



**VEL TECH MULTI TECH**  
**Dr RANGARAJAN Dr.SAKUNTHALA**  
**ENGINEERING COLLEGE**

(An ISO 9001: 2008 Certified Institution)

(Owned by Vel Trust)

(Approved by Govt. of Tamil Nadu and affiliated to Anna University)



**SYLLABUS**

**WEEKLY SCHEDULE**

**VII SEMESTER**

**2015 - 2016**

**DEPARTMENT OF BIO MEDICAL**  
**ENGINEERING**

**IV YEAR DEGREE COURSE**

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## **WEEK DETAILS**

<b>SL.NO.</b>	<b>WEEK</b>	<b>FROM</b>	<b>TO</b>
1	<b>WEEK1</b>	<b>24.06.2015</b>	<b>26.06.2015</b>
2	<b>WEEK2</b>	<b>29.06.2015</b>	<b>03.07.2015</b>
3	<b>WEEK3</b>	<b>06.07.2015</b>	<b>10.07.2015</b>
4	<b>WEEK4</b>	<b>13.07.2015</b>	<b>17.07.2015</b>
5	<b>WEEK5</b>	<b>20.07.2015</b>	<b>24.07.2015</b>
6	<b>WEEK6</b>	<b>27.07.2015</b>	<b>28.07.2015</b>
7	<b>WEEK7</b>	<b>03.08.2015</b>	<b>07.08.2015</b>
8	<b>WEEK8</b>	<b>10.08.2015</b>	<b>14.08.2015</b>
9	<b>WEEK9</b>	<b>17.08.2015</b>	<b>21.08.2015</b>
10	<b>WEEK10</b>	<b>24.08.2015</b>	<b>28.08.2015</b>
11	<b>WEEK11</b>	<b>31.08.2015</b>	<b>04.09.2015</b>
12	<b>WEEK12</b>	<b>07.09.2015</b>	<b>11.09.2015</b>
13	<b>WEEK13</b>	<b>14.09.2015</b>	<b>18.09.2015</b>
14	<b>WEEK14</b>	<b>21.09.2015</b>	<b>25.09.2015</b>
15	<b>WEEK15</b>	<b>28.09.2015</b>	<b>30.09.2015</b>
16	<b>WEEK16</b>	<b>05.10.2015</b>	<b>09.10.2015</b>
17	<b>WEEK17</b>	<b>12.10.2015</b>	<b>16.10.2015</b>
18	<b>WEEK18</b>	<b>19.10.2015</b>	<b>20.10.2015</b>
19	<b>WEEK19</b>	<b>27.10.2015</b>	<b>30.10.2015</b>

## **SUBJECT CONTENTS**

<b>SL.NO</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>
<b>THEORY</b>		
<b>1</b>	<b>BM2401</b>	<b>Pattern recognition and neural networks</b>
<b>2</b>	<b>BM2402</b>	<b>Medical informatics</b>
<b>3</b>	<b>BM2403</b>	<b>Medical optics</b>
<b>4</b>	<b>BM2404</b>	<b>Digital image processing</b>
<b>5</b>	<b>EC2352</b>	<b>Computer networks</b>
<b>6</b>	<b>BM2023</b>	<b>Physiological Modelling</b>
<b>PRACTICAL</b>		
<b>7</b>	<b>BM2405</b>	<b>Hospital training</b>
<b>8</b>	<b>BM2406</b>	<b>Digital image processing Lab</b>

### TEST / EXAM SCHEDULE

SL.NO	SUBJECT CODE	SUBJECT NAME	UNIT TEST I	UNIT TEST II	Pre Model Exam	UNIT TEST IV
1	BM2401	Pattern recognition and neural networks	13.07.2015	03.08.2015	21.08.2015	14.09.2015
2	BM2402	Medical informatics	14.07.2015	04.08.2015	22.08.2015	15.09.2015
3	BM2403	Medical optics	15.07.2015	05.08.2015	24.08.2015	16.09.2015
4	BM2404	Digital image processing	16.07.2015	06.08.2015	25.08.2015	18.09.2015
5	EC2352	Computer networks	17.07.2015	07.08.2015	26.08.2015	21.09.2015
6	BM2023	Physiological Modelling	20.07.2015	10.08.2015	27.08.2015	22.09.2015

SL.NO	SUBJECT CODE	SUBJECT NAME	MODEL EXAM
1	BM2401	Pattern recognition and neural networks	05.10.2015
2	BM2402	Medical informatics	06.10.2015
3	BM2403	Medical optics	07.10.2015
4	BM2404	Digital image processing	08.10.2015
5	EC2352	Computer networks	09.10.2015
6	BM2023	Physiological Modelling	12.10.2015

