



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with "A" Grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 / 51 / 52 / 54 / 55 Fax: 044 - 2450 2344

www.sathyabama.ac.in



STUDENT'S CIRCULAR

02-06-2021

This is to inform that Department of Biomedical Engineering is offering Open Elective Courses listed below for the Batch 2018-2022 (III year) during the academic year 2021-2022 ODD Semester.

1. Forensic Science
2. Drug Delivery Systems
3. Fundamentals of Mechatronics
4. Medical optics and laser applications
5. Biomems and Nanotechnology

students are requested to register their names with respective year coordinators before the end date of registration (10-06-2021).

HOD/BIO MEDICAL

Dr. T. SUDHAKAR

DEPARTMENT OF BIOMEDICAL ENGINEERING
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar Rajiv Gandhi Salai
Chennai - 600 119

Copy to:

1. Dean (Staff Affairs)
2. Dean (Student Affairs)
3. Deans of Schools
4. All HODs
5. III & IV Year UG students

BATCH: 2018-2022

COURSE NAME: Biomems and Nanotechnology

COURSE CODE: SBM1606

SBM1606	BIOMEMS AND NANOTECHNOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To enable the student to acquire adequate knowledge on micro mechanical devices and their applications in drug delivery and nanotechnology.

UNIT 1 INTRODUCTION

9 Hrs.

MEMS – definition. Origin of MEMS – Types – Materials used and their properties. MEMS Technology.
Applications in health care. Integrated MEMS and microsystem.

UNIT 2 PROCESSING: MICRO MACHINING TECHNOLOGY

9 Hrs

Lithography- etching- Ion implantation- wafer bonding- Integrated processing- Bulk micro machining- surface micro machining- coating technology and CVD-LIGA process.

UNIT 3 MICROSYSTEMS AND MICROFLUIDS

9 Hrs.

General principles- Microsensors – Actuators- Electrostatic forces- Piezoelectric crystals – Intelligent materials and structures. Fundamentals of micro fluids, lab – on – a chip devices - Silicon and glass micromachining for micro total analysis systems. Surface chemistry in polymer microfluidic systems.

UNIT 4 APPLICATION IN MEDICINE

9 Hrs.

Trends in MEMS for health care. Drug delivery systems - Biochip – Micro needles- Microelectrodes- Neural prosthesis – shape memory implants.

UNIT 5 BIOMEDICAL NANOTECHNOLOGY

9 Hrs.

Nanotechnology- Medical applications of Nanotechnology- Drug synthesis and delivery- Nanofabrication methods – Nanomaterials in human body- Toxicity in nanomaterials.

Max. 45 Hours

Course Outcomes:

At the end of the course, the student should be able to:

CO1: Understand the main issues stemming from operating in micro and nanolength scales

CO2: Learn how to effectively utilize the available tools and procedures to analyze and design micro/nano-scale engineering systems

CO3: Understand basic principles, tools and future directions of micro/nanotechnology

CO4: Demonstrate professionalism in interactions with team members, colleagues, faculty, and staff

CO5: Identify the application of nanoscience and nanotechnology, including theory and experiment

CO6: Analyse to critique journal papers on nanoscience/nanotechnology

TEXT / REFERENCE BOOKS

Tai-Ran Hsu, MEMS & Microsystem, Design and manufacture, Mc. Graw Hill 2002.

Malsch, NeelinaH., ed., Biomedical Nanotechnology, Washington, DC: CRC Press, 2005

Marc J. Madou, Fundamentals of Microfabrication and Nanotechnology, 3rd Edition, Three-Volume Set, CRC Press 2011.

Mohamed Gad-el-Hak, The MEMS Handbook, CRC Press, 2005

HocineYahia, Shape Memory Implants Springer Verlag 2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 80

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice; each carrying 12 marks

60 Marks

Students Name List

S. NO.	ROLL NUMBER	STUDENT NAME
1	18SBM5040	ABHISHEK. S
2	18SBM5001	AFIF. A.S
3	18SBM1004	AJAY. R
4	18SBM5002	AKSHYA. V
5	18SBM5003	ANEESHWAR. M
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38	18SBM5022	VUKKA LAKSHMIDHAR
39	18SBM5042	HARISH. T.S

BATCH: 2018-2022

COURSE NAME: Medical Optics and Laser Application

COURSE CODE: SBM1602

SBM1602	MEDICAL OPTICS & LASER APPLICATIONS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To enable the student to understand the basics of tissue properties, instrumentation principles in medical optics and the the therapeutic applications thereof

UNIT 1 OPTICAL PROPERTIES OF THE TISSUES 9 Hrs.

