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Ph. D COURSE

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Ph. D COURSE

Paper-I RESEARCH METHODOLOGY

UNIT 1. Research process- Characteristics and requirements: Types of research

UNIT 2. The Research Phases: Phases- I Formulating a research problem, Phase- II Planning a research problem, Phase- III Conducting a research proposal

UNIT 3. Reviewing the literature: The place of the literature review in research, Clarity and focus to research problem. Improving research methodology, broadening your knowledge base in your research area, enabling you to contextualize your findings. How to review the literature, Searching, reviewing of the literature, Developing a theoretical and conceptual framework

UNIT 4. Formulating a research problem: Source, consideration and step in formulating a research problem. Formulation of research objectives in qualitative research

UNIT 5. Identifying variables: Types of variable and types of Measurement Scale

UNIT 6. Constructing Hypotheses: Definition, function, testing and characteristics of hypothesis. Types of hypothesis

UNIT 7. Conceptualizing a research design: Research design- Function and theory of research design

UNIT 8. Constructing an Instrument for Data Collection: Selection a method of data collection. Collection data using attitudinal scales. Validity and reliability of a research instrument

UNIT 9. Selecting a sample: Concept, sampling terminology, principles of sampling. Factor affecting the interferences. Types of sampling- Non Random, non probability sampling design in quantitative research

UNIT 10. Writing a research proposal: How to write a research proposal. Objectives, Hypotheses, Study design, Setting, Measurement procedures, Ethical issues. Sampling, Analysis of data, Structure of the report and Problems and limitations

UNIT 11. Writing a research report: Writing a research report, developing an outline, writing about a variable. Referencing, writing a bibliography and summary

UNIT 12. Research methodology and practice Evaluation and types of evaluation from a focus perspective. Types of evaluation from a philosophical perspective. Undertaking an evaluation. Ethical in evaluation and summary

Recommended Books:

1. Kothari, C R, Research Methodology.
2. Bhattacharyya, Dipak Kumar, Research Methodology.
3. Parikh, M.N. And Gogtay, N, ABC of Research Methodology and Applied Biostatistics: A Primer for Clinicians and Researchers.
4. Yelikar, Kanan, Essentials of Research Methodology & Dissertation Writing

Ph.D. Course work- Applied Mathematics

Name of the Guide	Name of the PhD Scholar
Dr. Falguni Acharya	Majmundar Jaykumar Nileshkumar Panchal Jitendrakumar Ghanshyambhai

Core Paper 1: Mathematics

Unit 1: Linear Algebra: Matrices & Determinants with Properties, Linear Independence, Rank of Matrix, System of Linear Equations, Consistency of System, Gauss Jordan and Gauss-elimination Method, Eigen values & Eigenvectors and its Applications, Caley Hamilton Theorem

Unit 2: Ordinary Differential Equation: Order and degree of a differential equation, separable differential equations, Homogeneous differential equations, equations reducible to Homogenous differential equations Exact differential equations, Linear differential equations and equations reducible to linear differential equations, Solution of Linear homogeneous and non-homogeneous differential equations of higher order with constant coefficients and with variable coefficients, Wronskian, method of Variation of Parameters, method of Undetermined Coefficients, Differential operator method, Linear non-homogeneous differential equations with variable coefficients, Euler's Cauchy method

Unit 3: Partial Differential Equations: Linear and quasi-linear first order partial differential equations, method of characteristics; second order linear equations in two variables and their classification; Cauchy, Dirichlet and Neumann problems; solutions of Laplace, wave and diffusion equations in two variables; Fourier series and Fourier transform and Laplace transform methods of solutions for the above equations.

Unit 4: Complex Numbers: Review of Complex Numbers, Algebraic Operations on Complex Numbers, Properties of Complex Numbers, Geometric representation of Complex Number, Modulus and Argument of Complex Number, De- Moivres' Theorem, Root of Complex Number, Euler's Formula, Hyperbolic, Inverse Hyperbolic and Logarithmic function

Unit 5: Numerical Analysis: Gauss Elimination, Partial pivoting, Gauss-Jacobi and Gauss Seidel methods, Bisection, false position, Secant and Newton-Raphson methods, Rate of convergence, Newton-Cotes formula, Trapezoidal and Simpson's formulae

Reference books:

1. H.T.H. Piaggio: An Elementary Treatise on Differential equations, Barman Press.
2. Zafar Ahsan: Differential Equations and Their Applications, Prentice-Hall of India Pvt. Ltd. New Delhi-Second edition

3. I. N. Sneddon: Elements of Partial Differential Equations, Mc Graw Hill Book Co.
4. Rai Singhania: Ordinary and Partial Differential Equations, S.Chand &Company, New Delhi
5. E. Kreyszig, Advanced Engineering Mathematics(8th Edition), John Wiley (1999)
6. S. D. Conte and Carl de Boor, Elementary Numerical Analysis-An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980
7. C.E. Froberg, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley,1981
8. Elementary Linear Algebra, 9th Edition, Howard Anton, Chris Rorres, Wiley India

Core Paper 2: Functional analysis

Unit 1: Review of linear spaces, quotient linear spaces, direct sums of linear subspaces, basis of a linear space - existence using Zorn's lemma, linear transformations from a linear space to another, projections on a linear space.

Unit 2: Normed linear spaces, Banach spaces, quotient of a normed linear space by a closed linear subspace, continuous linear transformations from a normed linear space to a normed linear space, finite dimensional normed linear spaces.

Unit 3: Conjugate space of a normed linear space, Hahn-Banach theorem with consequences, the natural imbedding of a normed linear space in its second conjugate space.

Unit 4: Reflexive spaces, open mapping theorem, projections on a Banach space, closed graph theorem, uniform boundedness theorem, conjugate of an operator on a Banach space.

Unit 5: Hilbert spaces, orthogonal complements, complete orthonormal sets in a Hilbert space.

Reference books:

- (1) "Functional Analysis" by B. V. Lemay, New Age International Limited publishers.
- (2) "An introduction to Hilbert Spaces" by S. K. Berberian, Oxford Uni. Press, 1959. D.Van Nostrand Co. Inc. Princeton, N.J., 1967, also available in paperback, edition by Springer.
- (3) "A Hilbert space problem book" by P. R. Halmos.
- (4) "An introductory functional analysis with Application" by E.Kreyszig, WSE edition, 1989, paperback.
- (5) "Linear Analysis" An Introductory course by Bela Bollobas, Foundation Books, Delhi (Cheap Edition), 1994.

Core Paper 2: Fuzzy Logic

Unit 1:

Basic concepts of Fuzzy sets theory, Basic concepts of Fuzzy subsets, operations on fuzzy sets, fuzzy relationship, the extension principle and Fuzzy arithmetic measures of, fuzziness

Unit 2: Aggregation Operations on fuzzy sets:

Intersection and union of fuzzy sets, weighted union and intersections, non-monotonic fuzzy operations, mean aggregation operators, ordered weighted averaging operators, fuzzy measures and integrals

Unit 3: The theory of approximating reasoning:

Primary elements of the AR system, semantics of the AR system, Deduction in AR, minimal solution and projections, binary logic in AR, functional representations

Unit 4: Introduction to fuzzy logic control:

Basic concepts, basic reasoning algorithm, On the relationship to PI, PD, and PID control, design of FLC, extension of the FLC.

