Department: Electronics & Computer Engineering

Rev: Course Structure/00/2023-24

Class: Final Year B. Tech

Semester: VIII

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
23EC4801	HSMC	Self-Learning Course 1*	-	-	-	-	15	15	20	50	100	3
23EC4802	PEC	Self-Learning Course 2*	-	-	-	-	15	15	20	50	100	3
IFT03	PROJ	Internship*	-	-	-	-	50	50	-	100	200	10
		Total					**80**	**80**	**40**	**200**	**400**	**16**

Self-Learning Course 1* - Management

23EC4801A - Financial Management for Managers
23EC4801B - E-Business
23EC4801C - Principles of Management
23EC4801D - Investment Management

Self-Learning Course 2* - Electronics & Computer Engineering

23EC4802A- Software Testing
23EC4802B- Industrial Automation And Control
23EC4802C- Computer Vision And Image Processing - Fundamentals And Applications
23EC4802D- Biomedical Signal Processing

Important Note: * indicates that the same course or title may not be available in NPTEL SWAYAM catalogue, then course from same domain or category whichever available on NPTEL SWAYAM catalogue will be Offered.

- **Internship: Student need to complete internship 18-20 weeks as per AICTE guidelines.**

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Self-Learning Course 1* - Management

23EC4801A	HSMC	Financial Management for Managers	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Financial management-an overview, Financial decisions in the firms, the fundamental principles of finance, goals of financial management, building blocks of modern finance.	[3]
Week 2: Risk-return trade off, Organization of finance functions, Emerging role of financial managers in India, Over view of financial statements – Income statement, Balance Sheet, Cash flow statement, Analysis of financial statements	[3]
Week 3: Financial Planning & forecasting, Tools & techniques of Financial Planning & Forecasting, Sources of finance.	[3]
Week 4: Time Value of Money, Future value of a single amount, Present value of a single amount, Future value of Annuity, Present value of Annuity & Perpetuity	[3]
Week 5: Capital Budgeting –Concept and overview, Capital budgeting process, Project classification, Techniques of capital budgeting, Investment criteria	[3]
Week 6: Net present value, internal rate of return, Modified Internal rate of return, Benefit cost ratio, Pay-back period method	[3]
Week 7: Accounting rate of return, Investment appraisal in practice, Estimation of project cash flows – overview, Estimation of project cash flows-tools & techniques, Estimation of project cash flows-tools & techniques	[3]
Week 8: Accounting rate of return, Investment appraisal in practice, Estimation of project cash flows – overview, Estimation of project cash flows-tools & techniques, Estimation of project cash flows-tools & techniques	[3]
Week 9: Break-even analysis, some other models and tools of risk analysis, Project selection under risk, cost of Capital-Overview, Cost of debt & preference capital.	[3]
Week 10: Cost of equity, Determining the proportions, WACC, WA Marginal cost of capital, Determining the optimum capital budget	[3]
Week 11: Capital structure of firms-An overview, Net income approach, Net operating income approach, Traditional proposition, MM Proposition	[3]
Week 12: Dividend decisions-An overview, Relevance of dividend, Dividend policy formulation, Dimensions of divined policy, Legal & procedural aspects of dividend decisions	[3]

Reference Books:

1. Prasanna Chandra "Financial Management: Theory and Practice" 9th Edition, McGraw Hill Education Publishers.
2. Van Horne, J.C, "Fundamentals of Financial Management", 13th Edition, Prentice Hall Publishers.
3. Brealey and Myers," Principles of Corporate Finance", 11th Edition, McGraw Hill Education Publishers

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4. Pandey I.M., "Financial Management", 11th Edition, Vikas Publishers.
5. Khan, M.Y. and Jain, P.K., "Financial Management", 7th Edition, McGraw-Hill Education Publishers.

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23EC4801B	HSMC	E-Business	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Introduction to E-Business	[3]
Week 2: Making Functional Areas E-Business Enabled : Value chain and supply chain, inter and intra organizational business processes, ERP	[3]
Week 3: Making Functional Areas E-Business Enabled : E-Procurement	[3]
Week 4: Making Functional Areas E-Business Enabled : E-marketing, E-Selling, E- Supply Chain Management	[3]
Week 5: Technologies for E-Business: Internet and Web based system	[3]
Week 6: Technologies for E-Business: Security and payment systems	[3]
Week 7: Technologies for E-Business: Supply chain integration technologies (EDI, RFID, Sensors, IoT, GPS, GIS)	[3]
Week 8: Technologies for E-Business: Supply chain integration technologies (Web services and cloud)	[3]
Week 9: Decision Support in E-Business: Web analytics	[3]
Week 10: Decision Support in E-Business: Customer behavior modeling	[3]
Week 11: Decision Support in E-Business: Auctions	[3]
Week 12: Decision Support in E-Business: Recommender systems	[3]

