

SAURASHTRA UNIVERSITY, RAJKOT

**B.E IV SEMESTER
[BIOMEDICAL & INSTRUMENTATION ENGINEERING]**

Code	Subject	Teaching Scheme		Exam Scheme				
		Lect.	Pra	Theory	Paper Hrs.	Prac/ Oral	Term Work	Total Marks
401	Electronic Instrument & Measurement techniques	4	2	100	3	25	25	150
402	Transducers & Measurement Techniques	4	2	100	3	25	25	150
403	Human Biology - II	4	2	100	3	25	25	150
404	Circuit Theory	4	-	100	3	-	-	100
405	Electrical Engineering	4	2	100	3	25	25	150
406	Electronics Workshop Practice	-	2	-	-	25	25	50
TOTAL		20	10	500	-	125	125	750

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM IV (BIOMEDICAL & INSTRUMENTATION ENGG.)

**BM - 401: ELECTRONIC INSTRUMENTS &
MEASUREMENT TECHNIQUES**

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
4	2	100	3	25	25	150

1. ANALOG ELECTRICAL INSTRUMENTS :

Classification, Principle of Operation, Operating torque, Methods of Control, Damping and mechanical balancing of moving system, Basic construction and working principle of Galvanometer.

Types of ammeter and voltmeter, theory of operation of moving coil, moving iron, electro-dynamometer and induction type instruments, Errors Relative merits, Calibration and Extention of range of by shunts and multipliers.

Basic construction, working and application of ohm meter, Megger and multimeter Principles of working, methods of connection, Errors, Compensation and use of dynamometer type wattmeter and induction type energy meter.

2. BRIDGES AND THEIR APPLICATIONS :

Bridge for measurement of low, high and medium resistances, AC bridge for measurements of inductance, Capacitance and freq. Wagner connection.

3. ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS :

Advantages of electronic meter, basic construction and working of high input impedance voltmeters such as VTVM, FET INPUT, True RMS reading and rectifier type A.C. voltmeter etc.

Digital display methods, segmental display, dot matrix display, LED and LCD display, resolution, sensitivity and accuracy of digital meters.

Different type of digital voltmeter, Multimeter, frequency, time period and phase angle measurement techniques, High frequency measurement consideration R-L-C and Q measurement, Vector impedance meter, RF Power and voltage measurement.

Principles of working of Different type of recorders such as analog, graphics and strip chart, multipoint, X-Y, ultra-violet recorders etc. use of CRO & Computer for recording.

Construction and working of CRT, block diagram of CRO & detail understanding of associated function and features, delay line, details of front panel controls, special purpose CRO such as sampling oscilloscope, storage oscilloscope, multi beam, multi trace oscilloscope, CRO probes, Observation and measurement of waveforms and associated parameter like voltage, current , phase and frequency etc.

4. INSTRUMENTS FOR SIGNAL GENERATION AND ANALYSIS OF WAVEFORM :

Construction and working of sine wave, square wave, pulse and function generators, Sweep frequency generators, Wave analyzer, spectrum analyzer, Distortion analyzers.

BOOKS RECOMMENDED:

Electrical and Electronic Measurements and Instrumentation	-A. K. Sawhney
Electronic Instrumentation and Measurement techniques	-Cooper & Helfrick
Electronic Instrumentation and Measurement	-David A Bell
Electronic Instrumentation	-Jones & Chin

SAURASHTRA UNIVERSITY, RAJKOT
B.E. SEM IV (BIOMEDICAL & INSTRUMENTATION ENGG.)
BM - 402: TRANSDUCERS & MEASUREMENT TECHNIQUES

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
4	2	100	3	25	25	150

1. MEASUREMENT, INSTRUMENTATION & CALIBRATION:

Introduction, measurement, classification of transducers, performance characteristics, errors in measurement, calibration and standards.

2. ACTIVE ELECTRICAL TRANSDUCERS:

Introduction, Piezo-electric transducers, Magnetostriction transducers, Hall-effect & photo-electric transducers, electro-mechanical transducers, Ionization & electro-chemical transducers.

3. PASSIVE ELECTRICAL TRANSDUCERS:

Resistive transducer, Inductive transducer, Capacitive transducer.