# **BM2401 PATTERN RECOGNITION AND NEURAL NETWORKS**

## **UNIT I INTRODUCTION AND SIMPLE NEURAL NET**

**WEEK 1:** Elementary neurophysiology and biological neural network-  
Artificial neural network

**WEEK 2:** Architecture, biases and thresholds,

**WEEK 3:** Hebb net, Perceptron, Adaline and Madaline.

## **UNIT II BACK PROPOGATION AND ASSOCIATIVE MEMORY**

### **WEEK 4: UNIT TEST I**

Back propagation network, generalized delta rule,

**WEEK 5:** Bidirectional Associative memory, Hopfield network

### **WEEK 6: UNIT TEST II**

## **UNIT III NEURAL NETWORKS BASED ON COMPETITION**

**WEEK 8:** Kohonen Self organizing maps Learning Vector  
Quantization, counter propagation network.

## **UNIT IV UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS**

### **WEEK 9: UNIT TEST III**

Patterns and features, training and learning in pattern recognition,  
discriminate functions, different types of pattern recognition.

**WEEK 10:** Unsupervised learning- hierarchical clustering, partition  
clustering. Neural pattern recognition approach – perception model

### **WEEK 11: UNIT TEST IV**

## **UNIT V SUPERVISED LEARNING USING PARAMETRIC AND NON PARAMETRIC APPROACH**

**WEEK 12:** Bayesian classifier, non parametric density estimation,  
histograms, kernels, window estimators,

**WEEK 13:** k-nearest neighbor classifier, estimation of error rates.

**WEEK 14: UNIT TEST V**

**WEEK 15: ICD CLASSES**

**WEEK 16: MODEL EXAM**

**TEXT BOOKS:**

1. Hagan, Demuth and Beale, “Neural network design”, Vikas Publishing House Pvt. Ltd., New Delhi , 2002
2. Freeman J.A., and Skapura B.M, " Neural networks, algorithms, applications and programming techniques”, Addison – Wesley,2003
3. Duda R.O, Hart P.G, “Pattern classification and scene analysis”, Wiley Edition,2000
4. Earl Gose, Richard Johnsonbaugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

**REFERENCES:**

1. Robert Schalkoff, “ Pattern recognition, Statistical, Structural and neural approaches”  
John Wiley and Sons(Asia) Pte. Ltd., Singapore, 2005
2. Laurene Fausett ,” Fundamentals of neural networks – Architectures, algorithms and applications”, Prentice Hall, 1994

**BM2402 MEDICAL INFORMATICS**

**UNIT I MEDICAL INFORMATICS**

**WEEK 1:** Introduction - Structure of Medical Informatics Internet and Medicine -Security issues,

**WEEK 2:** Computer based medical information retrieval, Hospital management and information system,

**WEEK 3:** Functional capabilities of a computerized HIS, e-health services, Health Informatics – Medical Informatics, Bioinformatics

**UNIT II COMPUTERISED PATIENT RECORD**

#### **WEEK 4: UNIT TEST I**

Introduction - History taking by computer, Dialogue with the computer, Components and Functionality of CPR,

**WEEK 5:** Development tools, Intranet, CPR in Radiology- Application server provider, Clinical information system, computerized prescriptions for patients.

#### **WEEK 6: UNIT TEST II**

### **UNIT III COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING**

**WEEK 7:** Automated clinical laboratories-Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System - Computerized ECG, EEG and EMG,

**WEEK 8:** Computer assisted medical imaging- nuclear medicine, ultrasound imaging ultrasonography-computed X-ray tomography, Radiation therapy and planning, Nuclear Magnetic Resonance

### **UNIT IV COMPUTER ASSISTED MEDICAL DECISION-MAKING**

#### **WEEK 9: UNIT TEST III**

Neuro computers and Artificial Neural Networks application, Expert system - General model of CMD,

**WEEK 10:** Computer –assisted decision support system-production rule system cognitive model, semester networks , decisions analysis in clinical medicine-computers in the care of critically patients-computer assisted surgery-designing

#### **WEEK 11: UNIT TEST IV**

### **UNIT V RECENT TRENDS IN MEDICAL INFORMATICS**

**WEEK 12:** Virtual reality applications in medicine, Computer assisted surgery, surgical simulation, Telemedicine - Tele surgery computer aids

for the handicapped, computer assisted instrumentation in Medical Informatics

**WEEK 13:** Computer assisted patient education and health - Medical education and health care information

**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, Medicl informatics Tata Mcgraw Hill Publishing computers Ltd, 2003 New Delhi