Reference Books:

1. Management Information Systems: Managing the Digital Firm, Laudon and Laudon, Pearson
2. Scaling for E-Business, Menasce & Almeida, PHI
3. eBusiness & eCommerce – Managing the Digital Value Chain, Meier & Stormer, Springer

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23EC4801C	HSMC	Principles of Management	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Introduction to Management: Management – An Emerging Profession, Definition, Nature, Scope, Purpose, and characteristics of Management, Functions, roles, skills of an effective Manager	[3]
Week 2: Evolution of Management Thought: Classical Theory, Scientific Management, Management Process or Administrative Management, Bureaucracy, Behavioural Science Approach, Quantitative a pproach, Systems Approach, Contingency Approach, Operational Approach	[3]
Week 3: Planning: Types of Plans, Planning Process, Introduction to Strategic Management, Types of Strategies, Understanding environment of business: Environmental appraisal – Industry Analysis - Porter's Model of competitive advantage, analysis of organisational resources and capabilities	[3]
Week 4: Forecasting and Premising: Introduction to Forecasting, Essential Components in Business Forecasting, Determinants of Business Forecasts, Benefits of Forecasting, Techniques of Forecasting, Limitations of Forecasting	[3]
Week 5: Decision-making: Introduction, Components of Decision-making, Decision-making Process, Group Decision-making, Creativity Problem-solving	[3]
Week 6: Management by Objectives and Styles of Management: Core Concepts of MBO, Characteristics of Management by Objectives, Process of MBO, Defining the Goal, Action Plan, Final Review, Benefits of Management by Objectives, Limitations of Management by Objectives, Styles of Management, American Style of Management, Japanese Style of Management, Indian Style of Management	[3]
Week 7: Organizing and Directing: Introduction, Organizational Design, Hierarchical Systems, Organization Structure, Types of Organization Structure, Formal and Informal Organization, Factors Determining Span of Management, Centralization and Decentralization, Span of control, Understanding authority and responsibility, Principles of Delegation, Authority, Developing a culture of Innovation and performance	[3]
Week 8: Staffing and Coordination: Introduction, Human Resource Management, Recent Trends in HRM, Technology in HRM, Economic Challenges, Workforce Diversity, Concept of Coordination, Need for Coordination, Importance of Coordination, Principles of Coordination, Coordination Process, Types of Coordination, Issues and Systems Approach to Coordination, Techniques of Coordination	[3]
Week 9: Career Development Strategy: Introduction, Concept and Elements of Career, Overview of Career Development, Significance and Advantages of Career Development, Objectives of Career Development, Types of Career Development Programmes, Different Stages or Cycles of Career Development Process, Career Anchors, Steps in the Career Planning Process	[3]

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Week 10: Leadership styles of Managers: Leadership Concept, Nature, Importance, Attributes of a leader, Role of a leader in demonstrating awareness of legal, personnel, and strategic issues relating to globalization, culture and gender diversity in an organization, Role of leader in conflict resolution and negotiations	[3]
Week 11: Organizational Communication: Communication in Organizations: Introduction, Importance of Communication in the Workplace; Understanding Communication Process, Barriers to Communication, Use of tone, language and styles in Communication, Role of Perception in influencing communication, Role of culture in communication	[3]
Week 12: Change management: Concept of change, change as a natural process, Importance & Causes of change – social, economic, technological, organizational, Developing a climate for learning, Concept of learning organizations Challenges of Contemporary Business: Role of Ethics, Corporate social responsibility, and environmental issues Books and references	[3]

Reference Books:

1. Stephen P. Robbins, David A. Decenzo, 2016. Fundamentals of Management, Pearson Education, 9th Edition
2. Harold Koontz, O'Donnell and Heinz Weihrich, 2012. Essentials of Management. New Delhi, 9th edition, Tata McGraw Hill
3. Management Fundamentals: Concepts, Applications, & Skill Development, 6th edition, Sage. 2014
4. Richard L. Daft, Principles Of Management, Cengage Learning. 2009
5. Robbins, Management, 9th edition Pearson Education. 2008

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23EC4801D	HSMC	Investment Management	3-0-0	3 Credits

