michigan.
5	Ecology & Environment	Sharma, P.D.	Meerut: Rastogi Publications, Meerut, 1990.

History
Paper-II (Departmental I)

Subject Code:HIS903	History and Historical Method

UNIT-I

Nature of History: Value of History; Historical Facts; Early 20th century views on History; History, Individual and Society

UNIT-II

History as a Science: Scientific Method; Causation in History; Issues of Objectivity, Religion and Morality; Determinism and Chance in History

UNIT-III

Scope of History: Progress in History; 'Widening Scope" of History; Comparative History; History and the Social Sciences-Geography, Economics, Political Science, Social Anthropology, Sociology, Psychology.

UNIT-IV

Feminist History: concept, Feminist Historiography, Uma Chakravarti, Tanika Sarkar; Marxist interpretation of Indian History: R.S. Sharma, Irfan Habib, Vipin Chandra; Subaltern Studies: Ranjit Guha, Sumit Sarkar, Dinesh Chakravarty

Text/Reference Books:

S. No.	Author(S)	Title	Publisher
1	Gottschalk, Louis	Understanding History: A Primer of Historical Method	Alfred. A Knopf, Delhi
2	Jha, D.N.	Ancient India : An Introductory Outline	People's Publishing House, New Delhi
1	Bryant, Edwin	The Quest for the Origins of Vedic Culture : Indo-Aryan Migration	Debate, Oxford University Press, New Delhi
2	Chandra, Satish	Essays in Medieval Indian History	Oxford University Press, New Delhi
3	Philips, C.H., (Ed.),	Historians of India, Pakistan and, Ceylon	Oxford University Press, New Delhi
4	Bloch, Marc	The Historian's Craft	Manchester University Press
5	Carr, E.H.	What is History?	Penguin
6	Delzell, Charles F	The Future of History	Venderbilt University Press
7	Elton, G.R	The Practice of History	Blackwell, Oxford

History
Paper-III (Departmental II)

Subject Code:HIS905	Indian History: Approaches and Themes

Unit-I

Vedic studies: Original home, religion and society ; the Golden Age of the Guptas; Indian Feudalism; the concept of Segmentary state; the Integrative Processual Model.

Unit-II

Understanding socio-economic changes in the Delhi Sultanate; the process of Islamization; the nature of state in Mughal India: Freedom Movement in the 20th century Punjab.

Unit-III

Explorations in the nature of colonialism; the making of Indian nationalism; the drain of wealth from India; agriculture and agrarian movements.

Unit-IV

Understanding emergence of socio-religious reform movements in Punjab; Educational Enterprise of the Christian Missionaries, The Arya Samaz and Singh Sabha; Regional history with reference to the north-western region.

Text/Reference Books:

S. No.	Author(S)	Year	Title	Publisher
1	Bryant, Edwin	2002	The Quest for the Origins of Vedic Culture : Indo-Aryan Migration	Debate, Oxford University Press, New Delhi
2	Jha, D.N.	1977	Ancient India : An Introductory Outline	People's Publishing House, New Delhi
1	Chandra, Satish	1996	Historiography, Religion and State in Medieval India	Har Anand, New Delhi
2	Chandra, Satish	2003	Essays in Medieval Indian History	Oxford University Press, New Delhi
3	Philips, C.H., (Ed.),	1961	Historians of India, Pakistan and, Ceylon	Oxford University Press, New Delhi
4	Habib, Irfan	1999	The Agrarian System of Mughal India, Second Revised Edition	Oxford University Press, New Delhi
5	Chattopadhyaya, Brajdulal	1994	The Making of Early Medieval India	Oxford University Press, New Delhi
6	Sharma, R.S.,	1985	Indian Feudalism c. AD 300-1200	Second Edition, Macmillan, New Delhi
7	Thapar, Romila	2004	Social History of Ancient India : Some Interpretations	Orient Longman, Hyderabad

Mathematics
Paper-II (Departmental 1)

Subject Code: MAT907	Mathematics-I

Unit –I

Differential Equations**:** Method of variation of parameters, Sturm Liouville's boundary value problems. Sturm comparison and Separation theorems, Green functions, Construction of Green functions. Laplace transform, Laplace transform method for solving differential equations.

