



VEL TECH MULTI TECH

Dr RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

(Owned by Vel Trust 1997)

(An ISO 9001: 2008 Certified Institution)

Accredited By NAAC with 'A' Grade and NBA Accredited
Institution

(Approved by AICTE New Delhi and Govt. of Tamil Nadu, Affiliated to
Anna University Chennai)



SYLLABUS

WEEKLY SCHEDULE

VII SEMESTER 2016 - 2017

DEPARTMENT OF BIO MEDICAL ENGINEERING

IV YEAR DEGREE COURSE

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WEEK DETAILS

SL.NO.	WEEK	FROM	TO
1	WEEK1	24.06.2016	25.06.2016
2	WEEK2	27.06.2016	02.07.2016
3	WEEK3	04.07.2016	09.07.2016
4	WEEK4	11.07.2016	16.07.2016
5	WEEK5	18.07.2016	23.07.2016
6	WEEK6	25.07.2016	30.07.2016
7	WEEK7	01.08.2016	06.08.2016
8	WEEK8	08.08.2016	13.08.2016
9	WEEK9	16.08.2016	20.08.2016
10	WEEK10	22.08.2016	27.08.2016
11	WEEK11	29.08.2016	03.09.2016
12	WEEK12	06.09.2016	10.09.2016
13	WEEK13	12.09.2016	17.09.2016
14	WEEK14	19.09.2016	24.09.2016
15	WEEK15	26.09.2016	01.10.2016
16	WEEK16	03.10.2016	08.10.2016
17	WEEK17	13.10.2016	15.10.2016
18	WEEK18	17.10.2016	22.10.2016

SUBJECT CONTENTS

SL.NO	SUBJECT CODE	SUBJECT NAME
THEORY		
1	BM6701	Pattern recognition and neural networks
2	BM6702	Medical informatics
3	BM6703	Medical optics
4	IT6005	Digital image processing
5	CS6551	Computer networks
6	MD6702	Physiological Modelling
7	MD6010	Telehealth technology
PRACTICAL		
7	BM6711	Hospital training
8	BM6712	Digital image processing Lab

TEST / EXAM SCHEDULE

SL. NO	SUBJECT CODE	SUBJECT NAME	UNIT TEST I	UNIT TEST II	Pre Model Exam	MODEL EXAM
1	BM6701	Pattern Recognition And Neural Networks	14.07.2016 FN	01.08.2016 FN	06.09.2016	04.10.2016
2	BM6702	Medical Informatics	14.07.2016 AN	01.08.2016 AN	07.09.2016	06.10.2016
3	BM6703	Medical Optics	15.07.2016 FN	02.08.2016 FN	08.09.2016	08.10.2016
4	IT6005	Digital Image Processing	15.07.2016 AN	02.08.2016 AN	09.09.2016	13.10.2016
5	CS6551	Computer Networks	16.07.2016 FN	03.08.2016 FN	10.09.2016	15.10.2016
6	MD6702	Physiological Modeling	16.07.2016 AN	03.08.2016 AN	12.09.2016	17.10.2016
	MD6010	Telehealth Technology				

BM6701 PATTERN RECOGNITION AND NEURAL NETWORKS

UNIT I INTRODUCTION AND SUPERVISED LEARNING

WEEK 1:

Overview of Pattern recognition, Types of Pattern recognition

WEEK 2:

Parametric and Nonparametric approach, Bayesian classifier, Discriminant function

WEEK 3:

Non parametric density estimation, histograms, kernels, window estimators, k- nearest neighbor classifier, estimation of error rates.

UNIT II UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS

WEEK 4: UNIT TEST I

Unsupervised learning- Hierarchical clustering, Single-linkage Algorithm, Complete – linkage Algorithm,

WEEK 5:

Average-linkage algorithm and Ward's method, Partitional clustering- Forgy's Algorithm, k-means algorithm and Isodata Algorithm

WEEK 6: UNIT TEST II

UNIT III INTRODUCTION AND SIMPLE NEURAL NET

WEEK 8:

Elementary neurophysiology and biological neural network- Artificial neural network-Architecture,

WEEK 9:

Biases and thresholds, Hebb net, Perceptron, Adaline and Madaline

UNIT IV BACK PROPAGATION AND ASSOCIATIVE MEMORY

UNIT TEST III

WEEK 10:

Back propagation network, generalized delta rule, Bidirectional Associative memory Hopfield Network

WEEK 11: UNIT TEST IV

UNIT V NEURAL NETWORKS BASED ON COMPETITION

WEEK 12:

Kohonen Self organizing map, Learning Vector Quantisation,

WEEK 13:

Counter Propagation network

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. Duda R.O. Hart P.G, "Pattern Classification and scene analysis", Wiley Edition 2000 (Units I & II).
2. Hagan, Demuth and Beale, "Neural network design", Vikas Publishing House Pvt Ltd., New Delhi, 2002 (Units III, IV & V).