Teaching Scheme	**Evaluation Scheme**
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Introduction to Investment Management: Different concepts of investment, Objectives and determinants of investment, Investment vs. Speculation, Investment decision process, Investment approaches, diversification, hedging and arbitrage, Impact of taxes on investment and impact of inflation of investment.	[3]
Week 2: Securities Market in India: Market Structure, Trading Mechanics, Stock Indices, Regulation of Market, Investment Avenues, and their characteristics: Security and Non-Security Forms of Investment.	[3]
Week 3: Analyzing Investment Return and Risk: Different Concepts of Return and their calculations. Risk: Causes, Types, classification of investors calculation of risk of Risk. strategies to mitigate different types of risks.	[3]
Week 4: Incorporating Time Value of Money in Investment Decision: Techniques of Time Value of Money, Simple and Compound Interest, Compounding Frequency, Continuous Compounding, Compounding and Discounting, Practical Application of Compounding and Discounting, Types of Annuities, Present Value and Future Value Factors,	[3]
Week 5: Valuation of variable Income Securities: Equity shares	[3]
Week 6: Valuation of Fixed Income Securities: Bonds, debentures, preference shares, and convertible securities	[3]
Week 7: Approaches to Investment Analysis I: Fundamental Analysis (Economy/Industry and Company)	[3]
Week 8: Approaches to Investment Analysis II: Technical Analysis: Various prices and volume indicators, indices and moving averages; Interpretation of various types of trends and indices.	[3]
Week 9: Portfolio Management Analysis: Meaning, Principles, Process, Portfolio Analysis: Markowitz: Portfolio Return, Portfolio Risk and Portfolio Selection using mean variance approach, Capital market theory and CAMP.	[3]
Week 10: Investing through Mutual Funds: Features, Advantages, disadvantages, Different Mutual Funds Schemes, Latest Development, Performance Evaluation of Mutual Funds.	[3]
Week 11: Introduction to Derivatives: Concepts and Classifications, Participants in derivatives markets, financial derivatives market in India, Valuation of Futures (Forwards) and Options.	[3]
Week 12: Investment Risk Hedging Strategies using Derivatives Instruments: Futures and Options.	[3]

Reference Books:

1. Agarwala, K.N. and Deeksha Agarwala: Bulls, Bears and The Mouse, Macmillan, New Delhi.
2. Cheney, J. and E. Muses: Fundamentals of Investments, Paul, New York.
3. Clark, James Fransis: Investment- Analysis and Management, McGraw Hill, International Edition.
4. Dalton, John M: How the Stock Markets Works, Prentice Hall, Delhi.
5. Domodran: Investment Valuation, John Wiley, New York".

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6. Fabozzi, Frank J: Investment Management, Prentice Hall, International Edition.
7. Fischer, Donald, E. and Ronald, J. Jordan: Security Analysis and portfolio Management, Prentice Hall, Delhi.

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Self-Learning Course 2

23EC4802A	PEC	Software Testing	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Techniques and algorithms for test case design: Graphs based testing- structural coverage criteria.	[3]
Week 2: Graphs based testing: Data flow coverage criteria	[3]
Week 3: Graphs based testing: Data flow coverage criteria	[3]
Week 4: Graphs coverage for source code, design elements and requirements	[3]
Week 5: Techniques and algorithms for test case design: Logic based testing- Predicates, logic based coverage criteria	[3]
Week 6 : Specification based logic coverage, logic coverage on finite state machines	[3]
Week 7: Input space partitioning: Input domain modeling, combination strategies criteria	[3]
Week 8: Syntax based testing: Coverage criteria based on syntax, mutation testing	[3]
Week 9: Test case design (as learnt above) applied to object-oriented applications	[3]
Week 10: Test case design (as learnt above) applied to web applications	[3]
Week 11: Symbolic testing	[3]
Week 12: Concolic testing, Conclusion	[3]

Reference Books:

1. "Lessons Learned in Software Testing", by Cem Kaner, James Bach, and Bret Pettichord.
2. "The Art of Software Testing ", by Glenford J. Myers, Corey Sandler, and Tom Badgett.
3. "Software Testing: A Craftsman's Approach ", by Paul C. Jorgensen.