Unit –II

Numerical solutions of algebraic equations, Method of iteration and Newton — Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss-elimination and Gauss-Seidel methods, Finite differences, Lagrange, Newton interpolations, Numerical differentiation and integration, Trapezoidal and Simpson rules; Numerical solutions of ODEs and PDEs.

Unit –III

Metric space, Compactness, connectedness. Complete Metric Space. Topological Space.

Unit –IV

Linear programming problem and its formulation, hyper plane, convex sets and their properties, graphical method, basic feasible solution, simplex method; Bounded LPP's; Dual problem and duality theorems, dual simplex method; Transportation problems, Assignment problems and Game Theory.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1	Differential equations.	Piaggio	G.Bell & Sons Ltd
2	Introduction to Ordinary Differential Equations.	E.A. Coddington	McGraw-Hil
3	A Friendly Introduction to Numerical Analysis	Brian Bradie	Pearson Education
4	Numerical Methods for Scientific and Engineering Computations,.	M. K. Jain, S. R. K. Iyenger and R. K. Jain	New Age Publications, 2003
5	Principles of Mathematical Analysis	Walter Rudin	McGraw-Hill Ltd
6	Topology	J. R. Munkres	Pearson Prentice-Hall
7	Introduction to Topology and Modern Analysis	G. F. Simmons	Tata McGraw-Hill Edition
8	Linear Programming and Decision Making	Narag, A S.	New Delhi: S. Chand, 1979. Print.

Mathematics
Paper-III (Departmental 2)

Subject Code: MAT909	Mathematics-II

UNIT –I

Application of Partial Differential Equations: Solution of Laplace, Diffusion(Heat), Wave equations by method of separation of variables. D'Almbert solution of one dimensional wave equation, Solution of Laplace equation in polar coordinates by method of separation of variables.

UNIT – II

Mathematical Models: Introduction to population dynamics, Mathematical Ecology and Mathematical Bio-economics. A simple Prey-Predator Model, Mathematical Models in Pharmacokinetics, Epidemic Models.

UNIT-III

Fuzzy Set Theory: Introduction: Fuzzy Sets, The Operations of Fuzzy Sets, Fuzzy Relations, Fuzzy Graphs, Fuzzy Numbers, Fuzzy Functions, Fuzzy Logic.

UNIT- IV

Matlab: Using Command window: Input, output; edit of command lines; recalls from command history. Functions: User-defined functions: editing/saving codes (m files), arguments, compilation and execution, output/results, input, display. Familiarity with keywords (default names), defining built-in functions, Programming features and graphic characteristics.

Text/Reference Books:

S. No	Name	Author(S)	Publisher
1	Partial Differential Equations	E. DiBenedetto	Birkhauser, Boston
2	Mathematical Models in Biology and Medicine	J.N. Kapur	Paper Back English Affiliated East West Press (P) Ltd., New Delhi
3	Fuzzy Sets and Fuzzy Logic	George J. Klir and Bo Yuan	Prentice Hall of India, 1988
4	Matlab programming for engineers	S. Chapman	Thomson,2008
5	MATLAB: An Introduction with Applications,	Almos Gilat	Wiley India Ltd., 2004.

Physics

Paper-II (Departmental I)

Subject Code:PHY903	Lattice Dynamics

UNIT-1

Stress and Strain, elastic constants, elasticity energy, effect of crystal symmetry on elastic constants,

UNIT-2

Inelastic neutron scattering technology for the determination of phonon dispersion, lattice dynamics of a monoatomic, diatomic linear chain central and angular forces, lattice dynamics of two and three dimensional lattices, long range forces and microscopic theory, local, gap and resonant mode.

UNIT-3

Classical theory of specific heat, Einstein theory of specific heat, Debye theory of specific heat, thermal expension, Phonon density of state,

UNIT-4

Superionic conductor and proton conductors, some special crystal structures like fluorite, anti fluorite, perovskite etc and their applications.