Reference books:

1. Yager R.R. and Filev D.P., "Essentials of fuzzy modelling and control" Wiley New York
2. Zimmermann H.J., "Fuzzy set theory and its applications" Allied Publication
3. Klir. G.K. & Yuan B., "Fuzzy sets and logic" Prentice Hall of India New Delhi 1995.

Core Paper 2: Operation Research

Unit 1: Inventory theory:

General solution methods for OR models, methodology of OR and applications of OR. Inventory: Associated costs and inventory control, Deterministic inventory situations without and with shortages, Determining buffer stocks and reorder level, Multi-item deterministic problems: Limitation on inventory, limitation on floor space and limitation on investment,

Unit 2: Linear Programming:

General discussions of Linear programming problems and their illustrations, Graphical method of solving two variable problem, Convex sets and their properties, Feasible solution, optimum solution, Slack and Surplus variables, L.P.P. in a standard form, Properties of a solution (without proof), Simplex method and its computational procedure, Artificial basis technique.

Unit 3: Transportation problem:

Methods for finding initial basic feasible solution: Northwest corner rule, Matrix minima method, Vogel's approximation method, optimal solution: MODI Method. Assignment problem: Hungarian Method.

Unit 4: Game Theory:

Competitive Games, two person zero sum games, maximin and minimax criterion (based on pure strategies), Saddle points and the value of the game. Games without Saddle point: Mixed strategy solution of 2×2 games, Fundamental theorem of rectangular games, Expectation function of $m \times n$ rectangular games and the minimax - maximin theorem for it, Graphical Solution of $2 \times n$ and $m \times 2$ games, Dominance properties in games, Algebraic method of solving a game, Symmetric games, Games and linear programming.

Reference Books:

1. S. I. Gass, Linear programming, Mc Graw Hill Book Company, 1985.
2. K. V. Mittal and C. Mohan, Optimization methods in Operations Research and System Analysis, New Age International Publications, 1996.
3. Kanti Swaroop, Man Mohan and P.K. Gupta, Operations Research, Sultan Chand and Sons, 2005.
4. Hamdy A. Taha, Operations Research: An Introduction, McMillan Publishing Company, 2007.

Ph.D. Course work- Engineering and Technology

Name of the Guide	Name of the PhD Scholar
Dr. Ketan Kotecha	Amit Ratilal Chauhan Dweepna Garg

Core Paper 1: : Digital Video Processing and Surveillance

Learning Outcomes:

After learning this course, students will be able to:

- Understand different video processing techniques
- Understand motion detection techniques
- Understand Image Enhancement techniques
- Understand video surveillance techniques

Syllabus:

Unit 1: Introduction: Analog vs digital signals. Image and video signals. Electromagnetic spectrum. Principle of video processing. Digital Video Signal

Unit 2: Signals and System: 2-D and 3-D discrete signals. Complex exponential signals. Linear shift invariance system. 2-D convolution. Filtering in spatial domain

Unit 3: Fourier Transform and Sampling: 2D Fourier transforms Sampling, Discrete Fourier transform and filtering in the frequency domain

Unit 4: Motion detection and estimation: Applications of motion estimation, Optical flow, Phase correlation method, Block matching method, Region based method, Spatio temporal gradient methods and feature based

Unit 5: Image Enhancement: Introduction, Point-wise intensity transformation, Histogram processing, linear noise smoothing, Non-linear noise smoothing, Sharpening, Homomorphic filtering, Pseudo colouring and Video enhancement

Unit 6: Image Recovery: Examples of image and video recovery, Image restoration, Matrix-vector notation for images, Inverse filtering, Constrained least squares (CLS), Set-theoretic restoration approaches, Iterative restoration algorithms, Iterative least-squares and iterative constrained least-squares, Spatially adaptive algorithms, Wiener restoration filter, Wiener restoration filter vs. constrained least-squares filter, Wiener noise smoothing filter and other restoration applications

Unit 7: Lossless Compression: Introduction, Elements of information theory, Huffman coding, Run-length coding and fax, Arithmetic coding, Dictionary techniques and predictive coding

Unit 8: Image Compression: Scalar quantization, Vector quantization, Differential pulse-code modulation, Fractal image compression, Transform coding, JPEG and Subband image compression

Unit 9: Video Compression: Motion-compensated hybrid video encoding, On video compression standards, Early standards (H.261, H.263, MPEG-1 and MPEG-2), MPEG-4, H.264, H.265

Unit 10: Image and Video Segmentation: Methods based on intensity discontinuity, Methods based on intensity similarity, Watersheds and K-means algorithms and advanced methods

Unit 11: Tracking: Motion tracking methods

Unit 12: Video surveillance: Pixel level analysis, Background scene modelling, Object based analysis, Event detection and analysis and Foreground region detection

Reference book:

1. Digital Video Processing, Tekalp
2. The Essential Guide to Video Processing, Bovik

Core Paper 2: Machine Learning

Course Learning Outcome:

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

- Exposed to machine learning concepts and range of problems that can be handled by Machine learning
- Able to compare and parameterize different learning algorithms
- Develop ability to apply the machine learning concepts in real life problems

Syllabus:

Unit 1: Introduction to Machine Learning: Introduction, History, Why machine learning? Learn ability, Training, testing and validation, Over fitting vs under fitting, Supervised, unsupervised and semi supervised learning, Tools for machine learning and applications

Unit 2: Statistical Learning Techniques: Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Nonlinear Regression, Logistic Regression, Regularization, KNN, Model Selection Methods, Evaluation Measures, Evaluation Methodology, Applications

Unit 3: Decision trees: Introduction, Algorithm, Entropy, Example, Issues in decision tree learning

Handling missing values, Continuous attributes

Pruning of decision trees- Expected error pruning, Reduced error pruning, Rule post pruning

Incremental induction of decision tree, Advanced topics in decision tree, Applications

Unit 4: Artificial Neural Network: Introduction, Features of brain

- i. Biological Neuron
- ii. Biological Neural Network

Perceptron, Activation functions, Classification, recognition, association

Learning in Neural network

- i. Hebbian learning rule
- ii. Perceptron learning rule
- iii. Delta Learning rule
- iv. Other learning rules

Binary and Multiclass Classification, Linear vs nonlinear classifier, Multilayer neural network, ANN Architectures, Learning in Multilayer network, Back propagation algorithm

- i. Momentum method
- ii. Pruning

Competitive Neural Networks, Self-Organizing Maps, Learning Vector Quantization, Radial Basis Function Network, Applications

Unit 5: Deep learning: Introduction- Motivation - Why deep learning?