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23EC4802B	PEC	Industrial Automation and Control	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Module I 1 Introduction 2 Introduction(Cont.) 3 Architecture of Industrial Automation Systems 4 Architecture of Industrial Automation Systems(Cont.)	[3]
Week 2: Module II 5 Measurement Systems Characteristics 6 Measurement Systems Characteristics(Cont.) 7 Data Acquisition Systems 8 Data Acquisition Systems(Cont.)	[3]
Week 3: Module III 9 Introduction to Automatic Control 10 Introduction to Automatic Control(Cont.) 11 P-I-D Control 12 P-I-D Control(Cont.)	[3]
Week 4: 13 PID Control Tuning 14 PID Control Tuning(Cont.) 15 Feedforward Control Ratio Control 16 Feedforward Control Ratio Control(Cont.)	[3]
Week 5: 17 Time Delay Systems and Inverse Response Systems 18 Time Delay Systems and Inverse Response Systems(Cont.) 19 Special Control Structures 20 Special Control Structures(Cont.)	[3]
Week 6: 21 Concluding Lesson on Process Control (Self-study) 22 Introduction to Sequence Control, PLC , RLL 23 Introduction to Sequence Control, PLC , RLL(Cont.) 24 Sequence Control. Scan Cycle, Simple RLL Programs 25 Sequence Control. Scan Cycle, Simple RLL Programs(Cont.)	[3]
Week 7: 26 Sequence Control. More RLL Elements, RLL Syntax 27 Sequence Control. More RLL Elements, RLL Syntax(Cont.) 28 A Structured Design Approach to Sequence Control	[3]

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29 A Structured Design Approach to Sequence Control(Cont.)	
Week 8: 30 PLC Hardware Environment 31 PLC Hardware Environment(Cont.) 32 Flow Control Valves 33 Flow Control Valves(Cont.)	[3]
Week 9: Module IV 34 Hydraulic Control Systems - I 35 Hydraulic Control Systems - I(Cont.) 36 Hydraulic Control Systems – II 37 Hydraulic Control Systems - II(Cont.)	[3]
Week 10: 38 Industrial Hydraulic Circuit 39 Industrial Hydraulic Circuit(Cont.) 40 Pneumatic Control Systems - I 41 Pneumatic Control Systems - I(Cont.) 42 Pneumatic Systems – II 43 Pneumatic Systems - II(Cont.)	[3]
Week 11: 44 Energy Savings with Variable Speed Drives 45 Energy Savings with Variable Speed Drives(Cont.) 46 Introduction To CNC Machines 47 Introduction To CNC Machines(Cont.)	[3]
Week 12: Module V 48 The Fieldbus Network - I 49 The Fieldbus Network - I(Cont.) 50 Higher Level Automation Systems 51 Higher Level Automation Systems(Cont.) 52 Course Review and Conclusion (Self-study)	[3]

Reference Books:

1. Industrial Instrumentation, Control and Automation, S. Mukhopadhyay, S. Sen and A. K. Deb, Jaico Publishing House, 2013
2. Chemical Process Control, An Introduction to Theory and Practice, George Stephanopoulos, Prentice Hall India, 2012
3. Electric Motor Drives, Modelling, Analysis and Control, R. Krishnan, Prentice Hall India, 2002
4. Hydraulic Control Systems, Herbert E. Merritt, Wiley, 1991

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23EC4802C	PEC	Computer Vision and Image Processing – Fundamentals and Applications	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Introduction to Computer Vision and Basic Concepts of Image Formation Introduction and Goals of Computer Vision and Image Processing, Image Formation Concepts.	[3]
Week 2: Fundamental Concepts of Image Formation Radiometry, Geometric Transformations, Geometric Camera Models.	[3]
Week 3: Fundamental Concepts of Image Formation Camera Calibration, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections.	[3]
Week 4: Image Processing Concepts Image Transforms.	[3]
Week 5: Image Processing Concepts Image Transforms, Image Enhancement.	[3]
Week 6: Image Processing Concepts Image Filtering, Colour Image Processing, Image Segmentation	[3]
Week 7: Image Descriptors and Features Texture Descriptors, Colour Features, Edges/Boundaries.	[3]
Week 8: Image Descriptors and Features Object Boundary and Shape Representations.	[3]
Week 9: Image Descriptors and Features Interest or Corner Point Detectors, Histogram of Oriented Gradients, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency	[3]
Week 10: Fundamentals of Machine Learning Linear Regression, Basic Concepts of Decision Functions, Elementary Statistical Decision Theory, Parameter Estimation, Clustering for Knowledge Representation, Dimension Reduction, Linear Discriminant Analysis.	[3]
Week 11: Applications of Computer Vision Artificial Neural Network for Pattern Classification, Convolutional Neural Networks; Autoencoders.	[3]
Week 12: Applications of Computer Vision Gesture Recognition, Motion Estimation and Object Tracking, Programming Assignments	[3]

Reference Books:

1. Forsyth & Ponce, "Computer Vision-A Modern Approach", Pearson Education.
2. M.K. Bhuyan , " Computer Vision and Image Processing: Fundamentals and Applications", CRC Press, USA, ISBN 9780815370840 - CAT# K338147.
3. Richard Szeliski, "Computer Vision- Algorithms & Applications", Springer.

