

Dr. M.G.R Educational and Research Institute

Department of EEE

B. Tech - Bio Medical Instrumentation Engineering

Curriculum – 2018 Regulation BMI

	ELECTIVE -I											
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С					
1	BBI18E01	Bio Control System	Ту	3	0/0	0/0	3					
2	BBI18E02	Rehabilitation Engineering	Ту	3	0/0	0/0	3					
3	BBI18E03	Biomaterials and Implantable Devices	Ту	3	0/0	0/0	3					
4	BEI18E05	Embedded System	Ту	3	0/0	0/0	3					

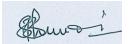
		ELECTIVE -II					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BBI18E04	Laser and Ultrasonic Application in Medicine	Ту	3	0/0	0/0	3
2	BBI18E05	Computer based Medical Instrumentation	Ту	3	0/0	0/0	3
3	BBI18E06	Biomedical MEMS and Nano Technology	Ту	3	0/0	0/0	3
4	BBI18E07	Computer Networks	Ту	3	0/0	0/0	3

		ELECTIVE –III					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BBI18E08	Neuroscience for Biomedical Applications	Ту	3	0/0	0/0	3
2	BBI18E09	Biological Effects of Radiation	Ту	3	0/0	0/0	3
3	BBI18E10	Drug Delivery Systems	Ту	3	0/0	0/0	3
4	BEI18E12	Artificial Intelligence and Expert Systems	Ту	3	0/0	0/0	3



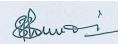
C. B. Palanivel

REGISTRAR Dr. M.G.R. EDUCATIONAL AND RESEARCH INSTITUTE (Deemed to be University) Periyar E.V.R. High Road, Maduravoyal, Chennai 600 095



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A DESCRIPTION OF A DESC	DEEMED TO BE UNIVERSITY	
	(An ISO 9001 : 2015 Certified Institution)	
	University with Graded Autonomy Status	

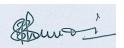
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu. India. **ELECTIVE –IV** Ty/ SUBJECT **T**/ S.NO. P/R **SUBJECT NAME** Lb/ L С CODE SLr ETL Ту BBI18E11 Medical Informatics 3 0/0 0/0 3 1 3 0/0 0/0 3 2 BEI18E16 Principles of Robotics Ty Biomedical Signal processing 3 0/0 3 3 0/0 BBI18E12 Ту 4 **Bio-Materials and Artificial Organs** BBI18E13 Ty 3 0/0 0/0 3 **ELECTIVE –V** Ty/ **SUBJECT T**/ S.NO. P/R С **SUBJECT NAME** Lb/ L CODE SLr ETL Recent Advances Applied to Hospital Ту 1 BBI18E14 3 0/0 0/0 3 Engineering Hospital Management 2 3 0/0 0/0 BBI18E15 Ty 3 System Theory Applied to Biomedical BBI18E16 3 Ту 3 0/0 0/0 3 Engineering 4 BBI18E17 Special Transducer and Instrumentation Ty 3 0/0 0/0 3



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 (An ISO 9001 : 2015 Certified Institution)	
University with Graded Autonomy Status	

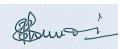
University with Graded Autonomy Status Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu. India.

		OPEN ELECTIVE					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BEE18OE1	Electrical Safety for Engineers	Ту	3	0/0	0/0	3
2	BEE18OE2	Energy Conservation Techniques	Ту	3	0/0	0/0	3
3	BEE18OE3	Electric Vehicle Technology	Ту	3	0/0	0/0	3
4	BEE18OE4	Biomedical Instrumentation	Ту	3	0/0	0/0	3
5	BEE18OE5	Introduction to Power Electronics	Ту	3	0/0	0/0	3
6	BEE18OE6	Industrial Instrumentation	Ту	3	0/0	0/0	3
7	BEE18OE7	Solar Energy Conversion System	Ту	3	0/0	0/0	3
8	BEE18OE8	Wind Energy Conversion System	Ту	3	0/0	0/0	3
9	BEE18OE9	Energy Storage Technology	Ту	3	0/0	0/0	3
		OPEN LAB					
1	BEE18OL1	Transducer LAB	Lb	0	0/0	3/0	1
2	BEE18OL2	PLC and SCADA LAB	Lb	0	0/0	3/0	1
3	BEE18OL3	Electrical Maintenance LAB	Lb	0	0/0	3/0	1
4	BEE18OL4	Power Electronics LAB	Lb	0	0/0	3/0	1
5	BEE18OL5	Bio Medical Instrumentation LAB	Lb	0	0/0	3/0	1





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CO4		Understands and applies differential equation, integrals, matrix theory, probability theoryetc												
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COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
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CO4		H	M			L		М	Μ					
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Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives ✓	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills					





BBI18E01 BIO CONTROL SYSTEM 3 0/0 0/0 3

UNIT I CONTROL SYSTEM MODELING

System concept- Differential Equations- Transfer functions- modeling of electrical systems- Translational and rotational mechanical systems-physiological systems- block diagram modeling- signal flow graphs

UNIT II TIME RESPONSE ANALYSIS

Time domain specifications - step and Impulse response analysis of first order and second order systemssteady state errors- Root locus techniques- construction of root locus- dominant poles- applications of Root locus diagram

UNIT III FREQUENCY RESPONSE & STABILITY ANALYSIS

Frequency response- Bode plot-Nyquist plots- Nyquist stability criterion- Relative stability- Gain marginphase margin- bandwidth magnitude plots- constant circles- Nichol's chart –stability –Routh-Hurwitz criteria

UNIT IV PHYSIOLOGICAL CONTROL SYSTEMS

Introduction to physiological control systems- modeling of human movements- parameter estimationlinearizing

UNIT V STUDY OF BIOLOGICAL SYSTEMS

Human Thermal system- Neuro muscular system- Respiratory system- oculomotor system

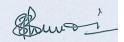
Total No of Periods: 45

TEXT BOOKS:

- 1. M.Gopal, "Control Systems", Principles and Design, Tata McGraw-Hill, 1997
- 2. Benjamin. C.Kuo, "Automatic Control Systems", Prentice Hall of India, 1995

REFERENCE BOOKS:

1. Manfreclyner and John H.Milsum, "Bio Medical engineering system", McGraw-Hill and Co., New York, 1970



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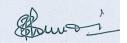
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Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu. India Subject Code: Subject Name : REHABILITATION ENGINEERING TY/ L Τ/ **P/ R** С **BBI18E02** LB/ S.Lr ETL **Prerequisite:** None Т 3 0/0 0/0 3 L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab **OBJECTIVE :** To study basics of Rehabilitation Engineering • To learn the design of Wheel Chairs • To gain knowledge of the recent developments in the field of rehabilitation engineering. • • To understand various assistive technology for vision and hearing To study various orthotic and prosthetic devices • COURSE OUTCOMES (COs) : (3-5) Understands the basics of Rehabilitation Engineering **CO1 CO2** Capable to design Wheel Chairs Understands the recent developments in the field of rehabilitation engineering **CO3 CO4** Acquires various assistive technology for vision and hearing Analysis various orthotic and prosthetic devices **CO5** Mapping of Course Outcomes with Program Outcomes (POs) COs/POs PO3 **PO4 PO5 PO7 PO8 PO9 PO10 PO11 PO12 PO1 PO2 PO6 CO1** Μ L Μ Η L Μ Η L Μ Η Η Η **CO2** Μ Μ L Η L Μ Η Η Μ L Η Μ **CO3** Η Μ Η Μ Μ Η Μ Η Μ L Η L **CO4** L Η Μ L Η Μ Η L L Η Μ Η **CO5** М Η L Η Μ Η Η Μ L L Μ L COs / PSOs **PSO1** PSO2 PSO3 PSO4 PSO5 **CO1** Μ Η Μ Η L **CO2** Η Μ L Η Μ **CO3** Η L Μ Η L **CO4** L Μ Μ L Μ H Η **CO5** М L Μ H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Internships / Technical Skill Social **Engineering Sciences** Program Electives Practical / Project Humanities and **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category





BBI18E02

UNIT I REHABILITATION TECHNOLOGY

Selection -design and manufacturing of augmentive- assistive devices appropriate for individual with disability

UNIT II REHABILITATION SCIENCE

Knowledge about the basic and clinical research - the variation in the physiological functioning - anatomical structure

UNIT III REHABILITATION ADVOCACY

Legal aspect helps the handicapped people in choosing the devices -the provisions available to them in this regard

UNIT IV REHABILITATION MEDICINE

Physiological aspects of functional recovery -neurological and physiological aspects -rehabilitation therapies training to restore vision auditory and speech

UNIT V REHABILITATION ENGINEERING

Introduction to Rehabilitation Engineering - PHAATE model - Clinical practice of rehabilitation Engineering - Low technology tools - Service delivery - Universal design - Design based on human ability - Standards for assistive technology - Test for best design

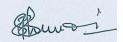
Total No of Periods: 45

TEXT BOOKS:

1. Reswick.J., "What is Rehabilitation Engineering?, Annual Review of rehabilitation", volume 2 springer – verlag, New York, 1982

REFERENCE BOOKS:

1. Robinsion.C.J, "Rehabilitation Engineering Handbook of electrical engineering", CRC Press, Bocaraton, 1993



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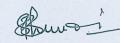
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Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu. India **Subject Code:** Subject Name : BIOMATERIALS AND TY/ L Τ/ **P/ R** С **BBI18E03 IMPLANTABLE DEVICES** LB/ S.Lr ETL Prerequisite: BIOMEDICAL INSTRUMENTATION Т 3 0/0 0/0 3 L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab **OBJECTIVE :** Learn characteristics and classification of Biomaterials • Understand different metals and ceramics used as biomaterials • Learn polymeric materials and combinations that could be used as a tissue replacement implants • Know the various artificial organs developed using these materials to perform medical application. COURSE OUTCOMES (COs) : (3-5) Analyze different types of Biomaterials and its classification. **CO1 CO2** Perform combinations of materials that could be used as a tissue replacement implant. **CO3** Know about the various polymeric materials used for medical applications **CO4** About bio-ceramics and its applications in medicine CO5 The graduate will be capable to perform medical application. Mapping of Course Outcomes with Program Outcomes (POs) COs/POs **PO2 PO4 PO7 PO8 PO9 PO10 PO11 PO12 PO1** PO3 **PO5 PO6 CO1** Μ Η Μ Н Μ L Η Μ Η L L Μ **CO2** Μ Η Η Μ L Η Μ Η Μ L Μ L **CO3** Η Η Η Μ H Μ Н L Η Μ Η Μ **CO4** Η Η Μ L Η Μ L Η Μ L Н Μ **CO5** Μ Η Μ L Η Μ L Η Μ L Н Μ COs / PSOs **PSO1** PSO₂ PSO3 **PSO4** PSO5 L **CO1** Μ Η Μ Η **CO2** Η Μ Η Μ L **CO3** Μ Μ L Н Μ **CO4** Η Η L Μ L **CO5** Μ H Μ L Μ H/M/L indicates Strength of Correlation H-High, M-Medium, L-Low Internships / Technical Skill Humanities and Social **Engineering Sciences** Program Electives Practical / Project **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category





BIOMATERIALS AND IMPLANTABLE DEVICES

BBI18E03

UNIT I BIOCOMPATIBILITY AND HEMOCOMPATIBILITY

Overview of Biomaterials used as medical devices - Classification of biomaterials - Impact and future of biomaterials - performance of implants - Interfacial phenomena and tissue response to biomaterials - Metals and alloys for orthopedic implants- Stainless steel - Cobalt chromium alloy - Titanium and its alloys - Electro kinetic factors - Types of orthopedic fixation devices – pins - screws and plates - IM nails and spinal

UNIT II BIOELECTRIC EFFECT

Wolff'slaw - Interface problems with artificial joints and various fixation methods - Failure of implantation materials- metallic corrosion - wear - metallic implant fractures and their impact on biological systems - Hard tissue replacements- total hip and knee joint replacements

UNIT III POLYMERS IN BIOMEDICAL USE

Hydrogels- silicone rubber- biodegradable polymers- microorganisms in polymeric implants and polymer sterilization-Biopolymers- Synthetic polymers- Composites- Types and Applications- Contraceptive devices

UNIT IV ORTHOPAEDIC IMPLANTS

Ophthalmology - introduction - contact lenses - eye shields and artificial tears- Biological Tests-Material surface characterization – Corrosion- Standards on biomaterials

UNIT V BIOCERAMICS, TYPES

Bioactive- resorbable - non-resorbable -Stoichiometry and Ca/P ratio of various forms calcium phosphates -bio ceramic coatings on metallic implants and bone bonding reactions on implantation - Hydroxyapatite properties and applications - Bone cements and bio glasses- Dental implants – materials - types and designs Total No of Periods: 45

