

SAURASHTRA UNIVERSITY, RAJKOT

B.E. VI SEMESTER

[BIOMEDICAL & INSTRUMENTATION ENGINEERING]

Code	Subject	Teaching Scheme		Exam Scheme				
		Lect.	Pra.	Theory Hrs.	Paper Marks	Prac/ Oral	Term Work	Total Marks
601	Microprocessor Architecture & Interfacing	4	2	3	100	25	25	150
602	Analog & Digital Communication	4	2	3	100	25	25	150
603	Industrial Instrumentation & Measurement Techniques - I	4	2	3	100	25	25	150
604	Biomaterials & Biomechanics	4	-	3	100	-	-	100
605	Medical Therapeutic Techniques & Equipments	4	2	3	100	25	25	150
606	Seminar*	-	2	-	-	50*	-	50
TOTAL		20	10	-	500	150	100	750

- College Level Examination

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM VI (BIO-MEDICAL & INSTRUMENTATION ENGINEERING)
BM - 601 : MICROPROCESSOR ARCHITECTURE & INTERFACING

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
04	02	100	03	25	25	150

1. **MICROPROCESSOR INTRODUCTION:**
Microprocessor architecture & its operation. Memory, Input and Output. Microprocessor system.
2. **8085 BASED MICROCOMPUTERS SYSTEMS:**
Block diagram and pin-out diagram of 8085. Generating control signals. Working of 8085 based microcomputer.
3. **INTRUCTIONS AND TIMINGS:**
Instruction classification. Format of Instruction. Instruction set; Data transfer, Arithmetic, Logical, Branching. Timing & Operation status. Assembly language programming Debugging.
4. **PROGRAMMING TECHNIQUES:**
Looping, Counting, Indexing, and Branching. Counters & Time delay. Stack and Subroutines. Code conversion, BCD arithmetic & 16 bit data operations. Data transfer schemes.
5. **INTERRUPTS:**
Vector interrupts, Priority of Interrupts. Interrupt levels.
6. **GENERAL PURPOSE PROGRAMMABLE PERIPHERAL DEVICES:**
8255- Programmable peripheral interface. 8253 - Programmable interval timer. 8259 - Programmable interrupts controller. DMA & 8257 DMA Controller. Introduction to 8279 (Programmable keyboard/display interface) & Serial I/O data communication. Bus interfacing Standards.
7. **INTERFACING DATA CONVERTERS:**
A to D converters, their types, construction and interfacing. D to A converters, their types, construction and interfacing.

BOOKS RECOMMENDED:

Microprocessor Architecture Programming & Application with 8085	-Ramesh Gaonker
Introduction to Microprocessor	-A. P. Mathur
Fundamental of Microprocessor & Microcomputer	-B. Ram

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM VI (BIO-MEDICAL & INSTRUMENTATION ENGINEERING)

BM - 602: ANALOG & DIGITAL COMMUNICATION

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
04	02	100	03	25	25	150

1. FUNDAMENTALS OF COMMUNICATION SYSTEM:

Block diagram of communication system. Transmitter. Channel and Receivers. Noise figure. Signal to Noise ratio (SN ratio). Noise factor.

2. MODULATION TECHNIQUES:

Need for modulation. Types of Modulation such as: Amplitude Modulation (AM), Frequency Modulation(FM), and Angle Modulation(AM). Comparison and Application of it. AM Transmitter. FM Transmitter.

3. PULSE MODULATION:

Pulse Amplitude Modulation (PAM). Pulse Frequency Modulation (PFM). Pulse Time Modulation (PTM). Pulse Position Modulation (PPM). Pulse Width Modulation (PWM). Pulse Code Modulation (PCM). Delta Modulation. A Delta Modulation.

4. DIGITAL COMMUNICATION:

Introduction. Synchronization. Asynchronous transmission. Probability of bit error in base-band transmission. Error detection & correction. Phase shift keying (PSK), Frequency shift keying (FSK). Differential Phase shift keying (DPSK). Quadratic Phase shift keying (QPSK). Modem classification. Modem interfacing.

5. APPLICATION OF COMMUNICATION TECHNIQUES TO BIO-MEDICAL INSTRUMENTATION

BOOKS RECOMMENDED:

Electronics Communication	-Roody & Coolen
Electronics Communication	-Kennedy
Modern Communication Circuits	-J. Smith
Principles of Communication System	-Taub & Schilling
Data Communication	-William Schweber

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM VI (BIO-MEDICAL & INSTRUMENTATION ENGINEERING)

BM - 603: INDUSTRIAL INSTRUMENTATION AND MEASUREMENT TECHNIQUE – I

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
04	02	100	03	25	25	150

1. **ORGANIZATION OF INSTRUMENT DEPT.:**
 Duties & responsibilities, Typical layout, Staffing pattern, Tools & accessories, Documentation of technical information & maintenance work, Planning, Cost control, Installation practice, Testing, Loop checking-starting up - commissioning.
2. **AIR SUPPLY SYSTEM:**
 Compressor system-types of compressors, compressor control, Distribution system, Design considerations, Pneumatic circuit & components e.g. pressure, level, flow, temperature and vibration switches & annunciators.
3. **CONTROL ROOM AND CONTROL PANELS:**
 Electric power system design for control room, objectives of control panel, types of control panels, console-monitor panels, Panel layout, piping, tubing, panel bid specifications, inspection.
4. **ENVIRONMENTAL SAFETY AND PROTECTIVE TECHNIQUES IN INSTRUMENTATION:**
 Definition of hazardous area and its classification, Flame proof enclosure, Intrinsically safe circuits & advantages.
5. **CONVERTERS:**
 I/P, P/I., V/F, F/V. Pneumatic and electric converters.
6. **DATA AEQUISITION SYSTEM:**
 Introduction, Generalized Block-diagram of DAS, Single channel & Multi channel analog & Digital DAS.

