

**Kurukshetra University, Kurukshetra**  
**(Established by the State Legislature Act XII of 1956)**  
**('A+' Grade, NAAC Accredited)**

॥ योगस्थः कुरु कर्माणि ॥  
समबुद्धि व योगयुक्त होकर कर्म करो  
(Perform Actions while Stead fasting in the State of Yoga)



**Revised Scheme of Examinations and Syllabus of Bachelor of Science (B.Sc.)  
Programme (Course: Electronic Equipment Maintenance) (CBCS-LOCF)**

5<sup>th</sup> & 6<sup>th</sup> Semesters  
w.e.f. 2022-23 (For IIHS only)

**DEPARTMENT OF ELECTRONIC SCIENCE**

**CBCS-LOCF CURRICULUM (2022-23)**

Programme Name: Bachelor of Science (B.Sc.) Programme  
**(Course: Electronic Equipment Maintenance)**  
(CBCS-LOCF)

(For the Batches Admitted From 2020-2021)

**Programme Outcomes (POs) for Three Year B.Sc. Programme  
(Course: Electronic Equipment Maintenance)**

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO3	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO4	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.
PO5	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO6	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO7	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO8	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout the life.
PO9	Environment and Sustainability	Ability to design and develop modern systems which are environmentally sensitive and to understand the importance of sustainable development.
PO10	Ethics	Apply ethical principles and professional responsibilities in scientific practices.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the scientific principles and apply these to manage projects.

**Programme Specific Outcomes (PSOs) for Three Year B.Sc. Programme  
(Course: Electronic Equipment Maintenance)**

PSO1	Students will be able to acquire the techniques & skills for the basic understanding of the principles and working of various Electronic Equipment and their repair & maintenance.
PSO2	Ability to explore technical knowledge in diverse areas of Electronics and experience an environment in cultivating the skills for a successful career in repair & maintenance of any Equipment, entrepreneurship as also the higher studies.
PSO3	Ability to design & perform electronic experiments as well as to analyze & suggest effective solutions.

## KURUKSHETRA UNIVERSITY KURUKSHETRA

### Revised Scheme of Examinations & Syllabus for B.Sc. Non-Medical Programme for the subject of Electronic Equipment Maintenance under Choice Based Credit System (CBCS-LOCF) V & VI Semesters w.e.f. 2022-23

Sem	Course	Paper Code	Nomenclature	Credits	Workload /Hrs/week	Exam. Duration (Hrs)	Internal Marks	External Marks	Total Marks
							Max.	Max.	
5	**DSE-EEM-5	DSE-EEM-501 (ELECTIVE-I)	Electronic Instrumentation	2	2	3	10	40	50
			Computer Hardware & Maintenance-I						
		DSE-EEM-502 (ELECTIVE-II)	Consumer Electronics	2	2	3	10	40	50
			Transducers and Sensors						
	EEM-503	Major Project	2	4	3	10	40	50	
<b>TOTAL</b>				<b>06</b>	<b>08</b>	<b>-</b>	<b>30</b>	<b>120</b>	<b>150</b>
6	**DSE-EEM -6	DSE-EEM-601 (ELECTIVE-III)	Electronic Equip. Maintenance	2	2	3	10	40	50
			Computer Hardware & Maintenance-II						
		DSE-EEM-602 (ELECTIVE-IV)	Biomedical Equip. Maintenance	2	2	3	10	40	50
			Embedded Systems & Robotics						
	EEM -603	Practical	2	4	3	10	40	50	
<b>TOTAL</b>				<b>06</b>	<b>08</b>	<b>-</b>	<b>30</b>	<b>120</b>	<b>150</b>

