A.P. STATE COUNSIL OF HIGHER EDUCATION

Semester-wise Revised Syllabus under CBCS, 2021-22

Domain Subject: **PHYSICS**

III Year B.Sc. - Semester – V

Course 7C: Electronic Instrumentation (Skill Enhancement Course (Elective), 3+2 Credits) Max. Marks: Theory:100 + Practical:50

I. Learning Outcomes: Students after successful completion of the course will be able to:1.

1. Identify various facilities required to set up a basic Instrumentation Laboratory.
2. Acquire a critical knowledge of various Electrical Instruments used in the Laboratory.
3. Demonstrate skills of using instruments like CRO, Function Generator, Multimeter etc. through hands on experience.
4. Understand the Principle and operation of different display devices used in the display systems and different transducers
5. Comprehend the applications of various biomedical instruments in daily life like B.P. meter, ECG, Pulse oxymeter etc. and know the handling procedures with safety and security.

II. **Syllabus:** *(Total Hours: 90 including Teaching, Lab, Field Training, Unit tests etc.)*

UNIT-I *Introduction To Instruments* (10 hrs)

Types of electronic Instruments - Analog instruments & Digital Instruments, DC Voltmeter and AC Voltmeter, Construction and working of an Analog Multimeter and Digital Multimeter (Block diagram approach)

UNIT-II *Oscilloscope* (10 hrs)

Cathode Ray Oscilloscope-Introduction, Block diagram of basic CRO, Cathode ray tube, Electron gun assembly, Screen for CRT, Time base operation, Vertical deflection system, Horizontal deflection system, Use of CRO for the measurement of voltage (AC and DC), frequency, phase difference.

UNIT-III *Transducers* (10 hrs)

Classification of transducers, Selection of transducers, Resistive, capacitive & inductive transducers, Resistive and capacitive touch screen transducer used in mobiles, Displacement transducer-LVDT, Piezoelectric transducer.

UNIT-IV *Display Instruments* (10 hrs)

Introduction to Display devices, Seven Segment Displays, LED Displays, Construction and operation (Display of numbers),Types of SSDs (Common Anode & Common Cathode type), Limitations of SSDs.

UNIT-V *Biomedical Instruments* (10 hrs)

Basic operating principles and uses of (i) Clinical thermometer (ii) Stethescope (iii) Sphygmomanometer (iv) ECG machine (v) Ultrasound scanning (vi) Pulse oxymeter(vii) Glucometer.

Reference Books:

1. Electronic Instrumentation by H.S.Kalsi , TMH Publishers
2. Electronic Instrument Hand Book by Clyde F. Coombs , McGraw Hill
3. Introduction to Biomedical Instrumentation byMandeep Singh, PHI Learning

4. Observe and understand the operation of a Digital Pulse oxymeter and measure the pulse rate of different people and understand the working of the meter.

Biomedical Instrumentation and Measurements by Leslie Cromwell ,Prentice Hall India.

1. Electronic Measurements and Instrumentation by Kishor, K Lal, Pearson, New Delhi
2. Electrical and Electronic Measurements by Sahan, A.K., Dhanpat Rai, New Delhi
3. Electronic Instruments and Measurement Techniques by Cooper, W.D. Halfrick, A.B., PHI Learning, New Delhi
4. Web sources suggested by the teacher concerned and the college librarian including reading material.

Course 7C: Electronic Instrumentation– PRACTICAL SYLLABUS

(30 Hrs. Max Marks: 50)

III. Learning Outcomes: On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in Instrumentation Laboratory or Electronic Laboratory.
2. Learn the construction, operational principles of various instruments.
3. Demonstrate skills on handling, Maintenance & trouble shooting of different instruments used in the Labs.
4. Acquire skills in observing and measuring various electrical and electronic quantities.
5. Perform some techniques related to Biomedical Instrumentation and measurement of Certain physiological parameters like body temperature, B.P. and sugar levels etc.

IV. Practical (Laboratory) Syllabus: *(30 hrs. Max marks: 50*)

1. Familiarisation of digital multimeter and its usage in the measurements of (i) resistance, (ii) current, (iii) AC & DC voltages and for (i) continuity test (ii)diode test and (iii) transistor test
2. Measure the AC and DC voltages, frequency using a CRO and compare the values Measured with other instruments like Digital Multimeter.
3. Formation of Sine, Square wave signals on the CRO using Function Generator and measure their frequencies. Compare the measured values with actual values.
4. Display the numbers from 0 to 9 on a single Seven Segment Display module by Applying voltages.
5. Display the letters **a** to **h** on a single Seven Segment Display module by applying voltages.
6. Measurement of body temperature using a digital thermometer and list out the error and corrections.
7. Measurement of Blood Pressure of a person using a B.P. meter And record the values and analyze them.
8. Get acquainted with an available ECG machine and study the ECG pattern to understand the meaning of various peak

Lab References**:**

1. Electronic Measurement and Instrumentation by J.P. Navani. ,S Chand & Co Ltd
2. Principles of Electronic Instrumentation by A De Sa, Elsevier Science Publ.
3. Electronic Measurements and Instrumentation by S.P.Bihari, YogitaKumari, Dr. Vinay Kakka, Vayu Education of India .
4. Laboratory Manual For Introductory Electronics Experiments by Maheshwari, New Age
5. International (P) Ltd., Publishers.
6. Electricity-Electronics Fundamentals: A Text-lab Manual by Paul B. Zbar
7. ,Joseph Sloop, & Joseph G. Sloop, McGraw-Hill Education.
8. Web sources suggested by the teacher concerned.

Co-Curricular Activities

(a) Mandatory:(*Training of students by teacher in field related skills: (lab:10 + field:05*)

1. **For Teacher**: Training of students by the teacher in the in the laboratory/field for not less than 15 hours on the field techniques/skills of understanding the operation, Maintenance and utility of various electrical and electronic instruments both in the Laboratory as well as in daily life.

For Student: Students shall (individually)visit a local electrical and electronics shop or small firm to familiarize with the various electrical and electronic instruments available in the market and also to understand their functionality, principle of operation and applications as well as the troubleshooting of these instruments.(Or) Student shall visit a diagnostic centre and observe the ECG machine and the ECG pattern(Or) Student shall visit a diagnostic centre and observe the CT scan and MRI scan.(Or) Student shall visit a mobile smart phone repair shop and observe the different components on the PCB(Motherboard), different ICs (chips) used in the motherboard and trouble shooting of touch screen in smart phones.

Observations shall be recorded in a hand-written Fieldwork/Project work not exceeding 10 pages in the given format to be submitted to the teacher.

2. Max marks for Fieldwork/Project work: 05.
3. Suggested Format for Fieldwork/Project work: *Title page, student details, index page, details of place visited, observations, findings and acknowledgements*.
4. Unit tests (IE)

Suggested Co-Curricular Activities

1. Training of students by related industrial / technical experts.
2. Assignments (including technical assignments like identifying different measuring instruments and tools and their handling, operational techniques with safety and security.
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Making your own stethoscope at home.
5. Making seven segment display at home.
6. Preparation of videos on tools and techniques in various branches of instrumentation.
7. Collection of material/figures/photos related to products of Measuring Instruments, Display Modules and Biomedical Instruments and arrange them in

a systematic way in a file.

8. Visits to Instrumentation Laboratories of local Universities or Industries like Cement, Chemical or Sugar Plants etc. or any nearby research organizations, private firms, etc.
9. Invited lectures and presentations on related topics by Technical /industrial experts

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