TEXT BOOKS:

- 1. Sujata V Bhat., "Biomaterials", Narosa Publishing House, New Delhi, 2002
- 2. A.F. Von Recum, "Handbook of Biomaterials Evaluation Scientific, Technical and Clinical Testing of Implant Materials", 2nd Edn., Taylor & Francis, Philadelphia, 1999
- F. Silver and C. Dillon, "Biocompatibility: Interactions of Biological and Implantable Materials" Vol.1, VCH Publishers, New York, 1989.
 Park. J.B. "Biomaterials: An Introduction", CBS Publishers, 2007

REFERENCE BOOKS:

- 1. L.L. Hench and E.C. Ethridge "Biomaterials: An Interfacial Approach", Academic press, New York, 1982.
- 2. F.H. Silver, "Biomaterials, Medical Devices and Tissue Engineering: An Intergrated Approach", 1st Editionn, Chapman & Hall, London, 1994
- 3. Buddy Ratner etal., "Biomaterials Science An Introduction to Materials in Medicine", Academic Press, San Diego, 2004



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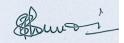
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Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu. India Subject Name : EMBEDDED SYSTEM **Subject Code:** TY/ L Τ/ **P/ R** С S.Lr **BEI18E05** LB/ ETL **Prerequisite: ADVANCEMENT IN ELECTRONICS** Т 3 0/0 0/0 3 L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab **OBJECTIVE :** The brief view of real time and embedded system. ٠ The graduates can understand the embedded system components and interface. • Detailed overview about embedded system design and development. • • Analysis of real time system performance, language and their features. The case studies of safety, aerospace, automobile, medical and industrial application. • COURSE OUTCOMES (COs) : (3-5) Capable to get brief view of real time and embedded system. **CO1 CO2** Understands embedded system components and interface. **CO3** The graduates understand embedded system design and development. **CO4** The graduates Analysisof real time system performance, language and their features **CO5** The graduate will be capable to perform case study on safety, aerospace, automobile, medical and industrial application. Mapping of Course Outcomes with Program Outcomes (POs) COs/POs **PO1 PO2** PO3 PO4 **PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1** Μ Η Μ Η Μ L Η Μ Η L L Μ **CO2** Μ Μ Η Μ L Η Μ L Η Μ L Η **CO3** Η Η Μ Μ Η Η Μ Η Η L Η Μ **CO4** Η Η Μ L Η Μ L Η Μ L Η Μ **CO5** Η Μ Η М L Η Μ Η Μ Μ L L COs / PSOs PSO1 PSO2 PSO3 PSO4 PSO5 **CO1** Μ Η Μ Η L **CO2** Η Μ Η Μ L **CO3** Μ Μ L Η Μ **CO4** Н Μ Н L L **CO5** L Μ Μ Η Μ H/M/L indicates Strength of Correlation H-High, M-Medium, L-Low Internships / Technical Skill Social **Engineering Sciences** Program Electives Practical / Project Humanities and **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category



UNIT I **INTRODUCTION TO EMBEDDED SYSTEMS**

Brief overview of real time systems and embedded systems - Classification of embedded systems -Embedded system definitions - Functional and non-functional requirements - Architectures and standards - Typical applications

UNIT II EMBEDDED SYSTEM COMPONENTS AND INTERFACE

Device choices - Selection criteria and characteristics of Processors and memory systems for embedded applications - Interface and Peripherals - Power sources and management

UNIT III EMBEDDED SYSTEM DESIGN AND DEVELOPMENT

Design methods and techniques - Classification of need - Need analysis -Requirement and specification -Conceptual design - Models and languages - State machine model - State machine tables - Verification -Validation - Simulation and emulation

UNIT IV **REAL TIME SYSTEMS AND MODELS**

Characteristics and classification of real time systems - Real time specifications and Design techniques -Event based - Process based and graph-based models - Real time kernel - Hierarchy services and design strategy - Real time system performance and analysis - Typical real time systems - Their languages and features

UNIT V **CASE STUDIES**

Case studies of safety-critical - time-critical embedded systems with reference to Aerospace- automobile -Medical and Industrial applications.

Total No of Periods: 45

TEXT BOOKS:

BEI18E05

- 1. Noergaard, T., "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Elsevier Publications, 2005
- 2. Berger, A.S., "Embedded System Design: An Introduction to Process, Tools and Techniques", CMP Books, 2002

REFERENCE BOOKS:

- 1. David, S., "An Embedded Software Primer", Addison-Wesley, 1999
- 2. Liv, J.W.S., "Real-Time Systems", Pearson Education, 2001
- 3. Vahid and Givargis, T., "Embedded System Design: A Unified Hardware/ Software Introduction",
- 1. John Wiley and Sons, 2002
- 4. Peatman, J.B., "Design with Microcontrollers", McGraw-Hill International Ltd., Singapore, 1989
- 5. Kang, C.M.K., and Shin, G., "Real Time Systems", McGraw Hill, 1997



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EMBEDDED SYSTEM

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	University with Graded Autonomy Status	