**\*\* DSE (Discipline Specific Elective).**

#### **Important Instructions:-**

1. A student can opt for one paper out of the list of elective papers provided against each paper code for respective semester.
2. One credit equivalent to 1 hour of teaching/2 hours of Practical work.
3. One credit equivalent to 25 marks.
4. Teaching workload will be calculated on the basis of teaching contact hours of the course.
5. The Practical examination will be held at the end of odd and even semester in one session of three hours duration.
6. For Practical/Project work, a maximum of 15 students are allowed in one group during course of study and also in Examination.
7. During Practical Examination, a candidate is required to perform one experiment from the prescribed list of experiments.
8. Distribution of Marks in Practical Examination B.Sc. I, II, III, IV & VI Semester):
  - I. Internal Marks: 10
  - II. Experiment Performed: 15
  - II. Lab Record: 10
  - IV. Viva/Voce : 15
9. Distribution of Marks in Major Project (Paper EEM-504) of B.Sc. V Semester:
  - I. Internal Marks: 10
  - II. Project Developed: 15
  - II. Project Report: 10
  - III. Viva Voce: 15

<b>Course Code: DSE-EEM-5</b>	<b>Course Name: ELECTRONIC INSTRUMENTATION</b>
<b>Paper Code: EEM- 501</b> Elective-I; Option (i)	
<b>Type:</b> DSE Course <b>Course Credits:</b> 02 <b>Contact Hours:</b> 02 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 40 <b>Internal Maximum Marks:</b> 10	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with the basic fundamental concepts of various types of Electronic Instruments.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Understand the basic concepts and characteristics of electronic instruments.
<b>CO2</b>	Demonstrate the working principle and utilities of various types of bridges.
<b>CO3</b>	Familiarize with the fundamentals of various types of transducers and their applications.
<b>CO4</b>	Learn the concepts of acquiring the data from any of the transducers.

<b>CO-PO Mapping Matrix for Course Code: DSE-EEM-5</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	2	3	3	3	2	2	3	2	3	2
<b>CO2</b>	3	3	2	2	2	3	2	3	1	2	2
<b>CO3</b>	2	3	3	3	2	2	2	2	2	1	2
<b>CO4</b>	3	2	2	3	3	3	2	3	3	2	2

<b>CO-PSO Mapping Matrix for Course Code: DSE-EEM-5</b>			
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>
<b>CO1</b>	3	2	3
<b>CO2</b>	2	3	3
<b>CO3</b>	3	2	3
<b>CO4</b>	2	3	3

### Unit-I

**DC and AC indicating Instruments:** Accuracy and precision, Types of errors, PMMC galvanometer, Sensitivity, Loading effect, Series Type and Shunt type Ohmmeter, Multimeter. Watthour Meter, Power Factor Meter.

### Unit-2

**DC and AC Bridges & their Applications:** General Conditions for Bridge Balance of Wheatstone Bridge, Kelvin Bridge, Maxwell Bridge, Hay Bridge, Schering Bridge, Wein Bridge, Wagner Ground Connection.

### Unit- 3

**Transducers:** Classification, Active, Passive, Mechanical, Electrical, their comparison. Selection of Transducers, Principle and working of following types: Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, Semi-conductor strain gauge) Capacitive (diaphragm), Inductive (LVDT-Principle and characteristics, Temperature (electrical and non-electrical), Piezoelectric (Element and their properties, Piezoelectric coefficients. Equivalent circuit and frequency response of P.E. Transducers)

### Unit- 4

**Photosensitive Transducers:** (photo-conductive, photo emissive, photo voltaic, semiconductor, LDR).  
**Data acquisition systems:** Block diagram, brief description of preamplifier, signal conditioner, instrumentation amplifier, waveform generator, A/D and D/A converter blocks, D/A and A/D Multiplexing, computer controlled test and measurement system.