Diminishing gradient of Back propagation and Over fitting

Various deep learning architecture and learning

Feed forward architecture- Convolution networks, Convolution layer, Sub sampling layer

Applications

Feedback architecture- Sparse coding, Deconvolutional networks, Learning algorithm Applications

Bi-directional architecture Restricted Deep Boltzmann machine, Auto encoders, Layer wise pre-training, Contrastive Divergence

Applications of deep learning - Speech processing, Image processing, Recommender systems, Spam filtering, Social media

Unit 6: Bayesian Learning:

Bayes Theorem

Naïve Bayes Classifier- Fitting Multivariate Bernoulli Distribution, Fitting Multinomial Distribution, Fitting Gaussian Distribution

Bayesian Belief Networks- EM Algorithm and applications

Unit 7: Reinforcement learning: Learning through Rewards, Q learning, Reinforcement Learning and Neural Networks

Unit 8: Support Vector machines: Linear SVM: Separable Case, Linear SVM: Non-Separable Case, Nonlinear SVM: Kernel Functions, LS-SVM, SMO, SVR, Applications

Unit 9: Clustering algorithms: Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Methods, Clustering High-Dimensional Data and Applications

Unit 10: Partially Supervised Learning: Learning from Labelled and Unlabelled Examples

- i. Motivation
- ii. EM algorithm
- iii. Co-Training
- iv. Self-Training
- v. Transductive Support Vector Machines
- vi. Graph Based Methods
- vii. Applications

Learning from Positive and Unlabelled Examples

- i. Motivation
- ii. Two Step Approaches
- iii. Direct Approaches
- iv. Applications

Unit 11: Miscellaneous Topics:

Learning from Labelled and Unlabelled Examples

- i. Feature Selection Methods and Applications
- ii. Dimensionality Reduction Methods and Applications
- iii. Ensemble Learning Methods
- iv. Probably Approximate Correct Learning

References:

1. Deeplearning.net
2. <https://www.coursera.org/course/ml>
3. Neural network videos by Hugo Larochelle

Ph.D. Course work- IT & Computer Sciences

Name of the Guide	Name of the PhD Scholar
Dr Narayan Joshi	Kaushal Girishbhai Gor Samiksha Himen Zaveri
Dr Varang Acharya	Vivek Pramodray Dave(Change of Guide)

Core Paper-1: Cloud Computing

Unit 1: Introduction to cloud computing: definition, characteristics, components, cloud provider, SAAS, PAAS, IAAS and others, organizational scenarios of clouds, administering and monitoring cloud services, benefits and limitations, deploy application over cloud, comparison among SAAS, PAAS, IAAS cloud computing platforms.

Infrastructure as a service: Amazon EC2

Platform as service: Google App engine, Microsoft Azure, utility computing, elastic computing

Unit 2: Basics of virtualization & implementation challenges: system virtualization technologies-architectures and internals. KVM, Xen, VMware.

Unit 3: Memory virtualization: virtualization techniques, ballooning, duplication and sharing. Network and storage virtualization, virtual machine migration & replication techniques, pre-copy and post-copy techniques, applicability to system availability, NoSQL databases.

Unit 4: Cloud file systems: GFS and HDFS, Big Table, HBase and Dynamo. Map-Reduce and extensions, enterprise batch processing using map- reduce, introduction to cloud development, Example / Application of Map Reduce, Features and comparisons among GFS, HDFS etc.

Unit 5: Cloud security fundamentals: vulnerability assessment tool for cloud, privacy & security in cloud, trusted cloud computing, secure execution environments and communications, identity management and access control, biometric security for cloud, cloud security challenges: virtualization security management- virtual threats, VM security recommendations & VM - specific security techniques, secure execution environments and communications in cloud.

References Books:

- Recent IEEE, ACM, Elsevier & other reputed journal papers / book chapters.
- Cloud computing A practical Approach. Anthony T Velte, Toby J Velte, TMH.
- Cloud Computing for Dummies, Judith Hurvitz, Bloor Robin.

Core Paper 2: Soft Computing

Unit 1: Introduction: introduction, necessity of soft computing, major areas & applications

Unit 2: Evolutionary Computing: basic concepts of genetic algorithms, working principle, encoding methods, fitness function, GA operators - reproduction, crossover, mutation, convergence of GA, multi-level optimization, real life problems

Unit 3: Fuzzy Systems: fuzzy set theory, fuzzy relation, fuzzification, minmax composition, defuzzification, fuzzy logic, fuzzy rule based systems, fuzzy decision making, fuzzy control systems, fuzzy classification

Unit 4: Neural Networks: basic concept of neural network, overview of learning rules and activation functions, single layer perceptrons and learning, back propagation networks-architecture of back propagation networks; back propagation learning; variation of standard back propagation neural network, introduction to associative memory, adaptive resonance theory and self organizing map, recent applications, hybrid systems, evolutionary design of neural networks, fuzzy evolutionary algorithms

Unit 5: Neural Network Based Fuzzy Systems: neural realization of basic fuzzy logic operators, neural network based fuzzy logic inference, neural network driven fuzzy reasoning, rule based neural fuzzy modeling, neural fuzzy relational systems, neuro - fuzzy controllers, recent applications.

Reference books:

- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S. Rajasekaran, G. A. Vijayalakshami, PHI.
- Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
- Elements of Artificial Neural Network, Kishan Mehrotra, MIT Press.

Ph.D. Course work- Management

Name of the Guide	Name of the PhD Scholar
Dr Bijal Zaveri Dr Abhijeet Chaterjee	Priyanka Dixitkumar Patel Tushar Narendra Shah(Change of Guide)
Rajkumari Soni	Aashka Hardik Thakkar

Core Paper-I Advanced Management Practices

Unit: 1 Nature of Management

Management: Concept, Nature, Importance, Art and Science & as a Profession, Management Vs Administration, Decision Theory Approach, Contingency Approach, Human behavior Approach, Challenges of management due to globalization, The organizational Chart., Levels of Management & their respective Functions, Job design, Managerial Functions in MNC's Departmentalization, Methods of Vertical Co-ordination, Need and Significance of Management, Management V/S Administration, levels of Management

Unit:2_Process of Management

Planning: Nature, Scope, Objective and Significances of Planning, Key factors to planning, Types of Plans, Process of Planning, Effective planning-Principles, Barriers & How to overcome barriers.

Organizing: Concept, Designing Organization Structure, Forms of Organizational Structure, Departmentation- need, importance & bases of Departmentation, Span of Control - Determination of factors affecting Span of Control, Delegation of Authority, Authority & Responsibility, Line & Staff, and Formal & Informal Organization.

Staffing: fundamentals of staffing Concept, Manpower Planning. System approach to staffing **Directing:** Concept, Direction and Supervision, Importance of Directing, Principles of Directing. **Coordination** – Need & Importance, Coordination & Cooperation, Techniques of Effective coordination.

Unit:3 Controlling : Concept, Types of control, Method : Pre-control - Concurrent control - Post control, an Integrated Control System, Concept of Quality, Factors affecting Quality, Developing a Quality, Control system - Pre-control of inputs.