4. MEASUREMENT OF TEMPERATURE:

Expansion thermometer (Liquid, Solid & Gas), RTD, Thermocouple, Optical & radiation Pyrometers, Thermistor.

5. MEASUREMENT OF FLOW:

Orifice plate, Pilot & Venturi tube, flow nozzle, Rota meter, Positive Displacement type transducer, Ultrasonic flow detector, Electromagnetic flow meter, Doppler shift, Cross-co-relation flow meter, Vortex flow meter.

6. MEASUREMENT OF PRESSURE:

Manometer, Bourdon tube, Diaphragm, Bellows, Different Electrical Pressure Transducers, Measurement of vacuum by Mc-leod, Pirani, thermocouple vacuum gauge.

7. MEASUREMENT OF LEVEL:

Float type, Displacer Hydrostatic, thermal effect types, Air bubble type & Diaphragm box type, Geiger - Muller counter, pneumatic type.

8. MISCELLANEOUS MEASUREMENT:

Flapper nozzle system, Viscosity measurement, Digital transducers.

BOOKS RECOMMENDED:

Transducers and Instrumentation	-D. V. S. Murty
Instrumentation devices & Systems	-Rangan - Mani Sharma
Principles of Industrial Instrumentation	-D. Pataranabis
Industrial Instrumentation	-DonaldEckman

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BM - 403: HUMAN BIOLOGY - II

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
4	2	100	3	25	25	150

ANATOMY

1 SKELETAL SYSTEM:

Structure & Formation of Bone & Fracture Healing
Type of Bones
Type of Joints
Classification of Movements & Introduction to Kinesiology
(Biomechanics)
Classification of Muscles

2. UNINARY SYSTEM:

Brief Structure of Kidneys

3. DIGESTIVE SYSTEM

4. REPRODUCTIVE SYSTEM

PHYSIOLOGY

1. RESPIRATION:

Pulmonary Ventilation

Mechanics of Pulmonary Ventilation, Pulmonary Volumes and Capacities, Physical Principles of Gas Exchange, Artificial Respiration (Ventilation), Pulmonary Function Testing (The basics), Effects of Acceleratory Forces on the Body in Avialational Space Physiology, “Artificial Climate ” in the Sealed Spacecraft, Weightlessness in Space, SCUBA Diveing.

2. EXCRETORY SYSTEM:

Structure of Kidney, Formation of Urine of Kidneys, Concentration & dilution of Urine, Renal function test, Treatment of Renal failure by artificial Kidney, Dialysis.

3. THE NERVOUS SYSTEM:

General Design of the Nervous System, Major Levels of Central Nervous-System Function, Comparison of the Nervous system with an electronic computer, Synapse & its functions, Receptors, Types of Sensations, EEG (Basic aspect).

4. SPECIAL SENSES:

Vision

The Eye as a camera, mechanism of the accommodation, Visual acuity, Ophthalmoscope, Color vision, Perimetry.

Hearing

Tympanic Membrane and The Ossicular System, The Cochlea, Hearing Abnormalities (Mechanics), Types of Deafness, Audiometry.

5. TRANSPORT OF FOOD IN THE ALIMENTARY TRACT:

Mastication (Chewing), Swallowing (Deglutition), Movements of the Small intestine, Movements of the Colon, Digesting of food (Born).

6. REPRODUCTIVE SYSTEM:

Spermatogenesis

Semen

The Monthly Ovarian Cycle

Physiologic

7. ENDOCRINE SYSTEM:

Pancrease,
Suprarenal,
Pitutory,
Thyroid,
Para Thyroid.

BOOKS RECOMMENDED:

Human Anatomy (Vol. 1, 2, 3)	- B. D. Chaurasiya
General Anatomy	- B. D. Chaurasiya
Gray's Anatomy (Reference)	
Principles of Anatomy & Physiology	- Tortora
Grant's Atlas of Anatomy	- Agar
Essentials of Human Anatomy Vol. 1, 2, 3	- Datta A. K.
Principles of General Anatomy	- Datta A. K.