UNIT-5

Existing Theoretical Models like Conventional force constant model, Born- von Karman model, Shell model, de-Launay angular force (DAF) model, ab-initio calculation, Density functional theory, Rigid - ion model etc. And experimantal techniques used in lattice dynamics.

S. No	Name	Author(S)	Publisher
1	An Introduction to Lattice Dynamics	Ajoy K. Ghatak, L. S. Kothari	Addison-Wesley
2	Solid state physics	H C Gupta	Vikas Publishing house
3	Solid State Physics	S O Pillai	New age international publications

Physics

Paper-III (Departmental II)

Subject Code:PHY905	Nuclear and Radiation Physics

Unit-I

X-rays and Atomic Structure: Some properties of x-rays; The scattering of x-rays by atoms and the number of electrons per atom; The diffraction of x-rays and Bragg's law; Characteristics x-ray spectra. Mosley's law

Unit-II

Artificial Radioactivity: The discovery of artificial radioactivity; The artificial radionuclides. Electron and positron emission. Orbital electron capture; The Transuranium elements; The artificial radionuclides: alpha particles; Isotope tables and nuclide charts

Unit-III

Alpha Decay: The velocity and energy of alpha particles; The absorption of alpha particles: range, ionization, and stopping power; Range-energy curves; Alpha-particle spectra. Long-range particles and fine structure; Nuclear energy levels; The theory of alpha-deacy.

Beta-Decay: The velocity and energy of beta-particles; The absorption of beta-particles. Range, ionization and energy loss; Range-energy relations for beta-particles; Beta-particle spectra. The continuous spectrum, The theory of beta-decay. Basis of the theory; The theory of beta-decay. Results and comparison with experiment; Energy levels and decay schemes; The neutrino; Symmetry laws and the non-conservation of parity in Beta-decay.

Gamma Decay: The absorption of gamma rays by matter: experimental data; The interaction of gamma rays with matter; Photoelectric absorption; Compton scattering; Electron-positron pair formation; The absorption of gamma-rays by matter. Comparison of experimental and theoretical results; The measurement of gamma-ray energies; Gamma-decay: internal conversion; Gamma-decay and nuclear energy levels: theory; Gamma-decay and nuclear energy levels: experimental results and nuclear isomerism.

Unit-IV

Nuclear Radiation Detectors: General introduction; Gas filled Ionization detector; Semiconductor Detector; Scintillation Detectors; Track etch Detecors

Text and Reference Books:

S. No.	Author(S)	Title	Publisher
1	Irving Kaplan	Nuclear Physics	Narosa Publishing House
2	S S Kapoor & V S Ramamurthy	Nuclear Radiation Detectors	Wiley Eastren Limited

Instrumentation in Genetics
Paper-II (Departmental I)

Subject Code:AGR903	Instrumentation in Genetics

UNIT-I

INSTRUMENTATION: Definition of instrument, Parts of an instrument**,** Techniques for instrumentation

UNIT-II

MICROSCOPY: Principle and application of Florescence microscopy**;** Principle, structure and application of TEM**;** Principle, structure and application of SEM**;** Histological preparations of tissues for SEM & TEM**;** Principle and application of Confocal microscopy**;** Principle and application of atomic force microscopy

UNIT-III

CHROMOTOGRAPHY AND ELECTROPHORESIS: A general idea of chromatographic techniques, theories and applications**;** High performance liquid chromatography (HPLC)**;** Electrophoresis techniques and applications**;** Centrifugation: general theory; instrumentation and application

UNIT-IV

SPECTROPHOTOMETRY: A general study of instrumentation and application of colorimetry Principle and application of Spectrophotometer; UV visible and IR spectrophotometer; Flame photometer; Atomic absorption spectroscopy; NMR and ESR spectrophotometry

Text/Reference books:

S.No.	Name/Title	Author	Publisher
1	Physical Biochemistry: Principles and Applications	Sheehan, D. (2000)	John Wiley and Sons Ltd., Chicester, England..
2	Instrumental Methods of Analysis	Wliard, Merritt, Dean, Settle	Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3	Principles and Techniques of Biochemistry and Molecular Biology,	Wilson and Walker (2010).	Cambridge University Press, New Delhi.
4	Bioinstrumentation	Veerakumari (2011)	MJP Publishers
5	Research methodology for biological sciences	N. Gurumini (2006)	MJP Publishers

Genetics
Paper-III (Departmental II)

Subject Code:AGR905	Concepts of Genetics

UNIT-I

Model systems in Genetic Analysis: Bacteriophage, E. coli, Neurospora crassa, yeast, Arabidopsis, maize, Drosophila, C. elegans, Zebra fish, Homo sapiens - General outline of life cycle, importance in Genetic analysis.

UNIT-II

Laws of inheritance: Mendel's Laws, concept of dominance, segregation, independent assortment; Chromosome theory of inheritance. Allelic and non-allelic interactions: Concept of alleles, types of dominance, lethal alleles, multiple alleles, test of allelism, complementation; Epistasis.

UNIT-III

Linkage: Concepts, recombination, gene mapping in prokaryotes and eukaryotes, fine structure mapping. Sex-linked inheritance: Conceptual basis, sex influenced traits, mechanism of sex determination. Quantitative inheritance – Concept, Genes and Environment - heritability, penetrance and expressivity. Cytoplasmic inheritance – Basis and mechanism, role of organellar genes.

UNIT-IV

Mutation – Classification, mechanism, repair, role in genetic analysis and evolution. Changes in Chromosome number and structure: Polyploidy, aneuploidy, chromosomal rearrangements - deletion, duplication, inversion, and translocation. Meiotic consequences in structural heterozygotes, role in speciation and evolution.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Concepts of Genetics	Klug W. S. and Cummings M. R	Prentice-Hall
2	Genetics	Strickberger M. W.	Prentice-Hall
3	Principles of Genetics	Snustad D. P. and Simmons M. J.	John Wiley & Sons.

Advanced Manufacturing Technology

Paper-II (Departmental I)

Subject Code: ME903	Advanced Manufacturing Technology

UNIT-I

Agile Manufacturing: Definition, business need, conceptual frame work, characteristics, generic features. **Four Core concepts**: Strategy driven approach-integrating organization, people technology, and interdisciplinary design methodology. Developing Agile Manufacturing: Enterprise design, System concepts as the basic manufacturing theory-joint technical & Organizational design and a model for the design of agile manufacturing enterprise. Enterprise design process insights into design processes, what is interdisciplinary design, main issues, and simple design example. Production Development Through CIM : Computers in Industrial manufacturing, Product cycle & Production development cycle, Introduction of CAD/CAM & CIM, sequential and concurrent engineering, soft and hard prototyping. Computer Integrated Manufacturing and Automation: Fundamentals of CAD/CAM, Computerized Manufacturing planning systems, shop floor control & automatic identification techniques. Computer Network for manufacturing and the future automated factory.

UNIT-II

NC/ CNC Machine Tools: General architecture of CNC Machine, Components of the CNC Systems: Machine Control Unit, CNC Driving system components: Hydraulic, Servo Motors, Stepper Motors, and Feedback Devices: Encoder, Resolver, Inductosyn, Tachometers, Counting devices, Digital to analog converters. Constructional Features of CNC Machines:Design considerations of CNC machines for improving machining accuracy, Structural Members, Slide ways, bearings, Re-circulating ball Screws, Spindle drives, Work holding devices and tool holding devices, Automatic tool changers: Principles of Operation, Machining Centres, Tooling for CNC machines. Computer Controls in NC : CNC Technology: Functions of CNC Control in Machine Tools, Advantages of CNC, Direct Numerical Control(DNC Systems): Configuration of DNC system, , Functions of DNC, Communication between DNC computer & MCU, Advantages of DNC, Adaptive control machining systems. Adaptive control optimization system, adaptive control constraint system, applications to machining processes, Benefits of Adaptive control machining.