Decision Making

Meaning Importance and types of decision, Decision making process, Effective decisions, creativity and decision making, Quality and quantitative techniques used for decision making, Planning Premises and Forecasting, Total quality management, Kaizen concept, Just in time inventory

Unit:4 Quantitative Techniques in Operations Management

Introduction to operations Research- Decision Making, Role of Technology In OR- Transportation Model- Assignment Model-CPM&PERT, Inventory Management, Inventory Models (EOQ)

Innovation and Technology Management

Competitive advantages through new technologies, Technological Forecasting, Technology strategy, Technology diffusion and absorption, Human Aspects in Technology Management, Social Issues in Technology Management.

GENERAL MANAGEMENT

1. Principles of management By L.M.Prasad
2. Principles of management by sherlekar and sherlekar
3. Management process and perspective by T.N. Chhabra and R.K.Suri
4. Ethical Management – Satish Modh - Macmillan
5. Business Ethics - Agalgatti – Nirali Prakashan
6. Business Ethics – A.C.Fernando - Pearso
7. Management & Organization – By Liouis A. Allen, Tata McGraw Hill Book Company, Delhi
8. Organization & Management – By C. B. Gupta, Sultan Chand & Sons, Delhi

Core Paper-2: Advanced Marketing Management

Unit:1 Marketing – Basics, Present day importance of marketing in national and global context; Consumer Behaviour – Decision Making Perspectives, Improving the judgment process, Models of consumer behaviour; Marketing Information System – Marketing Research System and Marketing Decision Support System.

Unit:2 Research Methods in Marketing – Quantitative and Qualitative Research in Marketing, Attitude Measurement and Scaling Techniques, Product Research, Test Marketing, Advertising Research, Media Research, Motivation Research., pricing research, promotion research, customer satisfaction research, sales and distribution research, brand research, advertising research. Research tools, research analysis – factor analysis,

Unit:3 Strategic Marketing – Customer, Competitor and Environmental Analysis; SWOT Analysis, BCG Framework model, Porter’s Model, GE Model, McKinsey Model, Market Leader, Challenger, Follower and Nicher Strategies; Market Entry/Exit Decision; Marketing Mix Strategies; Sustaining Competitive Advantage and Core Competence. Marketing research: application of marketing research, research process, research design, cluster analysis, conjoint analysis, product research, packaging research,

Unit:4 Strategic Market Management—An Introduction and Overview ,What Is a Business Strategy? A Business Strategy ,Strategic Market Management ,Marketing and Its Role in Strategy External Analysis , The Scope of Customer Analysis ,Segmentation ,Customer Motivations , Unmet Needs, Competitor Analysis ,Identifying Competitors—Customer-Based Approaches ,Identifying Competitors—Strategic Groups ,Potential Competitors ,

Competitor Analysis—Understanding Competitors ,Competitor Strengths and Weaknesses ,

References:

1. Kotler, P., Marketing Management; Analysis, Planning, Implementation and Control, New Delhi, MacMillan
2. Schiffman, L.G. and Kanuk, L.L., Consumer Behaviour, New Delhi, PHI.
3. Belch, G.E. & Belch, M.A., Introduction to Advertising and Promotion, Chicago, Irwin.
4. Porter, M.E., Competitive Advantage: Creating, Sustaining Superior Performance, New York, Free Press.
5. Keegan, W., Global Marketing Management, Englewood Cliffs, New Jersey, PHI.
6. Levy, M & Barton, A.W., Retailing Management, Irwin, London.

Core Paper-2: Advanced Human Resource Management

Unit -1 ORGANISATIONAL CULTURE: Meaning, Scope Nature Dimensions, distinction between culture & climate - value in culture - Organizational culture in MNC's - Managing multiculturalism & Diversity. Meaning of organizational effectiveness, strategies to improve organizational effectiveness and cultural implications Global and Cross cultural issues to HRM.

Unit - 2 INTERNATIONAL IMPLICATIONS OF HRM Managing HR in an International business-changing environment of firm - strategic planning & HR management, Information Technology & HR, Improving International Assignments through selection, Training, & Maintaining International employees.

Unit - 3 EMOTIONAL INTELLIGENCE : Emotional Intelligence-meaning, scope, self-image, awareness, perception, Knowledge and esteem - matching personality and Job, ethical decision making behavior, Transactional analysis - Ego states, Transactions, life position, strokes, games sweat shirts, Rackets, time-structuring - Impression management empathy neuro Linguistic Programming NLP.

Unit - 4 ORGANISATIONAL DEVELOPMENT : OD - concepts, nature, scope, Interventions-Intervention strategies – conditions for failure/success in OD efforts, issues in OD, OD trends in India - OD in International settings, OD and Organizational Effectiveness.

HUMAN RESOURCE DEVELOPMENT : HRD - meaning, scope, importance HRD across cultures, Organizational Training systems, view, needs assessment, training programmes evaluation, performance appraisal design & development, legal issues, implementation & evaluation, role of appraisals in managing performance, career development & planning, factors affecting career -choices - responsibilities of Employers/managers, career counseling, designing career development, system career programmes for special group.

References:

1. Aswathappa, K., HRM & Personnel Management –, TMH
2. C.B.Mamoria, Personnel Management, Himalaya
3. Monappa, Personnel Management
4. C.B.Mamoria, Industrial Relations, Himalaya
5. Robbins, Human Resource Management

Core Paper-2: ADVANCED FINANCIAL MANAGEMENT

Unit: 1 Introduction to Financial Management

Approaches to Financial Management: Traditional View - Modern View, Different Financial Decision , Financial Management's Importance in Business: Significance of Financial Controller-Finance Manager as a Facilitator- Organization Chart of Finance Function- Reason for Centralizing Finance Function Financial Objectives of Business Firm: Profit Maximization, Wealth Maximization, Value Maximization, Other Maximization Objectives, Agency theory of Firm

Components of Financial system: Function of Financial system, financial system design, Nature and role of financial Institution {Intermediaries} and financial market

Unit: 2 Raising Finance

a) Short term Financing

- i) Introduction & Characteristics
- ii) Sources of Short term Finance

b) Long Term Financing

- i) Need for long term financing
- ii) Sources of Long Term Finance
- iii) Risk analysis in Capital Budgeting & Sensitivity analysis

c) Primary & Secondary Markets

- i) Meaning, Importance & Role
- ii) Market intermediaries: brokers, dealers, investment bankers
- iii) Bid, Ask or Offer, bid-ask spread, Bull and bear, blue chips, day trading, stop loss,
- iv) BSE/ NSE Indices

Unit: 3 Investment Decisions

a) Short term Investment Decisions

b) Long term Investment Decisions

- 1) Time value of Money
 - (i) An overview & Study of Time lines
 - (ii) Theory of interest or computation of Interest
 - (iii) Amortization of a loan
- 2) Capital Expenditure Planning & control
 - (i) Definition, Importance

c) Venture Capital Finance

- i) Introduction, Meaning Features & Types
- ii) Stages of Venture Capital Investment

d) Mutual Funds: Concept & Types

e) Decision making techniques

- i) Lease or Buy
- ii) Make or Buy
- iii) Manufacture or Vendor Development
- iv) Do or Outsource

Unit: 4 Advanced financial analysis and planning

Financial statements, financial ratio analysis, fund flow and cash flow analysis, leverages, Cost – Volume – Profit analysis, financial forecasting, inter firm comparison, financial analysis and aspects inflation.