REFERENCES:

1. Freeman J.A., and Skapura B.M, "Neural Networks, Algorithms, Applications and Programming Techniques", Addison - Wesley, 2003.

2. Earl Gose, Richard Johnsonbaugh Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India Pvt Ltd., New Delhi, 1999.
3. Robert Schalkoff, “Pattern recognition, Statistical, Structural and neural approaches” John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2005.
4. Laurene Fausett, “Fundamentals of neural networks- Architectures, algorithms and applications”, Prentice Hall, 1994.

BM6702 MEDICAL INFORMATICS

UNIT I MEDICAL INFORMATICS

WEEK 1:

Introduction – Medical Informatics – Bioinformatics – Health Informatics,

WEEK 2:

Structure of Medical Informatics –Functional capabilities of Hospital Information System

WEEK 3:

On-line services and Off – line services - Dialogue with the computer

UNIT II MEDICAL STANDARDS

WEEK 4: UNIT TEST I

Evolution of Medical Standards – IEEE 11073 - HL7 – DICOM – IRMA - LOINC – HIPPA: Electronics Patient Records

WEEK5:

Healthcare Standard Organizations – JCAHO (Joint Commission on Accreditation of Healthcare Organization) - JCIA (Joint Commission International Accreditation) - Evidence BasedMedicine - Bioethics..

WEEK 6: UNIT TEST II

UNIT III MEDICAL DATA STORAGE AND AUTOMATION

WEEK 7:

Representation of Data, Data modeling Techniques, Relational Hierarchical and network Approach, Normalization techniques for Data handling, Plug-in Data Acquisition and Control Boards – Data Acquisition using Serial Interface

WEEK 8:

Medical Data formats – Signal, Image and Video Formats – Medical Databases - Automation in clinical laboratories - Intelligent Laboratory Information System –PACS.

UNIT IV HEALTH INFORMATICS

WEEK 9: UNIT TEST III

Bioinformatics Databases, Bio-information technologies, Semantic web and Bioinformatics, Genome projects

WEEK 10:

Clinical informatics, Nursing informatics, Public health informatics, Education and Training

WEEK 11: UNIT TEST IV

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS

WEEK 12:

Medical Expert Systems, Virtual reality applications in medicine, Virtual Environment – Surgical Simulation, Radiation therapy and planning – Telemedicine – virtual Hospitals - Smart Medical

WEEK 13:

Homes – Personalized e-health services – Biometrics - GRID and Cloud Computing in Medicine.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. R.D.Lele Computers in medicine progress in medical informatics, Tata Mcgraw Hill Publishing computers Ltd,2005, New Delhi
2. Mohan Bansal, Medical informatics Tata Mcgraw Hill Publishing computers Ltd, 2003 New Delhi

REFERENCES:

1. Orpita Bosu and Simminder Kaur Thukral, “Bioinformatics Databases, Tools and Algorithms”, Oxford University press, 2007.
2. Yi Ping Phoebe Chen, “Bioinformatics Technologies”, Springer International Edition, New Delhi, 2007

BM6703 MEDICAL OPTICS

UNIT I OPTICAL PROPERTIES OF THE TISSUES

WEEK 1:

Refraction, Scattering, absorption, light transport inside the tissue,

WEEK 2:

Tissue properties, Laser Characteristics as applied to medicine and biology-Laser tissue Interaction

WEEK 3:

Chemical-Thermal- Electromechanical – Photoablativ processes.

UNIT II INSTRUMENTATION IN PHOTONICS

WEEK 4: UNIT TEST I

Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, LEDs, Lasers, Optical filters,

WEEK 5:

Optical detectors – Time resolved and phase resolved detectors.

WEEK 6: UNIT TEST II

UNIT III SURGICAL APPLICATIONS OF LASERS

WEEK 7:

Lasers in ophthalmology- Dermatology,

WEEK 8:

Dentistry-Urology-Otolaryngology - Tissue welding

UNIT IV NON THERMAL DIAGNOSTIC APPLICATIONS

WEEK 9: UNIT TEST III

Optical coherence tomography, Elastography, Laser Induced Fluorescence (LIF)-Imaging

WEEK 10:

FLIM Raman Spectroscopy and Imaging, FLIM –Holographic and speckle application of lasers in biology and medicine.

WEEK 11: UNIT TEST IV

UNIT V THERAPEUTIC APPLICATIONS

WEEK 12:

Phototherapy, Photodynamic therapy (PDT) - Principle and mechanism

WEEK 13:

Oncological and nononcological applications of PDT - Biostimulation effect – applications-Laser Safety Procedures.