UNIT-III

Industrial Robotics: Robotics technology : Types of Robots, Robot Technology Levels, Robot geometric configurations and Technical Features, basic robot motions, Robot control systems, robot drive systems, Work-cell control and Interlocks, robot sensors, robot safety, robot-computer interface, industrial robot applications and benefits, robot programming and

programming languages. **Rapid Prototyping:** Introduction, Definition of Prototype, Types of prototype, Need for the compression in product development, History of RP systems, Survey of applications, Growth of RP industry, classification of RP systems. Stereo lithography Systems: Principle, Process parameter, process details, Data preparation, data files and machine details, Application. **Selective Laser Sintering**: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications, Fusion Deposition Modeling: Principle, Process parameter, Path generation, Applications.

UNIT-IV

Definition of an FMS – Types & configurations concepts – Types of flexibility & performance measures. Function of FMS host computer, FMS host and area controller function distribution. **Development and implementation of an FMS**: Planning phase, Integration, System configuration, FMS layouts, Simulation, FMS Project development steps. Project management, Equipment development, Host system development, planning, Hardware & Software development**. Automated Material Handling Systems**: Functions, Types, Analysis of material handling equipments, Design of Conveyor & AGV systems. Benefits of Automated material handling systems. Problems. Automated Storages Systems:Storage system performance, AS/RS, Carousel storage system, WIP storage system, Interfacing handling storage with manufacturing, Problems.

Text/Reference books:

S.No.	Name/Title	Author	Publisher
1	Agile Manufacturing - Forging Mew Frontiers'	Poul T Kidd	Amagow Co. UK
2	Automation, Production Systems & Computer Aided manufacturing	M. P. Grover	Prentice Hall.
3	Stereo 1ithography and other RP & M Technologies	Paul F. Jacobs	SME NY, 1996
4	Rapid Manufacturing	Flham D.T & Dinjoy S.S	Verlog London

Operations Management
Paper-III (Departmental II)

Subject Code: ME905	Operations Management

UNIT-I

Operations Planning Concepts: Introduction, Operations Functions in Organizations, Historical development, Framework for managing operations, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity, International dimensions of productivity, The environment of operations, Production systems decisions- a look ahead. **Operations Decision Making** : Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision Tree Problems, Economic models-Break Analysis in operations, P/V ratio, Statistical models.

UNIT-II

System Design and Capacity: Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning. **Forecasting Demand:** Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Moving Average methods, Exponential smoothing, Trend adjusted Exponential Smoothing, Regression and correlation methods, Application and control of forecasts-Mean Absolute Deviation, BIAS, and Tracking Signal. **Aggregate Planning and Master Scheduling:** Introduction- planning and scheduling, Objectives of aggregate planning, Three Pure Strategies, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

UNIT-III

Material and Capacity Requirements Planning: Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities. **Scheduling and Controlling Production Activities**: Introduction, PAC, Objectives and Data requirements, Loading –Finite and Infinite Scheduling methodology, priority sequencing, capacity control.

UNIT-III

Single Machine Scheduling: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule. **Flow –Shop Scheduling**: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic. **Job-Shop Scheduling**: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.

Text/Reference books:

S.No.	Name/Title	Author	Publisher
1	Operations Management	Monks, J.G	McGraw-Hill International Editions
2	Productions & operations management	Adam & Ebert	
3	Production and Operations Management	Pannerselvam. R	PHI.

REVIEW OF LITERATURE

(All Departments)

Subject Code:RLS902	PhD- Review Of Literature /Seminar (in Relevant Research Area)

1. The research student is required to prepare a concept paper/working, paper/review
2. Paper by reviewing at least 30 research papers / references books / unpublished doctoral dissertations / other reports etc.
3. To qualify the paper the research student is required either to present the prepared
4. Paper in an International Conference/ Seminar/ Workshop or publish the same in a research journal. Acceptance for publication or presentation will be considered as published/ presented.
5. A duly constituted RDC of the university shall evaluate the completion of the paper

Note: Seminar will be based on the Literature Review done.