Dividend and retention policies — formulating dividend policy : factors for consideration, dividend theories – Walter’s model, Gordon’s model, residual theory of dividend, Miller and Modigliani hypothesis. Indian positioning private and public sector in general.

FINANCIAL MANAGEMENT

1. Financial Management by Ravi M. Kishore – Taxman Publication
2. Financial Management tools & Techniques by Dr Pradip Kumar Sinha – Excel books
3. Financial Management: Principles & Practice by G Sudarsana Reddy- Himalaya Publishing
4. Fundamentals of Financial Management by Vyuptakesh Sharan – Pearson Education 2nd Edition
5. Financial Management by I M Pandey – Vikas Publishing House
6. Financial Management – P.V. Kulkarni, Satyaprasad - Himalaya Publishing House
7. Financial Management – Principles & Practice by Sudhindra Bhat– Excel Books
8. Financial Management: Management & Policy By R.M. Srivastava - Himalaya Publishing House
9. Fundamentals of Financial Management by Brigham & Houton - Cengage Learning
10. Financial Management by Khan & Jain- Tata McGraw Hill
11. Business Organization & Management – By R.N. Gupta, Sultan Chand & Sons, Delhi
12. Corporate Governance: Principal Policies & Practices by Fernando, Pearson Education
13. Corporate Ethics: The Business Code of Conduct for Ethical Employees by Steven R. Barth, Aspatore Books, 2003
14. Production & Operations Management – Chunawala & Patel – Himalaya Publishing House

Ph.D. Course work- Pharmacy- QA

Name of the Guide	Name of the PhD Scholar
Dr Yunus Pasha	Patel Parth Upendrabhai Thakor Khushbuben Ajitsinh
Dr Falguni Tandel	Patel Nidhi Harshadkumar

Core Paper 1: EVALUATION TECHNIQUES WITH REGULATORY REQUIREMENTS

Unit 1: Analysis of drugs and its metabolites from biological samples including, selection of biological sample, extraction of drugs by various methods as LLE, SPE and Membrane filtration. Application including Bioequivalence study, Bioavailability, Pharmacokinetic etc. USFDA guideline for validation of bioanalytical method

Unit 2: Solid state analysis of drug substance including related substances, and impurities present in drugs and their effect on drug stability and therapeutic action. Regulatory requirement related to stability study

Unit 3: Impurity Profile: methods of identification, isolation and estimation of impurities including various advance analytical techniques. Regulatory requirement related to impurity study.

Unit 4: Extraction, isolation of drugs from plant origin..Advance analytical techniques for evaluation of crude drug and herbal formulation. Compendial methods for evaluation of crude drug and herbal formulation

Unit 5: Compendial analytical methods, Validation of analytical methods according to USP and ICH guidelines.

Core Paper 2: PHARMACEUTICAL VALIDATION

Unit 1: Introduction to Pharmaceutical Validation: Definition, Manufacturing Process Model, scope of Validation, Advantage of Validation, Organization for Validation, Validation Master Plan, Types of process validation, Design Qualification, Installation Qualification, Operational Qualification & Performance Qualification of facilities

Unit 2: Calibration: concept, objective and regulatory requirement. National and international standards for calibration. Calibration of pharmaceutical equipments and instruments like pH meter, UV-Visible spectrophotometer, thermometer, melting point test apparatus. Calibration Master plan

Unit 3: Validation of Equipment, Concept of URS, DQ, IQ, OQ & PQ.
Validation of following equipments
- Dry Powder Mixers

- Fluid Bed and Tray dryers
- Tablet Compression (Machine)
- Dry Heat Sterilization/Tunnels
- Autoclaves
- Membrane filtration
- Capsule filling machines
- Validation of Integrated lines by media fill test

Unit 4: Utilities Validation:

- a. Validation of Pharmaceutical Water System & pure steam,
- b. Validation of HVAC system
- c. Validation of Compressed air.

Unit 5: Cleaning Validation: Cleaning of Equipment, Cleaning of Facilities

Unit 6: Validation of following analytical Instruments:

- HPLC
- Dissolution test apparatus
- U.V./Visible spectrophotometers

Unit 7: Process Validation Prospective, concurrent, retrospective & revalidation, Process validation of following formulations - Coated tablets - Capsules - Ointment/Creams - Liquid Orals.

Unit 8: Computer System Validation

Unit 9: Product development

Ph.D. Course work- Pharmacy- Pharmaceutical Technology / Pharmaceutics

Name of the Guide	Name of the PhD Scholar
Dr Dipti H Patel	Mansi Jatinbhai Shah Krishna Ashokbhai Patel

Core Paper 1: Tablet Formulation

Unit 1: Preformulation: Physical, Chemical and Pharmaceutical factors influencing formulation, Solid-state characterization: Crystallinity, hygroscopicity, Particle size and particle size distribution, compaction properties, Crystalline and polymorphism and its evaluation. Rationale for selecting the preferred polymorph/crystalline form, Drug-excipient compatibility study, Traces of organic volatile impurities (OVIs) and their regulatory limits (residual solvents).

Unit 2: Tablet: Definition, Merits/Demerits, General Properties and Types of Tablet Dosage form, Excipients, Granulation Methods, Types of Granulators, Evaluation of Granules, Processing Problems, Tableting Technology, Evaluation of Tablet.

Unit3: Tablet Coating: objectives, types of coating, film forming materials, formulations of coating solution, equipments for coating, coating process, evaluation of coated tablets, coating defects, specialized coating processes.

Unit 4: Recent Advances In Tablet: Site Specific and time release modulation eg. Osmotic, Colon targeting, matrix tablet, gastro retentive, mouth dissolving, buccal and sublingual.

Unit 5: Dissolution Studies: Basic Principles and regulatory requirement of Dissolution and Diffusion method for advanced Drug Delivery Systems. Methods for comparison of dissolution and diffusion profile. Application of kinetics model on dissolution.

Unit 6: Bioavailability and Bioequivalence: Method of studying bioavailability and bioequivalence. Cell-lines to predict- Biological, Pharmaceutical and Analytical considerations

Unit 7: Pharmacokinetic parameters Basic concept and importance of biological half-life, volume of distribution, renal clearance, total body clearance, plasma protein binding, and absorption rate constant, elimination rate constant.