Subject Code: BBI18E04 Subject Name : LASER AND ULTRASONIC APPLICATION IN MEDICINE TY / LB / LB / S.Lr T / P/ R BI18E04 APPLICATION IN MEDICINE LB / ETL S.Lr No. Prerequisite: None T 3 0/0 0/0 L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab Volume Volume OBJECTIVE : • • To Study About Ultrasonic • • • To Study About Ultrasonic Scanners • To Study About High Energy Ultrasonic • • • To Gain Knowledge of Holographic Application InMedicine • • • • COURSE OUTCOMES (COs) : (3- 5) • • • • • CO2 Graduate acquires knowledge on Ultrasonic • • • •	C 3
ETL T 3 0/0 0/0 L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE : • To Gain Knowledge of Laser • To Study About Ultrasonic • To Study About Ultrasonic Scanners • To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3- 5) CO1 Acquires Knowledge of Laser	3
Prerequisite: NoneT30/00/0L : Lecture T : TutorialSLr : Supervised Learning P : Project R : Research C: CreditsT/L/ETL : Theory/Lab/Embedded Theory and LabOBJECTIVE :• To Gain Knowledge of Laser• To Study About Ultrasonic• To Learn About Ultrasonic Scanners• To Study About High Energy Ultrasonic• To Gain Knowledge of Holographic Application InMedicineCOURSE OUTCOMES (COs) : (3-5)CO1CO1	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE : • To Gain Knowledge of Laser • To Study About Ultrasonic • To Learn About Ultrasonic Scanners • To Study About High Energy Ultrasonic • To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3-5) CO1 Acquires Knowledge of Laser	
T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE : • To Gain Knowledge of Laser • To Study About Ultrasonic • To Learn About Ultrasonic Scanners • To Study About High Energy Ultrasonic • To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3- 5) CO1 Acquires Knowledge of Laser	
OBJECTIVE : • To Gain Knowledge of Laser • To Study About Ultrasonic • To Learn About Ultrasonic Scanners • To Study About High Energy Ultrasonic • To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3- 5) CO1 Acquires Knowledge of Laser	
 To Gain Knowledge of Laser To Study About Ultrasonic To Learn About Ultrasonic Scanners To Study About High Energy Ultrasonic To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3-5) CO1 Acquires Knowledge of Laser	
 To Study About Ultrasonic To Learn About Ultrasonic Scanners To Study About High Energy Ultrasonic To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3-5) CO1 Acquires Knowledge of Laser	
 To Learn About Ultrasonic Scanners To Study About High Energy Ultrasonic To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3-5) CO1 Acquires Knowledge of Laser	
 To Study About High Energy Ultrasonic To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3-5) CO1 Acquires Knowledge of Laser 	
To Gain Knowledge of Holographic Application InMedicine COURSE OUTCOMES (COs) : (3- 5) CO1 Acquires Knowledge of Laser	
COURSE OUTCOMES (COs) : (3- 5) CO1 Acquires Knowledge of Laser	
CO1 Acquires Knowledge of Laser	
CO2 Graduate acquires knowledge on Ultrasonic	
CO3 Capable to analyze Ultrasonic Scanners	
CO4 Understands High Energy Ultrasonic	
CO5 Acquires knowledge on Holographic Application InMedicine	
Mapping of Course Outcomes with Program Outcomes (POs)	
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BBI18E04 LASER AND ULTRASONIC APPLICATION IN 3 0/0 0/0 3 MEDICINE

UNIT I LASER

Principles of Laser action -different types and of lasers and its operation -Applications of Laser in Biology -Dentistry, Ophthalmology –Dermatology –Medicine –Surgery -Interferometer Applications -Fluorescence studies in cancer Diagnosis -Laser in Genetic Engineering -Low power applications in Medicine

UNIT II ULTRASONICS

Different Modes of Display - A, B, C -scanning Techniques -Absorption in biological Tissues - Measurement of Ultrasonic Energy -Construction of Ultrasonic probe -Ultrasonic Imaging in Abdomen – Breast –Heart –Chest –Eye –Kidney –Skull -Pulsatile Motion -Pregnant and non-Pregnant uterus

UNIT III ULTRASONIC SCANNERS

Real Time Echo -2-D Scanners -Colour Doppler

UNIT IV HIGH ENERGY ULTRASONICS

Effects due to High energy ultrasonics applications in Surgery -Cell destruction -Cleaners

UNIT V HOLOGRAPHIC APPLICATION IN MEDCINE

Wave front Recording and Reconstruction -Recording Media -Image forming application -Motion Induced Constrast -correlation filtering -Holograms using Ultrasonic signals and Hologram using Lasers

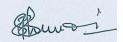
Total No of Periods: 45

TEXT BOOKS:

- 1. Leon Goldman, M.D., and R. Jamies Rockwell, Jr., "Lasers in medicine Gordon and breach", science publishers Inc., New York, 1971
- 2. Brown Y.H.V. and Dickson J.F. (Eds), "Advances in Bio Medical Engineering", Volume II and V, Academic press, London, 1972
- 3. Georg W. Stroke, Kock W.E., "Ultrasonic Imaging and Holography", plenum press, New York, 1974

REFERENCE BOOKS:

- 1. Mertellucci S. Sand Chester A.N., "Laser Photo biology and photo medicine", plenum press, New York, 1989.
- 2. Wolbarsht M.L., "Laser Application in Medicine and Biology", Plenum press, New York, 1989



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8086 Architecture - system connections and timing - Instruction set and assembly language programming - Macro assemblers - BIOS and DOS Services - memory and I/O interfacing - Advanced Intel 32 bit processors

UNIT II **MICROCONTROLLERS**

INTRODUCTION

Introduction - 8051 architecture and programming - micro controller based medical systems - TMS 320 series - architecture and programming - applications in bio-signal processing - IDE51 - C Cross Assemblers

UNIT III SYSTEM DESIGN

Multichannel computerized ECG.EMG and EEG data acquisition - storage -analysis - retrieval techniques - Medical image acquisitions through video - card - storage and retrieval techniques - Moderns and computer networking in the hospital

UNIT IV **COMPUTERS IN PATIENT MONITORING**

Physiological monitoring - automated intensive care units - computerized arrhythmia monitoring information flow in a clinical lab - computerized concepts - interfacing to HIS

UNIT V MEDICAL EQUIPMENTS SYSTEM

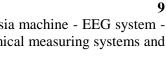
Microprocessor based medical system - pulmonary instrumentation - anesthesia machine - EEG system microprocessor based blood pressure monitor - prosthetic systems - bio- chemical measuring systems and microprocessor based medical devices - Radiological Information system.

TEXT BOOKS:

1. Kenneth J. Ayala, "The 8051 Micro Controller - Architecture Programming and Applications", Second Edition, Penram International, 1996

REFERENCE BOOKS:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and hardware", Mcgrase Hill, Singapore, 1999



Total No of Periods: 45





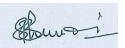
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UNIT I

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BBI18E06

UNIT I MEMS

Introduction - Typical MEMS Products - Application of Micro-system in Healthcare Industry - Working Principles of Microsystems Microsensors - Microactuation - MEMS with actuation - Micro-accelerators and Microfluidics - Materials for MEMS and Microsystems

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BIOMEDICAL MEMS AND

NANOTECHNOLOGY

UNIT II MEMS and Microfluidics

DUCATIO

Fundamental principle - Light Modulators -Beam splitter - Micro-lens -Micro-mirrors - Digital Micromirror Device -Light detectors - Important Consideration on Micro-scale fluid -Properties of fluid - Fluid Actuation Methods - Micro-pumps - Typical Micro-fluidic Channel -Micro-fluid Dispenser