WEEK 14: UNIT TEST V**WEEK 15: ICD CLASSES****WEEK 16: MODEL EXAM****TEXT BOOKS:**

1. Markolf H.Niemz, “Laser-Tissue Interaction Fundamentals and Applications”, Springer, 2007
2. Paras N. Prasad, “Introduction to Biophotonics”, A. John Wiley and Sons, Inc. Publications, 2003

IT6005 DIGITAL IMAGE PROCESSING**UNIT I DIGITAL IMAGE FUNDAMENTAL****WEEK 1:**

Introduction – Origin – Steps in Digital Image Processing – Components

WEEK 2:

Elements of Visual Perception – Image Sensing and Acquisition

WEEK 3:

Image Sampling and Quantization – Relationships between pixels - color models.

UNIT II IMAGE ENHANCEMENT**WEEK 4: UNIT TEST I**

Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering

WEEK 5:

Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters

WEEK 6: UNIT TEST II

UNIT III IMAGE RESTORATION AND SEGMENTATION

WEEK 7:

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

WEEK 8:

Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT IV WAVELETS AND IMAGE COMPRESSION

WEEK 9: UNIT TEST III

Wavelets – Subband coding - Multiresolution expansions - Compression: Fundamentals – Image Compression models

WEEK 10:

Error Free Compression – Variable Length Coding – Bit-Plane Coding –Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

WEEK 11: UNIT TEST IV.

UNIT V IMAGE REPRESENTATION AND RECOGNITION

WEEK 12:

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments –Boundary description

WEEK 13:

Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOK:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, PHI, 1997

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata McGraw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. Willlliam K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.
5. <http://eeweb.poly.edu/~onur/lectures/lectures.html>.
6. <http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html>

CS6551 COMPUTER NETWORKS

UNIT I FUNDAMENTALS & LINK LAYER

WEEK 1:

Building a network – Requirements - Layering and protocols - Internet Architecture

WEEK 2:

Network software – Performance ; Link layer Services

WEEK 3:

Framing - Error Detection - Flow control

UNIT II MEDIA ACCESS & INTERNETWORKING**WEEK 4: UNIT TEST I**

Media access control - Ethernet (802.3) - Wireless LANs – 802.11

WEEK 5:

Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)

WEEK 6: UNIT TEST II**UNIT III ROUTING****WEEK 7:**

Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6),

WEEK 8:

Multicast –addresses – multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT LAYER**WEEK 9: UNIT TEST III**

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management

WEEK 10:

Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

WEEK 12: UNIT TEST IV

UNIT V APPLICATION LAYER

WEEK 13:

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME)
– HTTP – Web Services – DNS- SNMP.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A systems approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.

REFERENCES:

1. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
4. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011

MD6702 PHYSIOLOGICAL MODELLING

UNIT I SYSTEM CONCEPT

WEEK 1:

Review of physiological system modeling- system properties- different configurations of tracheal network, static and dynamic resistance,

WEEK 2:

Thermal resistance in human systems, System with volume Storage capacity and its electrical analog, simplified model of respiratory system

WEEK 3:

Simulation of aortic segments, Comparison of muscle model isotonic response, Step response of resistant / compliant systems –Dye dilution study of circulation, pulse response of first order system.

UNIT II TRANSFER FUNCTIONS

WEEK 4: UNIT TEST I

System as an operator and use of Transfer function, Bio Engineering of coupled systems

WEEK 5:

Examples of transformed signals and circuits for transfer function with impedance concept- Development of lung model, Impedance of a two stage ladder network, Measurement of airway resistance.

WEEK 6: UNIT TEST II

UNIT III PERIODIC SIGNALS

WEEK 7:

Sinusoidal Functions, Analysis of Instrumentation to measure air flow system, second order system – representation of a respiratory system,

Evaluation of Transfer function from frequency response for muscle response modes, Relationship between Phase lag and Time Delay

WEEK 8:

closed loop aspects of pupillary control system , Transient Response of an Undamped Second order system, General Description of Natural Frequency Damping, Physical Significance of under damped responses of post systolic operations in aortic arch.

UNIT IV FEEDBACK

WEEK 9: UNIT TEST III

Characterization of Physiological Feedback systems- Hypophysis adrenal systems, pupillary hippus, Uses and Testing of System Stability

WEEK 10:

Simulation-Hodgkin-Huxley model, Model of cardiovascular variability.