Refraction, Scattering, Absorption, Light transport inside the tissue, Tissue properties, Laser Characteristics as applied to medicine and biology-Laser tissue Interaction-Chemical-Thermal Electromechanical – Photoablation processes.

UNIT 2 INSTRUMENTATION IN PHOTONICS 9 Hrs.

Instrumentation for absorption, Scattering and emission measurements, excitation light sources – high pressure arc lamp, LEDs, Lasers, Optical filters, - optical detectors – Time resolved and phase resolved detectors.

UNIT 3 SURGICAL APPLICATIONS OF LASERS 9 Hrs.

Lasers in ophthalmology- Dermatology – Types of lasers used in dermatology – Dentistry- Types of Dental lasers - Urology – Surgical therapy in urology - Otolaryngology - Tissue welding – Specifications

UNIT 4 NON THERMAL DIAGNOSTIC APPLICATIONS 9 Hrs.

Optical coherence tomography, Elastography, Laser Induced Fluorescence (LIF)-Imaging, FLIM Raman Spectroscopy and Imaging, FLIM – Holographic and speckle application of lasers in biology and medicine.

UNIT 5 THERAPEUTIC APPLICATIONS 9 Hrs.

Phototherapy, Photodynamic therapy (PDT) - Principle and mechanism - Oncological and nononcological applications of PDT - Biostimulation effect – applications-Laser Safety Procedures.

Max. 45 Hours

Course Outcomes:

At the end of the course, the student should be able to:

CO1: Understand the basic concepts of optical properties and their interaction with tissues.

CO2: Discuss about the instrumentation and detectors involved in photonics.

CO3: Acquire knowledge about various kinds of lasers used in medicine.

CO4: Analyse the application of lasers in diagnosis.

CO5: Explore the laser techniques in therapy

CO6: Identify the use of lasers that can be used for specific medical applications.

TEXT / REFERENCE BOOKS

1. Leon Goldman, M.D., & R. James Rockwell, Jr., Lasers in Medicine, Gordon and Breach Science Publishers Inc., 1975.

2. Abraham Katzir, Lasers and Optical Fibers in Medicine, Academic Press Edition, 1998.

3. Tuan Vo Dirh, Biomedical Photonics – Handbook, CRC Press, Boca Raton, 2003.

4. Glasser, O., Medical Physics -- Vol 1, 2, 3 Adam Hilgar Bristol Inc, 1987.

5. G. David Baxter, Therapeutic Lasers – Theory and practice, Churchill Livingstone Publications Edition- 2001.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 80

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

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BATCH: 2019-2023

COURSE NAME: Forensic Science

COURSE CODE: SBMA4007

SBMA4007	FORENSIC SCIENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

The syllabus is designed to provide a brief and basic knowledge to understand the forensic science particularly to the biomedical student. The main aim is to provide reasonable coverage of subject to know the basic concepts of the science so that the student can implement their knowledge in higher studies.

UNIT 1 ANIMAL CELL STRUCTURE 9 Hrs.

Cell and its inclusions – structure and function – types of cells: Blood & Body fluids – forensic significance – morphological identification of bones – forensic importance.

UNIT 2 BLOTTING TECHNIQUES 9 Hrs.

Identification of Human remains – methods of reconstruction – personal identity in the living and the dead – DNA fingerprinting – PCR - Blotting types (Southern, Northern and Western)

UNIT 3 FINGERPRINTS 9 Hrs.

FingerPrints – importance of plastic and visible finger prints – transfer methods of finger prints – fingerprint patterns – their classification – ridge characteristics – foot prints – importance – gait patterns and their characteristics – photography of foot prints – sunken and surface foot prints.

UNIT 4 TOXINS 9 Hrs.