UNIT III BIOMEMS

Introduction -Principle of Biosensor -Ampero-metric Biosensor - Micro-dialysis - BioMEMS for Clinical Monitoring - Monitoring of Glucose and Lactate with a micro-dialysis probe - Ammonia Monitoring - Electronic Nose -DNA Sensors

UNIT IV BIOMEMSAND DNA

Unique features of Nucleic Acids -Lab on the Chip –Electrophoresis -Polymerase Chain Reaction (PCR) -Biochemical reaction chains for integration: Biosensors and the "lab biochip" - Typical Microarray experiment -Manufacturing of Microarrays -Synthesis on the chip -Spotting Techniques - PCR on the chip -Microchamber Chips -Micro-fluidics Chips -Emerging BioMEMS Technology

UNIT V BIOMEDICAL NANOTECHNOLOGY

Nanoparticles- Nanomaterial characterization – XRD –SAXS –TEM –SEM -Scanning Tunneling microscopy –AFM -SPM technique -Biomolecular sensing for cancer diagnostics using carbon nanotubes -Carbon nanotube biosensors -Magnetic nanoparticles for MR Imaging -Nano-devices in biomedical applications

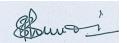
Total No of Periods: 45

TEXT BOOKS:

- 1. Steven S, Saliterman, "Fundamentals of BioMEMS and Medical Microdevices", International Society for Optical Engineering, First Edition 2006
- 2. NitaigourPremchandMahalik, "MEMS", Tata McGraw Hill, 2nd Reprint, 2008
- 3. Wanjun Wang and Steven A.Soper, "BioMEMS- Technologies and applications", CRC Press, First edition, 2007

REFERENCE BOOKS:

- 1. Tai-Ran Hsu, "MEMS and Microsystems- Design, Manufacture and NanoscaleEngineering", John Wiley and Sons, 2nd Edition, 2008
- 2. Gerald A Urban, "BioMEMS", Springer, First Edition, 2006
- 3. Abraham P. Lee and James L. Lee, "BioMEMS and BiomedicalNanotechnology", Volume I, Springer, First Edition, 2006
- 4. Paul C.H. Li, "Introduction to Microfluids and BioMEMS: A Design andProblem-Solving Textbook", CRC Press, First Edition, 2009
- 5. Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, First Edition 2002.



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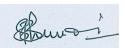
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BBI18E07 COMPUTER NETWORKS 3 0/0 0/0 3

UNIT I DATA COMMUNICATION CONCEPTS

Transmission media - Data encoding - Interface and Modems - Multiplexing - Error detection and correction - Digital subscriber line - Circuit switching - Packet switching - Message switching.

UNIT II WIDE AREA NETWORKS

ISO - OSI layered architecture - Function of the layers - Data link protocols - HDLC - LAPB - LAPD - Inter networking devices - Repeaters - Bridges - Routers - Routing algorithms - Distance vector routing-link state routing - X.25 protocol - congestion control

UNIT III FRAME RELAY AND ATM NETWORKS

Frames relay operation - layers and traffic control - ATM networks - Architecture switching - layers service classes

UNIT IV LOCAL AREA NETWORK

LAN topology - Ethernet - Token bus - Token ring - FDDI - Wireless LAN - ATM LAN - IEEE 802 Medium access control layer standard - Random access protocols - ALOHA - Slotted ALOHA

UNIT V OSI LAYERS

Transport layer issues - Session layer - Synchronization - Presentation layer - Encryption - decryption - Application layer - Message handling system - file transfer - virtual terminal - Email.

Total No of Periods: 45

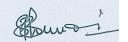
1. William Stallings, "Data and Computer Communication", sixth edition, Pearson education Asia,

REFERENCE BOOKS:

2000

TEXT BOOKS:

- 1. Behrouz A, Forouzan, "Data Communication and Networking", second edition, Tata McGraw-Hill, 2000.
- 2. Fred Halsall, "Data Communication, Computer networks and Open Systems", Fourth edition, Addison Wesley, 1995
- 3. Andrew S.Tanenbaum, "Computer networks", Third edition, PHI, 1996



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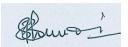
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BBI18E08 NEUROSCIENCE FOR BIOMEDICAL 3 0/0 0/03 **APPLICATIONS**

UNIT I INTRODUCTION TO NEUROSCIENCE

An overview of neuroscience - Applications of neuroscience - Neurons and Neuroglia - Neurotransmitters

UNIT II NERVOUS SYSTEM

Nervous system: central nervous system - peripheral nervous system - autonomic nervous system anatomical organization of the nervous system - functional organization of the nervous system - neuronsthe nerve cell - CSF

UNIT III ELECTRICAL PROPERTIES OF NERVOUS SYSTEM

Electrolytes within our neurons - Ion channels - Local signaling - Signal propagation - Action potential -Synapse - Synaptic integration - Modulation of synaptic transmission - Nerve-Muscle interaction

UNIT IV NEURAL NETWORKS

Current flow in neurons - Introduction to electro diagnostic signals and their measurement - nerve conduction study - evoked potentials and EEG

UNIT V **CHALLENGES**

Neuroscience methods and techniques to understand the functions of nervous system - Pathology of Nervous system - Molecular and cellular mechanisms of Parkinson's - Huntington's - Stroke and Alzheimer's diseases

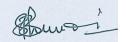
Total No of Periods: 45

TEXT BOOKS:

- 1. Richard S Snell, "Clinical Neuro Anatomy", Lippincott Williams & Wikkins, 2006
- 2. W.F Ganang, "Review of Medical Physiology", Mc Graw Hill Professional, 21st Edition, 2003

REFERENCE BOOKS:

- 1. A Krishnamurti, "Notes on Nervous System", Janagam Offset Printers, 1999
- 2. Eric R Sandel, "Principles of Neural Science", Elsevier, 4th Edition, 2000



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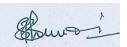
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BBI18E09BIOLOGICAL EFFECTS OF RADIATION30/00/0

UNIT I ACTION OF RADIATION ON LIVING CELLS

Various theories related to radiation at cellular level -DNA and chromosomal damages -experiments on computation of various parameters related to this radiation exposure

UNIT II SOMATIC APPLICATION OF RADIATION

Radio sensitivity protocols of different issues of human -LA\D 50/30 effective radiation on skin -bone marrow - eye -endocrine glands - basis of radiotherapy

UNIT III GENETIC EFFECTS OF RADIATION

Thresholds and linear dose -gene control hereditary diseases -effect of dose and I Infleneceson genetic equilibrium

UNIT IV EFFECT OF MICROWAVE AND RF WITH MATTERS

Effects on various human organs and systems -wavelength in tissues -nonthermal interaction -low frequency radiation -measurement devices used to compute the thermal effects -standards of protection - national and international standards and precautions.