### References:

1. Instrumentation Measurements and Analysis by Nakra & Choudhary; TMH
3. Electrical & Electronic Measurements & Instrumentation by A.K. Sawhney
4. Electronic Instrumentation and Measurements Techniques by W.D. Cooper; PHI

<b>Course Code: DSE-EEM-5</b>	<b>Course Name: COMPUTER HARDWARE &amp; MAINTENANCE-I</b>
<b>Paper Code: EEM- 501</b> Elective-I; Option (ii)	
<b>Type: DSE Course</b> <b>Course Credits: 02</b> <b>Contact Hours: 02 hours/week.</b> <b>Examination Duration: 3 Hours</b> <b>Mode: Lecture</b> <b>External Maximum Marks: 40</b> <b>Internal Maximum Marks: 10</b>	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with the basic concepts of various types of computer hardware and its maintenance.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Understand the basic concepts of the working of a PC system and functions of its main parts.
<b>CO2</b>	Familiarize with the importance of BIOS, Bus System, and primary and secondary memories in a PC.
<b>CO3</b>	Learn the functions and mechanism of different types of computer peripheral devices.
<b>CO4</b>	Understand the concepts of computer communication and software in a PC System.

**CO-PO Mapping Matrix for Course Code: DSE-EEM-5**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	3	2	3	3	2	2	2	2	3	2
<b>CO2</b>	2	2	3	3	3	2	3	2	2	1	2
<b>CO3</b>	3	3	3	3	2	2	2	2	1	3	1
<b>CO4</b>	3	2	2	2	3	3	3	3	3	2	3

**CO-PSO Mapping Matrix for Course Code: DSE-EEM-5**

COs	PO1	PO2	PO3
<b>CO1</b>	3	3	2
<b>CO2</b>	2	3	3
<b>CO3</b>	3	2	3
<b>CO4</b>	3	3	3

### Unit-I

**Personal Computer:** Evolution PC through Pentium; specifications of different styles of PCs, Functional Block diagram, System Unit and its various parts, Introduction to peripheral parts, Input/Output ports (serial port, parallel port, game port, USB port). Motherboard (MB), motherboard Layouts with specifications, motherboard items, SMPS and linear power supply (Brief Idea and comparison).

### Unit-II

**Basic Input/output System (BIOS):** services, features and functional parts of BIOS, Bus Standards: BUS Architecture with basic specifications (XT, ISA, EISA, MCA, VL, PCI)

**On Board Memory & Magnetic Media:** PC Memory Organization, Types of RAM, Memory Packages, Magnetic Storage (Fundamentals, Diskette basics, FDD Types and capacity, HDD, FDD & HDD sub-assemblies, HDD controller & interface types) Disk organization in DOS.

### Unit-III

**Input Devices:** Keyboard (basics, operation, types, functions, signals, interfacing logic); Mouse (principle of operation, types, signals); Scanner (principle of operation, types).

**Output Devices:** VDU (Video basics, types of display adaptors, Basic mechanism of CRT Controller); Printer (printing mechanism, types: DMP, Inkjet, Laser Printer, MFP, Data transfer b/w PC & Printer).

### Unit-IV

**CD-ROM Drive:** Principle of operation, merits and demerits, CD/DVD Diskette construction and R/W mechanism, Comparison of CD and DVD, Caring for CD and DVD discs, front and rear view details of CD/DVD drives.

**Computer Communication:** Modem basics and principle of operation, Internet and its features.

**Software Concepts:** System software, application software, operating systems, MSDOS and Windows (Introduction and differences).

### References:

1. IBM PC Clones by Govindarajulu
2. PC Hardware: The Complete Reference by C. Zacker, J. Rourke

<b>Course Code: DSE-EEM-5</b>	<b>Course Name: CONSUMER ELECTRONICS</b>
<b>Paper Code: EEM- 502</b> Elective-II; Option (i)	
<b>Type: DSE Course</b> <b>Course Credits: 02</b> <b>Contact Hours: 02 hours/week.</b> <b>Examination Duration: 3 Hours</b> <b>Mode: Lecture</b> <b>External Maximum Marks: 40</b> <b>Internal Maximum Marks: 10</b>	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with the fundamental concepts of popular consumer gadgets and appliances.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the basic mechanism and application of various audio and video systems.
<b>CO2</b>	Understand the working mechanism of commonly used domestic appliances.
<b>CO3</b>	Learn day to day maintenance of commonly used domestic appliances.
<b>CO4</b>	Familiarize with utilities of various popular office gadgets and digital access devices.