**BM2403 MEDICAL OPTICS**

**UNIT I OPTICAL PROPERTIES OF THE TISSUES**

**WEEK 1:** Refraction, Scattering, absorption, light transport inside the tissue,

**WEEK 2:** tissue properties, Light interaction with tissues, optothermal interaction,

**WEEK 3:** fluorescence speckles

**UNIT II INSTRUMENTATION IN PHOTONICS**

**WEEK 4: UNIT TEST I**

Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs,

**WEEK 5:** Lasers, optical filters, polarizer, solid state detectors, time resolved and phase resolved detectors.

**WEEK 6: UNIT TEST II**

**UNIT III APPLICATIONS OF LASERS**

**WEEK 7:** Laser in tissue welding, lasers in dermatology,

**WEEK 8:** lasers in ophthalmology, otolaryngology, urology.



## **UNIT IV OPTICAL TOMOGRAPHY**

### **WEEK 9: UNIT TEST III**

Optical coherence tomography, Elastography,

**WEEK 10:** Doppler optical coherence tomography, Application towards clinical imaging.

### **WEEK 11: UNIT TEST IV**

## **UNIT V SPECIAL OPTICAL TECHNIQUES**

**WEEK 12:** Near field imaging of biological structures, in vitro clinical diagnostic,

**WEEK 13:** fluorescent spectroscopy, photodynamic therapy.

### **WEEK 14: UNIT TEST V**

### **WEEK 15: ICD CLASSES**

### **WEEK 16: MODEL EXAM**

## **TEXT BOOKS:**

1. Tuan Vo Dirh, “Biomedical photonics – Handbook”, CRC Press, BocaRaton, 2003.
2. Mark E. Brezinski., Optical Coherence Tomography: Principles and Applications, Academic Press, 2006.

## **REFERENCES:**

1. Leon Goldman, M.D., & R. James Rockwell, Jr., “Lasers in Medicine”, Gordon and Breach, Science Publishers Inc., New York, 1971.
2. R. Splinter and B.A Hooper, An Introduction to BioMedical Optics, Taylor and Francis, 2007.

## **BM2404 DIGITAL IMAGE PROCESSING**

## **UNIT I DIGITAL IMAGE FUNDAMENTAL**

**WEEK 1:** Elements of digital image processing systems - Elements of visual perception

**WEEK 2:** image Sampling and quantization – basic relationships between pixels

**WEEK 3:** matrix and singular value representation of discrete images.

## **UNIT II IMAGE TRANSFORMS**

### **WEEK 4: UNIT TEST I**

1-D DFT - 2-D DFT – DCT – DST – Walsh Hadamard –

**WEEK 5:** Haar – Slant – KL – SVD and their properties.

### **WEEK 6: UNIT TEST II**

## **UNIT III IMAGE ENHANCEMENT**

**WEEK 7:** Gray level transformation – Histogram processing – enhancement using arithmetic/logic operation –

**WEEK 8:** spatial filtering – smoothing and sharpening spatial filter – smoothing infrequency domain filter – homomorphic filtering

## **UNIT IV IMAGE RESTORATION AND RECOGNITION**

### **WEEK 9: UNIT TEST III**

Image degradation models – unconstrained and constrained restoration – inverse filtering

**WEEK 10:** LMS filter – geometric mean filter – geometric transformation – pattern classes– optimal statistical classifier – neural networks and its uses in image processing

### **WEEK 11: UNIT TEST IV.**

## **UNIT V IMAGE COMPRESSION**

**WEEK 12:** Image compression models – elements of information theory – error free compression –lossy compression – run-length – Huffman coding – shift codes – arithmetic coding – bit plane coding – transform coding – JPEG standards – MPEG standards - wavelet transform predictive techniques – block truncation coding schemes – facet modeling. Image

**WEEK 13:** segmentation – detection of discontinuities – edge linking and boundary detection thresholding – region based segmentation – segmentation by morphological watersheds – use of motion in segmentation.

**WEEK 14: UNIT TEST V**

**WEEK 15: ICD CLASSES**

**WEEK 16: MODEL EXAM**

**TEXT BOOK:**

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing” Pearson education, 2007.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, PHI, 1997

**REFERENCES:**

1. Willian K. Pratt, “Digital Image Processing”, John Wiley, NJ, 1987.
2. Sid Ahmed M. A., “Image Processing Theory, Algorithm and Architectures”, McGraw Hill, 1995
3. Scott E. C. Umbaugh, “Computer Vision and Image Processing”, Prentice Hall, Eaglewood Cliffs, NJ, 1998.

## **EC2352 COMPUTER NETWORKS**

### **UNIT I PHYSICAL LAYER**

**WEEK 1:** Data Communications – Networks - Networks models – OSI model – Layers in OSI model –

**WEEK 2:** TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media switching:

**WEEK 3:** Circuit switched networks – Data gram Networks – Virtual circuit networks Cable networks for Data transmission: Dialup modems – DSL – Cable TV – Cable TV for Data transfer.