UNIT V UV RADIATION

Classification of sources-measurement -photo medicine -UV radiation safety Visibleand infrared radiation -combined effect of UV and IR -dose measuring instruments sed safety standards for this radiation

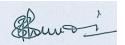
Total No of Periods: 45

TEXT BOOKS:

- 1. Glasser.O., "Medical Physics", vol I, II, III, The year book Publishers Iinc., Chicago, 1980
- 2. Baranski.S and Cherski.P, "Biological effects of microwave", Hutchison and Ross Inc., Stroudsburg, 1980

REFERENCE BOOKS:

1. Moselly.H., "non-ionizing Radiation", Adam-Hilgar, Bristol, 1988





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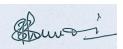
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BBI18E10DRUG DELIVERY SYSTEMS30/00/03

UNIT I SUSTAINED AND CONTROLLED DRUG DELIVERY

Introduction - properties of drugs - Pharmacokinetic properties of drugs - sustained release formulations - concept - physicochemical biological properties of drug - advantages and disadvantages - controlled drug delivery systems - automatically controlled drug delivery systems and their biomedical applications

UNIT II POLYMERS & TARGETTED DRUG DELIVERY SYSTEMS

Polymers used in drug delivery systems - modules - classification- characterization - advantages and disadvantages of polymer - targeted drug delivery systems - concepts - nanoparticles - liposomes - microspheres - hydrogels

UNIT III TRANSDERMAL DRUG DELIVERY SYSTEMS

Transdermal penetration of drugs - formulation - addition - polymers in transdermal drug delivery system - iontophoresis - transdermal controlled release products and devices

UNIT IV IMPLANTABLE DRUG DELIVERY SYSTEMS

Implantable micro - pump systems - peristaltic micro pump - osmotic micro pump - diaphragm micro pump - Fluorocarbon propellent driven micro pump - solenoid driver reciprocates micro pump - programmable implanted drug administrative device (DAD)

UNIT V SITE SPECIFIC DRUG DELIVERY SYSTEMS

Development in insulin therapy using biomedical controlled drug delivery systems - drug delivery using monoclonal antibodies - role of biosensors and transducers in diagnostic

Total No of Periods: 45

TEXT BOOKS:

- 1. Vyas S. P. Khar R. K., "Targetted and controlled drug delivery Novel Carrier System CBSPD", 2006
- 2. Anya M Hillery et. al.,"Drug delivery and targeting", CRC press, 2000

REFERENCE BOOKS:

1. Robinson R Robinson,"Conventional drug delivery systems", CRC press, 2004



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BEI18E12 ARTIFICIAL INTELLIGENCE AND EXPERT 3 0/0 0/0 3 SYSTEMS

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Overview of AI-general concepts-problem spaces and search - search techniques - BFS - DFS-Heuristic search techniques

UNIT II KNOWLEDGE REPRESENTATION

Knowledge - general concepts- predicate logic-representing simple fact- instance and ISA relationships - resolution - natural deduction

UNIT III KNOWLEDGE ORGANISATION AND MANIPULATION

Procedural Vs declaration knowledge - forward Vs backward reasoning - matching techniques - control knowledge/strategies - symbol reasoning under uncertainty - introduction to non – monotonic reasoning - logic for monotonic reasoning

UNIT IV ERCEPTION – COMMUNICATION AND EXPERT SYSTEMS

Natural language processing - pattern recognition - visual image understanding - expert system architecture

UNIT V KNOWLEDGE ACQUISITION

Knowledge acquisition - general concepts - learning - learning by induction - explanation based learning

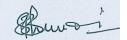
Total No of Periods: 45

TEXT BOOKS:

- 1. Elaine Rich and Kelvin Knight, "Artificial Intelligence", Tata McGraw-Hill, New Delhi, 1991
- 2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A modern approach", Prentice Hal, 1995

REFERENCE BOOKS:

- 1. Nelson N.J., "Principles of Artificial Intelligence", Springer Verlag, Berlin, 1980
- 2. Patterson, "Introduction to Artificial Intelligence and Expert systems", Prentice Hall of India, New delhi, 1990.



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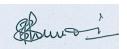
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BBI18E11MEDICAL INFORMATICS30/00/03

UNIT I BIOMEDICAL INFORMATION TECHNOLOGY

Historical highlights of Healthcare Information systems - Biomedical Information systems - problems and pitfalls - History and evolution of Electric resources - Internet and Interactive Multimedia components

UNIT II OVERVIEW OF COMPUTER HARDWARE

Motherboard and its logic - memory and I/O interfacing -memory and I/O mapI/O peripherals - add-on cards -RS 232-C - various IEEE standards

UNIT III HOSPITALS INFORMATION SYSTEMS

Concept of HIS and its Position on the hospital - introduction of a computerized HIS-application of HIS in project management - Automation of Medical record - hospital Inventory data protection aspects - costs and benefits of HIS - transfer of information within the hospital - Modems and computer networking in Hospitals

UNIT IV VISUAL PROGRAMMING AND MULTIMEDIA INFORMATION SYSTEMS

Visuals Basic principles and programming – Design - Production and testing of multimedia based medical information systems

UNIT V INTEGRATED MEDICAL INFORMATION SYSTEMS

Integration of Intra and Inter hospital information systems - Role of expert systems and fuzzy logic in medical information systems - Physiological system modeling and simulation - Concepts of Virtual reality -web based multimedia information systems - video conferencing

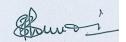
Total No of Periods: 45

TEXT BOOKS:

- 1. S.K. Chauhan, . "PC Organisation", S.K. Kataria and sons, Delhi.
- 2. Haroidsackman, "Biomedical Inforamtion Technology", Academic Press, New York, 1997

REFERENCE BOOKS:

- 1. Mary Beth Fecko, "Electronic Resources: Access and Issues, Bowker-saur, London, 1997
- 2. R.D. Lele, "Computers in medicine", Tata McGraw Hill, New Delhi, 1999
- 3. Tay Vaughan, "Multimedia making it work", Tata McGRaw Hill, New Yotk, 1999
- 4. Mark Spenik, "Visual Basic 6, Iterative Course", Techmedia, New Delhi, 1999