Forensic toxicology – poison and drugs, classifications, Source, nature, Actions and diagnosis of poisoning cases, postmortem findings and examination, treatment of poisoning cases, medico legal aspects; corrosive agents, irritants – mechanical and animal.

UNIT 5 SEROLOGICAL AND CHROMOSOMAL TECHNIQUES 9 Hrs.

Serology – basic principles of serology – concept of antigen and antibody and their reaction – application of serology in forensic science. Karyotyping – banding patterns - chromosomal abnormalities – sex determination – sex linked inheritance.

Max. 45 Hours

Course Outcomes:

At the end of the course, the student should be able to:

CO1: Gain the basic knowledge about forensic importance human cell and body fluids.

CO2: Understand the molecular characterization of DNA for the identification of human beings.

CO3: Recognize the forensic importance of finger print and foot print for legal proceedings.

CO4: Demonstrate information about medico legal aspects of different types of poisoning cases.

CO5: Familiarity to identify unnatural causes of death based on immunological techniques.

CO6: Employ karyotyping technique to identify chromosomal abnormality.

TEXT / REFERENCE BOOKS

1. De Robertis, General Cytology, Saunders, 6th Edition, 2008
2. Apurba Nandy, Principles of Forensic Medicine, New Central Book Agency, 2nd Edition, 2001
3. M. Krawczak and J. Schmidtke, DNA Fingerprinting, BIOS Scientific Publisher, 2nd Edition, 1995
4. Richard Saferstein Ed, Forensic Science Hand Book, Prentice Hall, 2010
5. P L Carpenter, Immunology and Serology, W B Saunders Company, 2nd Edition, 1965
6. David Friedlander, Molecular Biology, Narosa, 4th Edition, 1995
7. Narayan Reddy, The Essential of Forensic Medicine and Toxicology, 31st Edition, 2012.

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Exam Duration : 3 Hrs.

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20 Marks

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60 Marks

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2	19SBM1001	AISHVARIYA SHIVANI. S
3	19SBM5041	AISHWARYA J
4	19SBM5002	AISHWARYA MOHAN KUMAR
5	19SBM5038	AKSHARA D
6	19SBM5031	AKSHARA S
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STUDENT'S CIRCULAR

02-11-2021

This is to inform that Department of Biomedical Engineering is offering Open Elective Courses listed below for the Batch 2018-2022 (III year) during the academic year 2021-2022 EVEN Semester.

1. Medical Waste Management
2. Medical Equipment's and trouble shooting
3. Artificial organs and Tissue Engineering Neurology
4. Neurology

students are requested to register their names with respective year coordinators before the end date of registration (12-11-2021).

HOD/BIO MEDICAL

Dr. T. SUDHAKAR

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5. III & IV Year UG students

BATCH: 2018-2022

COURSE NAME: Medical Waste Management

COURSE CODE: SBM1608

SBM1608	MEDICAL WASTE MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

The study would ensure safe practices and proper management of medical waste, in order to safeguard the patient, health care, community and the environment.

UNIT 1 INTRODUCTION & WASTE SEGREGATION 9 Hrs.

General Introduction, Definition of Biomedical Waste, General and Hazardous health care waste – Colour Coding and types of containers for disposal of medical waste, Segregation, Collection & Disposal.

UNIT 2 TYPES OF BIOMEDICAL WASTE 9 Hrs.

Infectious waste, Genotoxic waste, Waste Sharps – Categories, Categorization and composition of Biomedical waste. Liquid Biomedical Waste - Radioactive wastes, Metals, Chemicals & drugs

UNIT 3 HOSPITAL GENERATED WASTE 9 Hrs.

Human Blood and Blood Products, pathological wastes, Contaminated sharps, Contaminated animal carcasses, body parts, and bedding Basic information about infection, Infectious agents on organizations spread of infection, Basic information about Hospital acquired infection.

UNIT 4 TYPES OF WASTE DISPOSAL 9 Hrs.

Disinfections unit container for Autoclaving, Sharp waste containers for storage & transportation, autoclaving, Incineration, Plasma Pyrolysis /Gasification systems, Composting.

UNIT 5 BIOETHICS AND RECENT TRENDS 9 Hrs.