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BM - 404: CIRCUIT THEORY

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
4	-	100	3	-	-	100

1. CIRCUIT FUNDAMENTALS AND THEORMS:

Charge and energy, Field and circuit concept and interrelationship, circuit parameters, R.L.C.M. etc. Dot convention of coupled circuit. Circuit and voltage sources and source transformation, energy and power. Average and complex power, Insertion loss, Optimizing power transfer, Tellegen's theorem, Kirchoff's laws, Basic terms e.g. node, branch, graph, tree, loop, etc. Network, Number of network equation required for solution. Thevenin's, Norton's, Millman's, Super position, Reciprocity theorem.

2. TRANSIENT AND STEADY STATE ANALYSIS:

Initial conditions in elements, Geometrical interpretation of derivatives, procedure for evaluating initial conditions.

Concept and physical significance of complex frequency. Transform impedance and admittance of R.L.C. elements and circuits. Driving point, transfer, input and output impedance of a network, application of network, application of network theorem. Formation of network equilibrium equations on node and loop basis. Duality, Method of writing parameter matrix directly, solutions using Minors and Gauss method. Network analysis using Laplace and inverse Laplace transforms, synthesis of typical waveforms and their Laplace transforms, shift functions. General solution of second order equations in S domain, Response related to s plane location of roots pole zero concept. Restrictions on pole zero location for driving point functions and transfer functions. Sinusoidal steady state analysis using exponentials.

3. TWO PORT NETWORK PARAMETERS:

Short Circuit admittance (Y), open circuit impedance(Z), Transmission (A B C D). Hybrid (h) parameters. Inter relation between parameters sets. Conditions for reciprocity of a two port network. Two port network topologies like PIE, Ladder, Bridge T, Lattice etc. Symmetrical networks, Parallel connection of two networks.

BOOKS RECOMMENDED:

Network Analysis	-M. E. Van Valkenburg
Network Analysis	-G. K. Mittal
Engineering Circuit Analysis	-W. H. Hyat, J. E. Kommetry
Electric Circuits	-J. Eduminister
Linear Circuit Analysis	-S. Madhu PHI

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BM - 405: ELECTRICAL ENGINEERING

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
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1 ELEMENTS OF D.C. & A.C. MACHINES:

Principle of working, constructional features, classification, type of winding, types of connections, concept and mechanism of emf/torque generation and related equations, Performance characteristic and field of application of D.C. machines (motor & generator), synchronous machines (Alternator & synchronous Motor) Induction machine (Induction motor single and three phase).

Starting logic & Methods for D.C. Motor, single & three-phase induction motor and synchronous motors.

2. TRANSFORMERS:

Principle of working, constructional features, types, emf equation, vector diagram, equivalent circuit, losses & efficiency, OC & SC test, parallel operation, Auto transformer, constructional features & connections of 3 phase transformers, current and potential transformers, ratio and phase errors.

3. DISTRIBUTION OF POWER:

Distribution systems, types, selection and size of feeders, calculations, types of cables, underground cables.

BOOKS RECOMMENDED:

A text of Electrical Technology (Vol. - II)	-B. L. Theraja
Electrical Technology (Vol. - I & II)	-J. B. Gupta
A Course in Electrical Power	-Soni, Gupta, Bhatnager

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BM - 406: ELECTRONIC WORKSHOP PRACTICE

TEACHING SCHEME		EXAMINATION SCHEME				
THEORY HOURS	PRACTICAL HOURS	THEORY MARKS	PAPER HOURS	PRACTICAL/ORAL MARKS	TERMWORK MARKS	TOTAL MARKS
-	2	-	-	25	25	50

FOLLOWING ASPECTS MAY BE COVERED:

1. Study and identification of electronic components such as resistors, capacitors, inductors, AF and RF transformers, coils, relays, reed switches, PCB connectors, LED, LCD display etc.
2. Testing and identification of electronic devices such as PN junction, Transistors, FETs, MOSFETs, UJT, SCRs, Diacs, Triacs, bridge rectifiers, TTL & MOS ICs, Operational Amplifiers etc.
3. Use of data books, specification and commercial identification of components and devices.
4. Soldering and de-soldering practice.
5. Use of breadboard and general purpose PCBs.
6. Study of different types of conductors, cables, connectors, e.g. Solid wire, stranded wire co-axial cable, lugs and clips, terminal strips, phone plug, TV-VCR connectors and receptacles, fuses such as glass cartridge fuses etc.
7. Study of PCB design techniques and processes, PCB circuit tracing exercise.
8. Study of house wiring and energy meter connection.