WEEK 11: UNIT TEST IV

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS

WEEK 12:

Simulation of thermal regulation, pressure and flow control in circulation, oculo motor system,

WEEK 13:

Endocrinal system, functioning of receptors, introduction to digital control system.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS

1. Willian B. Blesser, “A System Approach to Biomedicine”, Mc Graw Hill Book Co., New York, 1969 (Units I, II, III, IV).
2. Manfredo Clynes and John H.Milsum, “Biomedical Engineering System”, McGraw Hill and Co., New York , 1970 (Unit V).
3. Micheal C.K.Khoo, ”Physiological Control System” Analysis, Simulation and Estimation“- Prentice Hall of India , New Delhi , 2001(Unit V).

REFERENCES

1. Richard Skalak and Shu Chien, “Hand Book of Biomedical Engineering”, Mc Graw Hill and Co. New York, 1987.
2. Douglas S.Rigg., “Control Theory and Physiological Feedback Mechanism”, The Wilkliam and Wilkins Co. Baltimore, 1970.

MD6010 TELEHEALTH TECHNOLOGY

UNIT I TELEMEDICINE AND HEALTH

WEEK 1:

History and Evolution of telemedicine, Functional diagram of telemedicine system, Telemedicine, Telehealth

WEEK 2:

Tele care, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine

WEEK 3:

Confidentiality, Social and legal issues, Safety and regulatory issues, Advances inTelemedicine.

UNIT II TELEMEDICAL TECHNOLOGY

WEEK 4: UNIT TEST I

Principles of Multimedia - Text, Audio, Video, data, Data communications and networks, PSTN,POTS, ANT, ISDN, Internet, Air/

wireless communications: GSM satellite, and Micro wave, Modulation techniques, Types of Antenna, Integration and operational issues

WEEK 5:

Communication infrastructure for telemedicine – LAN and WAN technology. Satellite communication. Mobile hand held devices and mobile communication. Internet technology and telemedicine using world wide web (www). Video and audio conferencing. Clinical data – local and centralized.

WEEK 6: UNIT TEST II

UNIT III TELEMEDICAL STANDARDS

WEEK 7:

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN), Video Conferencing, Real-time Telemedicine integrating doctors / Hospitals

WEEK 8:

Clinical laboratory data, Radiological data, and other clinically significant biomedical data, Administration of centralized medical data, security and confidentiality of medical records and access control, Cyber laws related to telemedicine.

UNIT IV MOBILE TELEMEDICINE

WEEK 9: UNIT TEST III

Tele radiology: Definition, Basic parts of teleradiology system: Image Acquisition system Display system, Tele pathology, multimedia databases, color images of sufficient resolution, Dynamic range, spatial resolution, compression methods, Interactive control of color, Medical information storage and management for telemedicine

WEEK 10:

Patient information medical history, test reports, medical images diagnosis and treatment. Hospital information system - Doctors, paramedics, facilities available. Pharmaceutical information system.

WEEK 11: UNIT TEST IV**UNIT V TELEMEDICAL APPLICATIONS****WEEK 12:**

Telemedicine access to health care services – health education and self care. · Introduction to robotics surgery, telesurgery. Telecardiology, Teleoncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability.,

WEEK 13:

Telemedicine access to health care services – health education and self care, Business aspects - Project planning and costing, Usage of telemedicine.

WEEK 14: UNIT TEST V**WEEK 15: ICD CLASSES****WEEK 16: MODEL EXAM****TEXT BOOKS**

1. Norris, A.C. “Essentials of Telemedicine and Telecare”, Wiley, 2002

REFERENCES

1. Wootton, R., Craig, J., Patterson, V. (Eds.), “Introduction to Telemedicine. Royal Society of Medicine” Press Ltd, Taylor & Francis 2006

2. O'Carroll, P.W., Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), "Public Health Informatics and Information Systems", Springer, 2003.
3. Ferrer-Roca, O., Sosa - Iudicissa, M. (Eds.), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54, 2002.
4. Simpson, W. Video over IP. A practical guide to technology and applications. Focal Press Elsevier, 2006.
5. Bemmell, J.H. van, Musen, M.A. (Eds.) Handbook of Medical Informatics. Heidelberg, Germany: Springer, 1997.
6. Mohan Bansal, "Medical Informatics", Tata McGraw-Hill, 2004.

BM6712 DIGITAL IMAGE PROCESSING

1. Image sampling and quantization
2. Analysis of spatial and intensity resolution of images.
3. Intensity transformation of images.
4. DFT analysis of images
5. Transforms (Walsh, Hadamard, DCT, Haar)
6. Histogram Processing
7. Image Enhancement-Spatial filtering
8. Image Enhancement- Filtering in frequency domain
9. Image segmentation – Edge detection, line detection and point detection
10. Basic Morphological operations.
11. Basic Thresholding functions
12. Analysis of images with different color models.

MINI PROJECTS:

1. Applications to Biometric and security
2. Applications to Medical Images
3. Texture analysis with statistical properties
4. Boundary detection