Analysis of blood and urine data, compartment models, kinetics of one and two compartment model

Core Paper 2: Advances in Drug Delivery

Unit 1: Preformulation: Physical, Chemical and Pharmaceutical factors influencing formulation, Solid-state characterization: Crystallinity, hygroscopicity, Particle size and particle size distribution, compaction properties, Crystalline and polymorphism and its

evaluation. Rationale for selecting the preferred polymorph/crystalline form, Drug-excipient compatibility study, Traces of organic volatile impurities (OVIs) and their regulatory limits (residual solvents).

Unit 2: Dissolution and Diffusion- Basic Principles and regulatory requirement of Dissolution and Diffusion method for advanced Drug Delivery Systems. Methods for comparison of dissolution and diffusion profile. Application of kinetics model on dissolution and diffusion profile.

Unit 3: Pharmacokinetic parameters - Basic concept and importance of biological half-life, volume of distribution, renal clearance, total body clearance, plasma protein binding, and absorption rate constant, elimination rate constant. Analysis of blood and urine data, compartment models, kinetics of one and two compartment model.

Unit 4: Method of studying bioavailability and bioequivalence. Cell-lines to predict-Biological, Pharmaceutical and Analytical considerations.

Unit 5: Drug targeting: Basic Concepts of Molecular Pharmaceutics, Rationale of targeted drug delivery system; importance in therapeutics; Biological processes & events involved in drug targeting; 1st order, 2nd order & 3rd order targeting, Active & Passive targeting, Organ specific targeting. Principles of Molecular biology - Cell recognition and signaling - signal transduction – cell surface receptors.

Unit 6: Drug Delivery Systems: Structure, stability, composition, methods of preparation, evaluation, applications in drug delivery, drug targeting and commercial aspects of: Particulate Carriers, Vesicular carriers.

Unit 7: Transdermal Drug Delivery Systems: The structure & function of skin Fundamental of skin permeation, kinetic evaluation, formulation design & optimization, Permeation enhancement techniques viz. Electrical, Chemical and Mechanical methods of permeation enhancements, recent advancements in skin delivery systems, Evaluation, Merits & Demerits

Core paper 2: Pharmaceutical Analytical Technique

Unit 1: UV-visible spectroscopy: Brief review of electromagnetic spectrum and absorption of radiations. The chromophore concept, absorption law and limitations. Theory of electronic spectroscopy, absorption by organic molecules, choice of solvent and solvent effects. Applications of uv-visible spectroscopy, Woodward –Fischer rules for calculating absorption maximum, interpretation of spectra, multi-component assay, difference spectra and derivative spectra.

Unit 2: Infrared Spectrophotometry: Introduction, basic principles, and sampling techniques, interpretation of spectra, applications in pharmacy. Ft-ir, attenuated total reflectance (atr), near infra red spectroscopy (nir) -theory and applications

Unit 3: X-ray diffraction methods: Introduction, generation of x-rays, x-ray diffraction, bragg's law, x-ray powder diffraction, interpretation of diffraction patterns and applications.

Unit 4: Thermal methods of analysis: Theory, instrumentation and applications of thermo gravimetric analysis (tga), differential thermal analysis (dta), differential scanning calorimetry (dsc). And thermo mechanical analysis (tma).

Unit 5: Chromatographic techniques: classification of chromatographic methods based on mechanism of separation. Theories of chromatographic separation, principles, elution techniques, instrumentation, derivatization and applications of gas chromatography, HPLC, principles, elution techniques, applications of ion exchange and ion pair chromatography, affinity chromatography, size exclusion chromatography.

Unit 6: Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing

Unit 7: Radio Immuno Assay: Introduction, Principle, Theory and Methods in Radio Immuno Assay, Related ImmunoAssay procedures and applications of RIA Techniques. Enzyme immuno assay- ELISA and EMIT

Unit 8: Electron Microscopy: Introduction to Scanning Electron Microscopy and Transmission Electron Microscopy.

Unit 9: Stability Study

(a) Basic concept and objectives of stability study.

(b) Regulatory requirements related to stability testing with emphasis on matrixing / bracketing techniques, climates zone, impurities in stability study, photo stability testing etc.

Applications of microcalorimetry in stability study.

Ph.D. Course work- Pharmacy- Pharmaceutics

Name of the Guide	Name of the PhD Scholar
Dr Deepa H Patel	Patel Sneha Kiritkumar Siddharth Mohan Bhadsavale

Core paper 1: Advanced Drug Delivery Systems

Unit 1: Preformulation (a) Physical, Chemical and Pharmaceutical factors influencing formulation (b) Solid-state characterization: Crystallinity, hygroscopicity, Particle size and particle size distribution, compaction properties (c) Crystalline and polymorphism and its evaluation. Rationale for selecting the preferred polymorph/crystalline form (d) General principles and applications of various characterization techniques viz: Differential thermal analysis Differential scanning calorimetry, X-Ray diffraction, FTIR in Preformulation study. (e) Drug-excipient compatibility study (f) Traces of organic volatile impurities (OVIs) and their regulatory limits (residual solvents). (g) Preformulation studies of Biotechnological derived products and reference guidelines.

Unit 2: Dissolution and Diffusion Basic Principles and regulatory requirement of Dissolution and Diffusion method for advanced Drug Delivery Systems. Methods for comparison of dissolution and diffusion profile. Application of kinetics model on dissolution and diffusion profile.

Unit 3: Pharmacokinetic parameters Basic concept and importance of biological half-life, volume of distribution, renal clearance, total body clearance, plasma protein binding, and absorption rate constant, elimination rate constant. (b) Analysis of blood and urine data, compartment models, kinetics of one and two compartment model.

Unit 4: Method of studying bioavailability and bioequivalence. Cell-lines to predict-Biological, Pharmaceutical and Analytical considerations.

Unit 5: Drug targeting: Basic Concepts of Molecular Pharmaceutics, Rationale of targeted drug delivery system; importance in therapeutics; Biological processes & events involved in drug targeting; 1st order, 2nd order & 3rd order targeting, Active & Passive targeting, Organ specific targeting. Principles of Molecular biology - Cell recognition and signaling - signal transduction – cell surface receptors

Unit 6: Drug Delivery Systems: Structure, stability, composition, methods of preparation, evaluation, applications in drug delivery, drug targeting and commercial aspects of: Particulate Carriers, Vesicular carriers.

Unit 7: PEGylation

Unit 8: Novel Drug Delivery Systems: Intelligent drug delivery, Novel delivery systems for Cancer targeting, Inflammation and CNS targeting.

Core Paper 2: Modern Analytical Techniques

Unit 1: UV-VISIBLE SPECTROSCOPY: Theory of UV-Spectroscopy, absorption law and limitations, choice of solvent and solvent effects. Applications of UV-Visible spectroscopy, Woodward–Fischer rules for calculating absorption maximum, interpretation of spectra, multi-component assay, difference spectra and derivative spectra.

Unit 2: INFRARED SPECTROPHOTOMETRY: Introduction, basic principles, and sampling techniques, interpretation of spectra, applications in Pharmacy. FT-IR, Attenuated Total Reflectance (ATR), near infrared Spectroscopy (NIR) -theory and applications,.