Modern Technology for handling Biomedical Wastes – Monitoring & Controlling of Cross Infections, Protective Devices – Bioethics and Handling of Waste Management.

Max. 45 Hours

Course Outcomes:

At the end of the course, the student should be able to:

C01: Understand the importance colour coding for waste segregation and collection

C02: Attain the adequate knowledge about types of biomedical waste and the severity of hazardousness

C03: Understand the amount of waste generated in hospital and quantify for discard

C04: Demonstrate the types of waste disposal and its process to dispose

C05: Learn about modern technology and protective devices for handling biomedical waste

C06: Outline the methods of bioethics and environment safety.

TEXT / REFERENCE BOOKS

1.V. J. Landrum, Medical Waste Management and disposal, Elsevier, 1991, ISBN: 978-0-8155-1264-6

2.S A Tabish, Principles of Hospital Management, OUP, Jaypee Publishers.6th Edition 2000.

3. S L Goel, Dr. R. Kumar, Encyclopedia of Hospital Management - Text and Case Studies Hospitals in Community Health Care, ISBN(Hardbound): 8184502273, 9788184502275. 2010.

4. J. Glyn Hendry & Gary W Heinke, Environmental Science and Engineering, Prentice Hall India, 2004

5. Shyam Divan, Environmental law and policy in India, Oxford India Press, 2004.

6. Charles A Wentz, Hazardous Waste Management, McGraw Hill Inc, Newyork, 1995

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 80

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice; each carrying 12 marks

60 Marks

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39	18SBM5042	HARISH. T.S

BATCH: 2019-2023

COURSE NAME: Medical Equipment Maintenance and Troubleshooting

COURSE CODE: SBMA3001

SBMA3001	Medical Equipment Maintenance and Troubleshooting	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand and learn the troubleshooting of instruments used for diagnosis and therapy.
- Learn how to maintain the overall working of equipment.

UNIT 1 INTRODUCTION 9 Hrs.

Testing of electrical equipments: AC, DC power supply, Grounding, shielding, Guarding, insulation testing, insulation resistance measurement, Types of Circuit Breakers, Rating - Testing of circuit breakers – Transformer testing- Earthing –Earth wires - Earthing of appliances – contactor, relay testing–CT and PT, Panel wiring- Megger-Testing equipments and instruments.

UNIT 2 TESTING AND TROUBLESHOOTING 9 Hrs.

Testing of electronic components: Troubleshooting of PCB boards, Calibration of analog and digital sensor probe, Display interface, DC Power supply design, testing, Safe electrical practice, Cables and standard, Fuse.

UNIT 3 TESTING OF MEDICAL EQUIPMENT 9 Hrs.

Testing of surgical Equipment: Functions and operating procedure-Testing and maintenance of Heart lung machine, surgical lights, ventilator, patient monitor, anesthesia machine, dialyzer, surgical tools.

UNIT 4 TROUBLESHOOTING OF MEDICAL EQUIPMENT 9 Hrs.

Troubleshooting of equipments: X-ray machines, Troubleshooting of ECG recorders, incubator, baby warmer, infusion pumps, annual maintenance, contract requirements, vendor services, and quality and safety standards.

UNIT 5 MAINTENANCE MANAGEMENT 9 Hrs.

Life cycle management of medical equipment: Cost of the medical equipment, maintenance cost, replacement analysis, managing equipment service, decision making, extracting optimal benefit from medical equipment over its life cycle. Case study.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Identify major reasons for equipment failure.
- CO2 - Compare general testing and troubleshooting of equipment.
- CO3 - Understand testing of OT instruments
- CO4 - Discuss about the troubleshooting of medical equipment and safety standards.
- CO5 - Analyze the management issues pertaining to medical instruments.
- CO6 - Apply the tools in design, testing and developing medical equipment

TEXT / REFERENCE BOOKS

1. Shakti Chatterjee, Aubert Miller, "Biomedical Equipment Repair", Cengage Learning Technology & Engineering, 2010.
2. David Herres, "Troubleshooting and Repairing Commercial Electrical Equipment", McGraw Hill Professional, 2013.
3. Rao S, "Testing, Commissioning, Operation and Maintenance of Electrical Equipment", Khanna Publishers, New Delhi, 2014.
4. Francis Hegarty, John Amooore, "Health care technology management – A systematic approach", CRC Press, USA, 2017.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice 20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks 80 Marks

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BATCH: 2019-2023

COURSE NAME: Artificial Organs and Tissue Engineering

COURSE CODE: SBMA3003

SBMA3003	Artificial Organs and Tissue Engineering	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

➤ To provide a general introduction to the use of artificial materials in the human body for the purpose of aiding healing, correcting deformities and restoring lost function.