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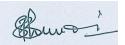
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BEI18E16PRINCIPLES OF ROBOTICS30/00/03

UNIT I BASIC CONCEPTS

Definition and origin of robotics - different types of robotics - various generations of robots - degrees of freedom - Asimov's laws of robotics - dynamic stabilization of robots

UNIT II POWER SOURCES AND SENSORS

Hydraulic - pneumatic and electric drives - determination of HP of motor and gearing ratio - variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging - laser - acoustic - magnetic -fiber optic and tactile sensors

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits - end effectors - U various types of grippers - design considerations

UNIT IV KINEMATICS AND PATH PLANNING

Solution of inverse kinematics problem - multiple solution jacobian work envelop - hill climbing techniques - robot programming languages

UNIT V CASE STUDIES

Multiple robots - machine interface - robots in manufacturing and non-manufacturing applications - robot cell design - selection of robot

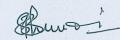
Total No of Periods: 45

TEXT BOOKS:

- 1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", McGraw-Hill Singapore, 1996
- 2. Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998

REFERENCE BOOKS:

- 1. Deb.S.R., "Robotics technology and flexible Automation", John Wiley, USA 1992
- 2. AsfahlC.R., "Robots and manufacturing Automation", John Wiley, USA 1992
- 3. Klafter R.D., Chimielewski T.A., Negin M., "Robotic Engineering An integrated approach", Prentice Hall of India, New Delhi, 1994
- 4. McKerrow P.J.,"Introduction to Robotics", Addison Wesley, USA, 1991
- 5. Issac Asimov,"I Robot", Ballantine Books, New York, 1986



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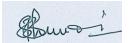
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BBI18E12BIOMEDICAL SIGNAL PROCESSING30/00/03

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS

DUCATIO

Classification and time domain representation of discrete-time signals - Typical sequences and their representation - Classification of sequences - Basic operations on sequences - Discrete-time systems

UNIT II TRANSFORM

Discrete Fourier Transform (DFT) computation of DFT, Z-transform - Mathematical derivation of the unilateral-properties of the Z-transform - Inverse Z-Transform

UNIT III NEUROLOGICAL SIGNAL PROCESSING

EEG analysis - Linear prediction theory-Autoregressive method adaptive segmentation - Transient detection - Overall performance -classification of sleep stages

UNIT IV CARDIOLOGICAL SIGNAL PROCESSING

ECG data acquisition - ECG lead system ECG parameters and their estimation - Multiscale analysis for parameters estimation of ECG waveforms - Arrhythmia analysis monitoring - Continuous ECG recording

UNIT V ECG DATA REDUCTION TECHNIQUES

Direct ECG data compression techniques - Transformation compression techniques - Other data compression techniques - Compression clinical application of Prony's method

Total No of Periods: 45

TEXT BOOKS:

1. DC Reddy, "Biomedical signal processing", TMH, 2005

REFERENCE BOOKS:

- 1. Akav M., "Biomedial signal processing", Academic press 1994
- 2. Kok FL, "Biomedical signal processing", PHI, 1999

3. Mitra SK, "Digital signal processing", TMH, 2001

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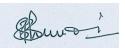
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BBI18E13BIO-MATERIALS AND ARTIFICIAL ORGANS30/00/03

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

Definition and classification of bio-materials -mechanical properties -visco elasticity -wound-healing process - body response to implants - blood compatibility

UNIT II IMPLANT MATERIALS

Metallic implant materials -stainless steels -co-based alloys -Ti-based alloys -ceramic implant materials - aluminum oxides -hydroxyapatite glass ceramics carbons -medical applications

UNIT III POLYMERIC IMPLANT MATERIALS

Polymerization –polyolefin – polyamicles –Acrylic –polymers –rubbers -high strength thermoplastics - medical applications

UNIT IV TISSUE REPLACEMENT IMPLANTS

Soft-tissue replacements, sutures -surgical tapes, adhesive -percutaneous and skin implants -maxillofacial augmentation -blood interfacing implants -hard tissue replacement implants -internal fracture fixation devices -joint replacements

UNIT V ARTIFICIAL ORGANS

Artificial Heart -Prosthetic Cardiac Valves -Limb prosthesis - Externally Powered limb Prosthesis -Dental Implants

Total No of Periods: 45

TEXT BOOKS:

1. PARK J.B., "Biomaterials Science and Engineering", Plenum Press, 1984

REFERENCE BOOKS:

1. Chua, Chena.J.Y, Wanga.L.P, N.Huang, "Plasma-surface modification of biomaterials", Materials Science and Engineering: R: Reports, Volume 36, Number 5, 29 March 2002, pp. 143-206 (64)



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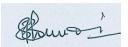
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BBI18E14 RECENT ADVANCES APPLIED TO HOSPITAL 3 0/0 0/0 3 ENGINEERING

UNIT I STANDARDISATION OF HOSPITAL EQUIPMENTS

Need for standardization -classification of equipment's -international standards -Experimental methods of testing standards -maintenance of standards and recalibration

UNIT II CLINICAL ENGINEERING

Hospital design-electrical- airconditioning-sanitation -ventilation -safety regulation to be incorporated in the hospital center -management and legal aspects -latest drug delivery systems for sustained delivery of medicines

UNIT III NETWORKING

Importance of networking -LAN features -network topologies -LAN components -network operating system -basic data communication concept –application-LAN and multi-user system -planning and installing LAN in hospital set up

UNIT IV FIBRE OPTIC SENSORS FOR MEASURING PHYSIOLOGICAL PARAMETERS 9

Different optical sources -optical detectors -principle of fiber optic cables -single mode multi-mode -step index and graded index type -sensors based on polarization -interferometer principle -magnetic sensors - application of the sensors in measuring pressure –temperature –flow -rotation and chemical activities - principles of smart sensors

UNIT V EMI AND EMC APPLIED TO HOSPITAL EQUIPMENTS

Principles of EMI -computation of EMI -measuring techniques to quantify the level of interference - method of suppressing and isolating this unit from interference

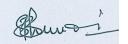
Total No of Periods: 45

TEXT BOOKS:

- 1. Donald R.J. White, "A Handbook of electromagnetic Interference and Compatibility", Vol 4, 5, Published by Donwhite Constant Maryland, 1972
- 2. Webster J.G. and Albert M. Cook, "Clinical Engineering Principles and Practices", Printice Hall Inc, Englewood Cliffs, New Jersery, 1979
- 3. Bernhard Keiser, "Principles of Electromagnetic Compatibility", Artech House- 3rd Edition, 1986