### **UNIT II DATA LINK LAYER**

## **WEEK 4: UNIT TEST I**

Data link control: Framing – Flow and error control – Protocols for Noiseless and Noisy Channels – HDLC

Multiple access: Random access – Controlled access

**WEEK 5:** Wired LANS: Ethernet – IEEE standards – standard Ethernet changes in the standard – Fast Ethernet – Gigabit Ethernet. Wireless LANS: IEEE 802.11 – Bluetooth. Connecting LANS: Connecting devices - Backbone networks - Virtual LAN Virtual circuit networks: Architecture and Layers of Frame Relay and ATM

## **WEEK 6: UNIT TEST II**

### **UNIT III NETWORK LAYER**

**WEEK 7:** Logical addressing: IPv4, IPv6 addresses Internet Protocol: Internetworking –

**WEEK 8:** IPv4, IPv6 - Address mapping – ARP, RARP, BOOTP, DHCP, ICMP, IGMP, Delivery - Forwarding - Routing – Unicast, Multicast routing protocols.

### **UNIT IV TRANSPORT LAYER**

#### **WEEK 9: UNIT TEST III**

Process-to-Process delivery - User Datagram Protocol (UDP) – Transmission Control

**WEEK 10:** Protocol (TCP) – Congestion Control – Quality of services (QoS) – Techniques to improve QoS

#### **WEEK 12: UNIT TEST IV**

### **UNIT V APPLICATION LAYER**

**WEEK 13:** Domain Name System (DNS) – E-mail – FTP – WWW – HTTP – Multimedia Network Security: Cryptography – Symmetric key and Public Key algorithms - Digital signature – Management of Public keys – Communication Security – Authentication Protocols.

#### **WEEK 14: UNIT TEST V**

#### **WEEK 15: ICD CLASSES**

## **WEEK 16: MODEL EXAM**

### **TEXT BOOKS:**

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill,: Unit I – IV, 2006.
2. Andrew S. Tannenbaum, “Computer Networks”, Pearson Education, Fourth Edition, : Unit V, 2003.

### **REFERENCES:**

1. Wayne Tomasi, “Introduction to Data Communication and Networking”, 1/e, Pearson Education.
2. James .F. Kurose & W. Rouse, “Computer Networking: A Topdown Approach Featuring”,3/e, Pearson Education.
3. C.Sivaram Murthy, B.S.Manoj, “Ad hoc Wireless Networks – Architecture and Protocols”, Second Edition, Pearson Education.
- 4.Greg Tomshon, Ed Tittel, David Johnson. “Guide to Networking Essentials”, fifth edition, Thomson India Learning, 2007.
5. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2000.

## **BM2023 PHYSIOLOGICAL MODELLING**

### **UNIT I PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG**

**WEEK 1:** System concept, system properties – Resistance, storage, resistance – compliance, piecewise linear approximation,

**WEEK 2:** electrical analog for compliance, thermal storage, step response of first order systems

**WEEK 3:** resistance- compliance systems, and pulse response of first order systems

### **UNIT II TRANSFER FUNCTIONS**

#### **WEEK 4: UNIT TEST I**

Transfer functions and its use, Study of transfer function of first order

**WEEK 5:** second order systems, engineering concept in coupled system, example of Transformed signals

**WEEK 6: UNIT TEST II**

**UNIT III IMPEDANCE CONCEPT**

**WEEK 7:** Transfer functions with impedance concept, prediction of performance, identification of the system from impedance function.

**WEEK 8:** periodic signals, relationship between transfer function and sinusoidal response, evaluation of transfer function from frequency response

**UNIT IV FEEDBACK SYSTEMS**

**WEEK 9: UNIT TEST III**

Characteristics of physiological feedback systems

**WEEK 10:** stability analysis of systems

**WEEK 11: UNIT TEST IV**

**UNIT V SIMULATION OF BIOLOGICAL SYSTEMS**

**WEEK 12:** Simulation of thermal regulation, pressure and flow control in circulation, ocular motor

**WEEK 13:** fabrication; Future applications: MEMS – robots – random system, endocrinal system, functioning of receptors.

**WEEK 14: UNIT TEST V**

**WEEK 15: ICD CLASSES**

**WEEK 16: CYCLE TEST III**

**REFERENCES**

1. William B. Blesser, "System approach to Bio-medicine", McGraw-Hill book co., New York, 1969.
2. Manfred Clynes and John H. Milsum, "Bio-medical engineering system", McGraw-Hill book co., New York, 1970.
3. Michael C.K. Khoo, "Physiological Control Systems -Analysis, Simulation and Estimation" Prentice Hall of India Pvt. Ltd., New Delhi, 2001
4. Douglas S. Regs, "Control theory and physiological feedback mechanism", The William & Williams co., Baltimore, 1970

## **BM2406 DIGITAL IMAGE PROCESSING**

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Non-linear Filtering.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images
10. Segmentation using watershed transform.

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