➤ It is expected that the student will have successfully completed elementary course in the mechanics of deformable bodies and an introductory course to material science prior to undertake a course in biomaterials.

UNIT 1 ORGAN REPLACEMENT 9 Hrs.

Evolution of organ replacement technology. Organ replacement outlook, Biology of transplantation of tissue products matching. Types of tissue grafts, design considerations, evaluation process.

UNIT 2 ARTIFICIAL ORGANS 9 Hrs.

Artificial heart valves, Heart valve prosthesis - mechanical and tissue valves, Cardiac pace makers, Pacemaker Implantation, Cardiac Stents, Artificial Lung, Artificial skin, Artificial pancreas, Artificial Cartilage, Artificial kidney, Dialysis - The Nephron and Mass Transfer, Dialysis Procedure and the Dialysis System, Dialyzer Cartridge Reuse.

UNIT 3 TRANSPLANTS 9 Hrs.

Transplants types, immunological considerations, blood transfusions. Individual organs - Kidney, liver, heart, lung, bone, skin, and pancreas. Regeneration and ethical considerations

UNIT 4 TISSUE ENGINEERING 9 Hrs.

Tissue engineering - Basic principles and considerations, Bioreactor - design and applications, Biomaterials - Protein surface interaction, Protein adsorption, Engineering Biomaterials for Tissue Engineering - 10 to 100 micron size scale

UNIT 5 STEM CELLS 9 Hrs.

The Biology of Stem cells - Embryonic stem cells, Control of stem cell development, adult stem cells, aging of stem cells, The importance of Stromal cells- Fibroblast, Endothelial cells, adipocytes, macrophages Tissue engineering of Bone marrow

Max. 45 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 - Understand organ replacement technology and evaluation process of various artificial organs.

CO2 - Acquire knowledge about different types of artificial organs and their implantation.

CO3 - Recognize the immunological complications of organ transplantation and graft rejection.

CO4 - Demonstrate principles of stem cells and biomaterials used for tissue engineering.

CO5 - Apply tissue engineering to produce biomolecules.

CO6 - Implement the artificial organs to replace malfunctioning of natural organs.

TEXT / REFERENCE BOOKS

1. Gerald E. Miller, Artificial organs, 1st edition, A Publication in the Morgan & Claypool Publishers series, United States of America, 2006.

2. Park J.B. and R.S. Lakes, Biomaterials: An Introduction 2nd Edition, Plenum press, New York, 2001.

3. Joseph D Bronzino, The Biomedical Engineering hand Book Vol.11, CRC Press, 2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice **20 Marks**

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks **80 Marks**

Students Name List

S.No.	Roll Number	Students Name
1	19SBM5001	AAKESH. U
2	19SBM5041	AISHWARYA J
3	19SBM5002	AISHWARYA MOHAN KUMAR
4	19SBM5038	AKSHARA D
5	19SBM5031	AKSHARA S
6	19SBM5003	ANCY HANNAH CHARLET. A
7	19SBM5037	CATHERINE MELITA PRADHIKSHA P
8	19SBM5006	CHELSEA HANNAH. A
9	19SBM5009	HEPZIBAH SUSAN. M
10	19SBM5039	KEERTHANA R
11	19SBM5010	KEERTHIVASAN. V
12	19SBM5013	LOCHANA. P
13	19SBM5014	MAHALAKSHMI. V
14	19SBM5015	MEENA MANJURI. J
15	19SBM5042	POOJAHSRI S
16	19SBM5019	PRERANA. S
17	19SBM5035	RENITTA D
18	19SBM5020	RIDDHITA THAKUR
19	19SBM5023	SHERYL ROBINSON