REFERENCE BOOKS:

- 1. Eric Udd, "Fiber Optic Sensors and introduction for engineers and scientists", Wiley Interscience Publication, New Delhi, 1991
- Bajbai, P.K., "Ceramic a novel device for sustained long term delivery of drugsBio Ceramic", Vol III
- 3. Rose Heliman Institute of Technology, Terrahaute, Indian, 1992.
- 4. S.K. Basandia, "Local Area Network", Golgotia Publishing Pvt Ltd., New Delhi, 1995



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CO5 Understands computer in medicine Mapping of Course Outcomes with Program Outcomes (POs)													
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BBI18E15HOSPITAL MANAGEMENT30/00/03

UNIT I NEED AND SCOPES OF CLINICAL ENGINEERING

Clinical engineering program - educational responsibilities - role to be performed by them in hospital - staff structure in hospital

UNIT II NATIONAL HEALTH POLICIES

Need for evolving health policy - health organization in state - health financing system - health education - health insurance - health legislation

UNIT III TRAINING AND MANAGEMENT OF TECHNICAL STAFF IN HOSPITAL 9

Difference between hospital and industrial organization - levels of training - steps of training - developing training program - evaluation of training - wages and salary - employee appraisal method

UNIT IV STANDARDS AND CODES IN HEALTH CARE

Necessity for standardization – FDA - Joint Commission on Accreditation of hospitals - ICRP and other standard organization - methods to monitor the standards

UNIT V COMPUTER IN MEDICINE

Computer application in ICU - X-Ray department - laboratory administration - patient data - medical records - communication - simulation

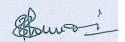
Total No of Periods: 45

TEXT BOOKS:

1. Webster J.C. and Albert M.Cook, "Clinical Engineering Principle and Practice", Prentice Hall Inc., Englewood Cliffs, New Jersey, 1979

REFERENCE BOOKS:

1. Goyal R.C., "Handbook of hospital personal management", Prentice Hall of India, 1996



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To Study about Impedance Concept													
To Learn about Periodic Signals, Feedback													
To Gain Knowledge on Simulation of Biological Systems													
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BBI18E16SYSTEM THEORY APPLIED TO
BIOMEDICAL ENGINEERING30/00/03

UNIT I INTRODUCTION

System Concept -System Properties -Piece Wiser Linear Approximation -Electrical Analog for Compliance -Thermal Storage -Mechanical Systems -Step response of a Resistance/Compliant Systems -Pulse Response of First Order System

UNIT II TRANSFER FUNCTION

System as an Operator use of Transfer Function -bioengineering of a Coupled System -Example of Transformed Signals

UNIT III IMPEDANCE CONCEPT

Circuits for the Transfer Function with Impedance Concept Prediction of Performance.

UNIT IV PERIODIC SIGNALS, FEEDBACK

Sinusoidal Functions -Sinusoidal Analysis of Instrumentation System -Evaluation of Transfer Function s from Frequency Response -Relationship between Phase Lag and Time Delay Transient Response of an Undamped Second Order system - General Description of Natural Frequency Damping -Physical Significance of Under Damped Responses - Characterization of Physiological FeedbackSystem -Uses and Testing of System Stability

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS

Simulation of Skeletal music servomechanism -thermo Regulation -Cardiovascular control System - Respiration controls -Occulo Motor System -Endocrine control system and Modeling of receptors

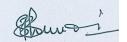
Total No of Periods: 45

TEXT BOOKS:

- 1. William B. Blesser, "A System Approacg to Biomedicine", McGraw Hill Book Co., New York, 1969
- ManfreoClynes and John H. Milsum, "Biomedical Engineering System", McGraw Hill and Co, New York, 1970

REFERENCE BOOKS:

- 1. Douglas S. Rigg, "Control Theory and Physiological Feedback Mechancis", The William and Wilkins Co., Baltimore, 1970
- RiechardSkalak and Shu Chien, "Handbook of Biomedical Engineering", McGraw Hill and Co., New York, 1987



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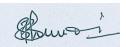
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BBI18E17SPECIAL TRANSDUCERS AND
INSTRUMENTATION30/00/03

UNIT I BASIC CONCEPTS OF MEASUREMENT

Transducer Categories - Characteristics of Transducers Static and Dynamic Characteristics of Measurement

UNIT II FORCE, PRESSURE AND MOTION MEASUREMENT

Various Transducers Capable of Measuring Low Pressure and Force - Its measuring System - External and Catheter tip Transducers - Transducer to Measure Single Movement and Differential Movements - Velocity Transducer - Seismic Pick Up - Accelerometer

UNIT III FLOW MEASUREMENT

Transducer to Measure Velocity - Magnitude and Direction Flow various Methods of measuring these Parameter - Invivo and Invitro Type of Measurements

UNIT IVCHEMICALANDOPTICALTRANSDUCER,TEMPERATUREANDRADIATION MEASUREMENT9

Ion Sensor - Anion and Cation Sensor - Liquid and solid Ion Exchange Membrane Electrodes - Enzyme Electrodes - Molecular Electrode - Fiber Optic Sensor - Photo Acoustic Sensors- PPG Sensors-Various Thermal Sensors Including Integrated Circuit Thermal Sensors - Radiation Thermometry and Chemical Thermometry - Scintillation technique - Gas ionization type films

UNIT V DATA ACQUISITION RECORDING

Signal Conditioners - Single and Multi-Channel data acquisition System - DATA Transmission system - Various Types of recorders - Multichannel column display oscilloscope - Multi colour dot scanner - Magnetic recorder.

Total No of Periods: 45

TEXT BOOKS:

- 1. Michael R. Newman, David G. Flemming, "Physical Sensors for Bio Medical Applications", CRC Press Inc, Flordia, 1980
- 2. Rangan C.S., Sarma G.R., And Mani V.S.V., "Instrumentation Devices and System", Tata McGraw Hill Publication Company Limited, New Delhi, 1983

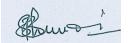
REFERENCE BOOKS:

- 1. Jacob Kline., "Handbook of Bio Medical Engineering", Avademic Press Inc., San Diego 1988
- 2. George C. Barney, "Intelligent Instrumentation", Prentice Hall of India, New Delhi, 1988
- 3. Earnest O.Doebelin., "Measurement System Application and Design", McGraw Hill, New York, 1990



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