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23EC4802D	PEC	Biomedical Signal Processing	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: Nil	CA-I :15 Marks CA-II :15 Marks Mid Semester Exam: 20 Marks Proctored NPTEL Examination: 50 Marks

Course Contents:

Week 1: Preliminaries, Biomedical signal origin & dynamics (ECG), Biomedical signal origin & dynamics (EEG, EMG etc.)	[3]
Week 2: Filtering for Removal of artifacts: Statistical Preliminaries, Time domain filtering (Synchronized Averaging, Moving Average), Time domain filtering (Moving Average Filter to Integration, Derivative-based operator), Frequency Domain Filtering (Notch Filter), Optimal Filtering: The Weiner Filter.	[3]
Week 3: Filtering for Removal of artifacts contd.: Optimal Filtering: The Weiner Filter, Adaptive Filtering Selecting Appropriate Filter	[3]
Week 4: Event Detection: Example events (viz. P, QRS and T wave in ECG), Derivative based Approaches for QRS Detection Pan Tompkins Algorithm for QRS Detection, Dicrotic Notch Detection Correlation Analysis of EEG Signal	[3]
Week 5: Waveform Analysis: Illustrations of problem with case studies, Morphological Analysis of ECG, Correlation coefficient, The Minimum phase correspondent.	[3]
Week 6: Waveform Analysis contd.: Signal length, Envelop Extraction, Amplitude demodulation, The Envelogram, Analysis of activity, Root Mean Square value, Zero- crossing rate, Turns Count, Form factor.	[3]
Week 7: Frequency-domain Analysis: Periodogram, Averaged Periodogram, Blackman-Tukey Spectral Estimator, Daniell's Spectral Estimator, Measures derived from PSD.	[3]
Week 8: Modelling of Biomedical Systems: Motor unit firing pattern, Cardiac rhythm, Formants and pitch of speech, Point process, Parametric system modelling, Autoregressive model, Autocorrelation method, Application to random signals, Computation of model parameters, Levinson-Durbin algorithm, Computation of gain factor, Covariance method, Spectral matching and parameterization, Model order selection, Relation between AR and Cepstral coefficients.	[3]
Week 9:Modelling of Biomedical Systems & Tutorials: ARMA model, Sequential estimation of poles and zeros, Tutorial 1.1: Notch filter design, Tutorial 1.2: Synchronized averaging, Tutorial 1.3: Design Butterworth low pass filter.	[3]
Week 10: Tutorials: Tutorial 2.1: Design derivative-based filter, Tutorial 2.2: Design Butterworth high pass filter, Tutorial 2.3: Design Wiener filter, Tutorial 3.1: Implement the Pan-Tompkins method for QRS detection.	[3]
Week 11: Tutorials:	[3]

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Tutorial 3.2: Use cross-correlation to detect alpha rhythm, Tutorial 3.3: Design a matched filter, Tutorial 3.4: Pan-Tompkins method for QRS detection and the Lehner and Rangayyan method to detect dicrotic notch, Tutorial 4.1: Half wave and full wave rectification, Tutorial 4.2: RMS value calculation, Tutorial 4.3: Turns count calculation, Tutorial 4.4: RMS, Turns count and Zero-crossing rate calculations	
Week 12: Tutorials: Tutorial 4.5: Derive the Envelogram, Tutorial 4.6: RR interval and Form Factor calculations, Tutorial 5.1: Power spectrum calculations using different windows, Tutorial 5.2: Mean frequency and variance of PSD, Tutorial 5.3: Compute PSDs of Voiced, Unvoiced and Silent portion of sound signal, Tutorial 5.4: Compute mean frequency of PSDs and ratio of energies, Tutorial 5.5: Study the changes in the PSDs by varying window width, number of segments averaged, and type of the window used.	[3]

Reference Books:

1. R M Rangayyan "Biomedical Signal Analysis: A case Based Approach", IEEE Press, John Wiley &Sons.Inc,2002.
2. Willis J. Tompkins " Biomedical Digital Signal Processing", EEE, PHI, 2004
3. D C Reddy "Biomedical Signal Processing: Principles and Techniques", Tata McGraw-Hill Publishing Co. Ltd, 2005
4. J G Webster "Medical Instrumentation: Application & Design", John Wiley & Sons Inc., 2001
5. C Raja Rao, S K Guha "Principles of Medical Electronics and Biomedical Instrumentation", Universities Press, 2001
6. AV Oppenheim and RW Shafer "Discrete-time Signal Processing", Prentice Hall, Englewood Cliffs, NJ, 1989.
7. Steven M. Kay, "Modern spectral estimation theory and application ", Prentice Hall, Englewood Cliffs, NJ, 198

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