Unit 3: NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: Fundamental Principle and Theory, Instrumentation, solvents, chemical shift, and factors affecting chemical shift, spin-spin coupling, coupling constant, and factors influencing the value of coupling constant, spin-spin decoupling, proton exchange reactions, simplification of complex spectra, FT-NMR, 2D -NMR and applications in Pharmacy, interpretation of spectra. C13 NMR- Introduction, Natural abundance, C13 NMR Spectra and its structural applications.

Unit 4: X-RAY DIFFRACTION METHODS: Introduction, generation of X-rays, X-ray diffraction, Bragg's law, X-ray powder diffraction, interpretation of diffraction patterns and applications.

Unit 5: THERMAL METHODS OF ANALYSIS: Theory, instrumentation and applications of Thermo Gravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) and Thermo Mechanical Analysis (TMA).

Unit 6: CHROMATOGRAPHIC TECHNIQUES:

a) Classification of chromatographic methods based on mechanism of separation. Theories of chromatographic separation.

b) Principles, elution techniques, instrumentation, derivatization and applications of gas chromatography, HPLC.

c) Principles, elution techniques, applications of ion exchange and ion pair chromatography, affinity chromatography, size exclusion chromatography, GC-MS, UPLC and LC-MS-stability studies and its applications.

Unit 7: ELECTROPHORESIS: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following:

a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing

Unit 8: RADIO IMMUNO ASSAY: Introduction, Principle, Theory and Methods in Radio Immuno Assay, Related Immuno Assay procedures and applications of RIA Techniques. Enzyme immuno assay- ELISA and EMIT

Unit 9: ELECTRON MICROSCOPY: Introduction to Scanning Electron Microscopy, Transmission Electron Microscope.

Unit 10: Stability Study

(a) Basic concept and objectives of stability study.

(b) Regulatory requirements related to stability testing with emphasis on matrixing / bracketing techniques, climates zone, impurities in stability study, photostability testing etc.

Applications of microcalorimetry in stability study.

Ph.D. Course work- Pharmacy- Pharmaceutics

Name of the Guide	Name of the PhD Scholar
Dr Abhay Dharamsi	Bijal Prahladbhai Prajapati

Core Paper 1: Pharmaceutics

Unit 1. Preformulation studies: Factors influencing formulation, Solid-state characterization: Particle size and particle size distribution (application of zeta sizer), Crystalline and polymorphism.

General principles and applications of various characterization techniques viz: Differential thermal analysis, Differential scanning calorimetry, X-Ray diffraction, FTIR in Preformulation study. Drug-excipient compatibility study, Traces of organic volatile impurities (OVIs) and their regulatory limits.

Unit 2. Dissolution study: Importance and equipments, Biological classification system (BCS); its significance on dissolution study and application in dosage form development. Selection of dissolution media and conditions. Comparison of dissolution profile by model independent (similarity and dissimilarity factor) and dependent methods. Concept of IVIVC, Methods of establishing IVIVC, Factors affecting IVIVC. Application of IVIVC.

Unit 3. Stability Study: Basic concept and objectives of stability study, shelf life and half life of pharmaceutical formulations, Importance of accelerated stability study, Effect of various environmental/ processing factors on stability of the formulation and techniques for stabilization of product against the same. Regulatory requirements related to stability testing with emphasis on matrixing / bracketing techniques, climates zone, impurities in stability study, photostability testing etc.,

Unit 4. Drug Absorption: Factors affecting drug absorption. Method of studying bioavailability and bioequivalence. Transport across CACO 2 monolayers, Other Cell-lines to predict- Biological, Pharmaceutical and Analytical considerations

Unit 5. Pharmacokinetic parameters : Basic concept and importance of biological half-life, volume of distribution, renal clearance, total body clearance, plasma protein binding, and absorption rate constant, elimination rate constant. Compartment models, kinetics of one and two compartment model.

Unit 6. Polymers in pharmaceutical formulations: Biodegradable polymers: Classification, Mechanism of biodegradation in the body. Polymer processing with respect to novel formulation design, Applications of polymers in novel drug delivery systems, Medical prosthetics and packaging.

Unit 7. Novel drug delivery system: Drug targeting and Basic Techniques for development of NDDS: Nanotechnology, bioadhesive systems, intelligent drug delivery, and tailor made medicines, targeted drug delivery with emphasis on nasal to brain.

Reference Books:

1. Remingtons, "Pharmaceutical Sciences" 19th edition.
2. Lachman "The theory and Practice of Industrial Pharmacy" 3rd edition.
3. Pharmaceutics "The Science of Dosage form design" by Aulton
4. Pharmaceutical dispensing by Husa.
5. Modern pharmaceutics by G. S. Banker.
6. Encyclopedia of pharmaceutical technology Volumes:1 to 19.
7. Pharmaceutical dissolution testing by Banaker.
8. Drug stability (Principles and Practices) by Jens. T. Carstensen.
9. Stability of drug and dosage forms by Yoskioka.
10. Applied Biopharmaceutics and pharmacokinetics by Leon Shargel, 4th edition.
11. Pharmacokinetics by Gibaldi and Perrier
12. Biopharmaceutics and pharmacokinetics: An introduction by Notari.
13. Pharmacokinetics for pharmaceutical scientist by John Wagner.
14. Dissolution, Bioavailability and Bioequivalence by Abdul.
15. Clinical Pharmacokinetics, Concepts and applications by Rowland and Tozer.
16. Biodegradable polymers as drug delivery systems, edited by M. Chasin, R. Langer, Marcel Dekker, New York.
17. Bioadhesive Drug Delivery Systems, E. Mathiowitz, Vol 98, Marcel Dekker, NY.
18. Novel Drug Delivery Systems, Y.W. Chien, Marcel Dekker, Inc., New York.
19. Targeted & Controlled Drug Delivery, S. P. Vyas and R. K. Khar, CBS Publishers & Distributors, New Delhi.
20. Nasal Systemic Drug Delivery, Y. W. Chien and K.S.E. Su, Vol 39, Marcel Dekker, NY.

Core Paper 2: MODERN ANALYTICAL TECHNIQUES

(Common to all disciplines)

Unit 1. UV-visible spectroscopy: Theory and application of UV-Visible spectroscopy and multi-component assay.

Unit 2. Infrared spectrophotometry: Basic theory and applications in Pharmacy. FT-IR, Attenuated Total Reflectance (ATR), Near infra red Spectroscopy (NIR).

Unit 3. Mass spectrometry: Basic principles, fragmentation processes and fragmentation pattern, interpretation of spectra and applications in Pharmacy.

Unit 4. X-ray diffraction methods: Introduction, Bragg's law, X-ray powder diffraction, interpretation of diffraction patterns and applications.

Unit 5. Thermal methods of analysis: Theory and applications of Thermo Gravimetric Analysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), Thermo Mechanical Analysis (TMA).

Unit 6. Chromatographic techniques: Classification of chromatographic methods and theories of chromatographic separation. Principles, elution techniques and applications of GC, HPLC and HPTLC, ion exchange and ion pair chromatography, affinity chromatography, size exclusion chromatography and chiral chromatography, GC-MS and LC-MS.