BOOKS RECOMMENDED:

Applied Inst. in process industry	-Andrews
Instrument engg. handbook	-Liptak
Instrument devices and systems	-Rangan, Mani, Sharma
Instrument tech	-E. B. Jones

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM VI (BIO-MEDICAL & INSTRUMENTATION ENGINEERING)

BM - 604: BIOMATERIALS & BIOMECHANICS

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
04	-	100	03	-	-	100

SECTION: A BIOMATERIALS:

1. Non-pharmaceutical materials used in medicine e.g. polymers, plastics, metals, ceramics, treated materials, rubber, acrylic, silicon.
2. Tissue reaction to external materials, and their compatibility. Blood/Biomaterial Interaction.
3. Treatment of materials for Biocompatibility.
4. Mechanical property of Biomaterials. Standards and assessment of Biomaterials.
5. Various applications of Biomaterials, e.g. prosthesis, implant & drug delivery.
6. Biodegradable materials and their applications. Corrosion and wear of Biomaterials.
7. Rheological property of biological solids. E.g. bone, tendons, blood vessels and biological liquids, mucus etc.

SECTION : B BIOMECHANICS:

1. Mechanics of Blood flow-Heamorheology.
2. Mechanics of Locomotion: Muscular mechanism, GAIT & Posture.
3. Mechanics of muscle.
4. Mechanics of cardiovascular & pulmonary system
5. Nature and Mechanism of biological control system. Feed back control and its components. Control of body temperature, Control of Blood pressure, Heart rate, Control of secretion, Control of movements etc.

BOOKS RECOMMENDED:

Biomaterials	-Science & engineering, Plenum press-1984
Biomaterials	-Hench & Etheridge
Biomechanics	-Sahay & Saxena
Orthopedic Mechanics	-D. N. Ghista & Roaf

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM VI (BIO-MEDICAL & INSTRUMENTATION ENGINEERING)
BM - 605: MEDICAL THERAPEUTIC TECHNIQUES & EQUIPMENTS

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
04	02	100	03	25	25	150

SECTION: A MEDICAL THERAPEUTIC TECHNIQUES:

1. Use of supportive equipments like Anesthetic apparatus. Suction machines. Respiratory support (Ambubags, Servo-ventilators etc.), Oxygen therapy units, Hemodialysis, Defibrillation, use of Pace-maker, Baby incubators etc. and their importance in clinical management of patients.
2. Surgical laser applications & therapeutic ultrasonography (Lithotripsy, phaco-emulsification etc.). Robotic surgery. Therapeutic endoscopy & microscopy.
3. Radiation therapy.
4. Microwave therapy, Thermo-therapy.
5. Organization & functioning of ICU, ICCU, & Emergency measures.

SECTION: B MEDICAL THERAPEUTIC EQUIPMENTS:

- Principles of operation, Specifications, Block-diagram, and Control panel details, design and other details of Bio-medical therapeutic and supportive Equipments and instruments.
1. **Life supportive equipments:** Servo-ventilators, Defibrillator, Cardiac Pace-maker, Oxygen therapy unit, artificial heart lung machine. Hemodialysers, Baby incubators etc.
 2. **Surgical Tools & Equipments:** Electro-cauteries, Short-wave, diathermy, Microwave diathermy, electro-anesthetic apparatus. Robotic surgical equipments, Surgical Laser, Therapeutic ultra-sound.
 3. **Equipments in ICU:** Patients monitors and alarms; Automatic drug delivery.
 4. **Electrical Hazards & Patient safety in Bio-medical equipments.**

BOOKS RECOMMENDED:

Respiratory support in intensive care	-Sykes
Mechanical ventilators	-Macntyre
Cardiac intensive care	-Brown
Foundation of anesthesia	-Hammings
Fundamentals of operation theatre	-T. K. Dalta
Bio-medical instruments & Measurements	-Cromwell
Bio-medical instrumentation	-R. S. Khandpur
Medicine and clinical engineering	-Bertil Jacobson & John Webster

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM VI (BIO-MEDICAL & INSTRUMENTATION ENGINEERING)

BM - 606: SEMINAR

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
-	02	-	-	-	50	50

- The students are required to prepare a write up on a particular topic which is not studied so far but may be extension of the topics of the subject studied or collections of material related to recent advances in the area of Medical & Industrial Instrumentation by,
 1. Literature survey from Books & Periodicals.
 2. Interaction with experts.
 3. Internet surfing.

TERM WORK TO BE SUBMITTED BEFORE END OF SEMESTER AND TO BE DEFENDED BY PRESENTATION BEFORE FACULTY, WHO WILL FORWARD THE MARKS TO THE UNIVERSITY.