Unit 7. Various microscopic techniques: Introduction to scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Inverted microscopy, etc.

Recommended books:

1. Spectrometric identification of Organic Compounds, Robert. M. Silverstein, Basseler, Morrill (John Wiley and Sons. N.Y).
2. Spectroscopy of Organic Compounds by P. S. Kalsi.
3. Principles of Instrumental Analysis by Douglas A. Skoog, James, J. Leary, 4th Edition.
4. Pharmaceutical Analysis – Modern Methods – Part A, Part B, James W. Munson 2001.
5. Organic Spectroscopy – William Kemp, 3rd Edition.
6. Chromatographic Analysis of Pharmaceuticals, John A. Adamovics, 2nd Edition.
7. Practical Pharmaceutical Chemistry, Part two, A. H. Beckett & J. B. Stenlake
8. Instrumental Methods of Analysis – Willard, Merritt, Dean, CBS, Delhi.
9. HPTLC – Quantitative Analysis of Pharmaceutical Formulations – P. D. Sethi.
10. Liquid Chromatography – Mass Spectrometry, W. M. A. Niessen, J. Van Der Greef, Vol. 58.
11. Modern Methods of Pharmaceutical Analysis, Vol.1, 2, RE Schirmer, Franklin Book

Ph.D. Course work- Pharmacy- Pharmaceutics

Name of the Guide	Name of the PhD Scholar
Dr Sulekha Bhadra	Deepak Suresh Chandra Jain

Core Paer 1: ESSENTIALS IN PHARMACEUTICS-I

Unit 1: Preformulation studies Physical, Chemical and Pharmaceutical factors influencing formulation: Crystallinity, polymorphism, hygroscopicity, particle size and particle size distribution, compaction properties and its evaluation. Rationale for selecting the preferred polymorph/crystalline form. Drug-excipient compatibility study. Traces of organic volatile impurities (OVIs) and their regulatory limits (residual solvents). Reference guidelines.

Unit 2: Polymers in pharmaceutical formulations Classification, General methods of synthesis, properties, characterization and evaluation. Biodegradable polymers: Classification, Mechanism of biodegradation in the body. Polymer processing with respect to novel formulation design, Applications of polymers in novel drug delivery systems, Medical prosthetics and packaging.

Unit 3: Solubilization and solubilized system Theoretical aspects and applications. Techniques for improvement in drug solubilization for development of various dosage forms.

Unit 4: Dissolution study: Importance, objectives, equipments, Biological classification system (BCS); its significance on dissolution study and application in dosage form development. Selection of dissolution media and conditions. Comparison of dissolution profile by model independent (similarity and dissimilarity factor) and dependent methods. Concept of IVIVC, Methods of establishing IVIVC, Factors affecting IVIVC. Numerical and Case studies. Application of IVIVC

Unit 5: Stability Study: Basic concept and objectives of stability study, predicting shelf life, accelerated stability study, Effect of various environmental/ processing factors like light, pH, temperature, etc. on stability of the formulation and techniques for stabilization of product against the same. Regulatory requirements related to stability testing.

Unit 6: Pharmacokinetics: Factors affecting drug absorption; i.e. Physicochemical, Physiological and Pharmaceutical. Transport across CACO 2 monolayers, Other Cell-lines to predict- Biological, Pharmaceutical and Analytical considerations. Method of studying bioavailability and bioequivalence.

Unit 7: NDDS & Targeting : Particulate & vesicular drug delivery systems. Concepts of targeting: Active & Passive targeting.

Core Paper 2: ESSENTIALS IN PHARMACEUTICS-II

Unit 1: Analytical instruments for chemical characterization: General principles and applications of UV, HPLC, IR, NMR, MS.

Unit 2: Analytical instruments for physical characterization: General principles and applications of various characterization techniques viz: Differential thermal analysis Differential scanning calorimetry, X-Ray diffraction.

Unit 3: Advanced analytical instrument: Particle size analysis, Zetasizer, SEM, TEM

Unit 4: Rheology study: Viscometer, rheometer, texture analyzer, elasticity study

Unit 5: Stability Study: Stability chambers. Photo stability study. Applications of microcalorimetry in stability study.

Unit 6: In vitro & in vivo models: In-vitro & in vivo models for diffusion study, penetration studies, bioavailability & BE studies for different types of formulations.

Ph.D. Course work- Pharmacy- Pharmacognosy

Name of the Guide	Name of the PhD Scholar
Dr VishalKumar R Patel	Prajapati Disha Prakash(Change of Guide)

Core Paper 1: Herbal Drug Technology

Unit 1: Classical Extraction Methods: Cold (Maceration) and Heat Extraction, Percolation, Soxhlet Extraction (Continuous Extraction), Different Types of Classical Form of Extracts.

Unit 2: Advanced Extraction Techniques: Supercritical Fluid Extraction, Counter Current Extraction.

Unit 3: Isolation of Phytoconstituents: Introduction, Isolation and characterization studies of different class of Phytoconstituents (Alkaloids, Glycosides, Tannins, Steroids, Saponins etc).

Unit 4: Introduction to Holistic Concept of Drug Administration in Ayurveda and Ayurvedic Pharmaceutics (Bhaishjya-Kalpana). Introduction, Method of Preparation, Characterization, Advantages and Standardization Parameters of Arishtas, Asavas, Gutikas, Satva, Taila, Ghrita, Lepa, Churnas, Vati-Gutikas, Lehyas&Bhasmas with Classical Examples.

Unit 5: Herbal Nutraceuticals: Classification and Brief Introduction of Few Important Indian and Non-Indian Herbs under Various Categories of Nutraceuticals Such As Anti-Oxidant, Probiotics, Prebiotics, Dietary Fibers.

Unit 6: Herbal Cosmeceuticals: Classification And Brief Introduction of Important Indian And Non-Indian Herbs Under Various Categories of Cosmeceuticals Such of Cosmetics of Dental Care, Skin Care, Personal Care and Hair Care With Important Marketed National And International Products.

Core Paper 2: Herbal Drug Evaluation

Unit 1: Quality control of herbal drugs: Adulterations and their detection by organoleptic, microscopic, chemical, biological, physical and other method of evaluations.

Unit 2: Phytochemical Screening: Chemical Characterization of Principle Phyto-Constituents Such As Carbohydrates and Sugars, Amino acids and Proteins, Alkaloids, Tannins, Flavanoids, Coumarins, Saponins, Triterpenoids, Steroids, Cardiac Sterols, Anthraquinones.

Unit 3: Evaluation Parameters Included in WHO Guidelines for Herbal Standardization.

Unit 4: Introduction and Applications of Different Methods of Chromatography in Evaluation of Herbal Drugs.

Unit 5: Introduction and Applications of Different Methods of Spectroscopy in Evaluation of Herbal Drugs.

Unit 6: Pharmacological Evaluation of Herbal and Ayurvedic Formulations.