<b>CO-PO Mapping Matrix for Course Code: DSE-EEM-5</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	2	3	2	3	3	2	2	2	2	2
<b>CO2</b>	3	3	3	3	2	2	3	2	3	1	3
<b>CO3</b>	3	3	3	3	2	2	3	1	1	3	2
<b>CO4</b>	3	3	2	3	3	3	2	3	3	2	1

<b>CO-PSO Mapping Matrix for Course Code: DSE-EEM-5</b>			
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>
<b>CO1</b>	2	3	3
<b>CO2</b>	3	2	3
<b>CO3</b>	2	3	3
<b>CO4</b>	3	3	2

### **Unit-I**

**Audio and Video systems:** Block diagram and basic working mechanism of PA system, Microphone, HDTV, DVD players, MP4 players, Set Top box, Digital cable TV, LCD, Plasma & LED TV. Projectors: DLP, Home Theatres, Remote Controls. Digital Camera, Handicam.

### **Unit-2**

**Microwave Ovens:** Microwaves (Range, block diagram, Single-Chip Controllers, types of Microwave oven, Wiring and Safety instructions, care and Cleaning).

**Washing Machines:** Electronic controller, hardware and software, Types of washing machines, Fuzzy logic washing machines, Features of washing machines, maintenance.

**Air Conditioners:** Air Conditioning, Components of air conditioning systems, types of air conditioning systems (unitary, central and split air conditioning systems), maintenance.

**Refrigerators, Dish Washer, Vacuum Cleaners:** Block diagram, basic working mechanism, maintenance.

### **Unit-3**

**Electronic Gadgets and Domestic Appliances:** Facsimile machine, Xerographic copier, calculators (Structure of a calculator, Internal organization of a calculator, servicing electronic calculators), Digital clocks (Block diagram and its working mechanism), Home security system, CCTV.

### **Unit-4**

**Digital Access Devices:** Types, Block diagram and basic working mechanism of Printers, Barcode scanner and decoder, Electronic Fund Transfer, Automated Teller Machines (ATMs).

**Landline and Mobile telephony:** Block diagram and basic working mechanism of Basic landline equipment, Cordless, Mobile phones: GPRS & Bluetooth, GPS Navigation system.

### **References:**

1. Consumer Electronics by S. P. Bali; Pearson Education
2. Consumer Electronics for Engineers by Philip Herbert Hoff

<b>Course Code: DSE-EEM-5</b>	<b>Course Name: TRANSDUCERS AND SENSORS</b>
<b>Paper Code: EEM- 502</b> Elective-II; Option (ii)	
<b>Type:</b> DSE Course <b>Course Credits:</b> 02 <b>Contact Hours:</b> 02 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 40 <b>Internal Maximum Marks:</b> 10	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with the fundamental concepts of transducers and sensors and their applications.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the basic concepts of electronic instrumentation..
<b>CO2</b>	Learn different types of errors existing in various measuring instruments.
<b>CO3</b>	Understand the mechanism of various types of transducers in measuring various physical quantities.
<b>CO4</b>	Familiarize with popular sensors and their applications in electronic instruments.

<b>CO-PO Mapping Matrix for Course Code: DSE-EEM-5</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	3	2	2	2	2	3	2
<b>CO2</b>	3	2	3	3	3	2	2	2	2	2	2
<b>CO3</b>	2	3	3	3	2	2	2	2	1	1	1
<b>CO4</b>	3	2	2	2	3	3	3	3	3	2	2

<b>CO-PSO Mapping Matrix for Course Code: DSE-EEM-5</b>			
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>
<b>CO1</b>	3	3	2
<b>CO2</b>	2	3	3
<b>CO3</b>	3	3	2
<b>CO4</b>	2	3	3

### Unit-I

**Basic concepts of Instrumentation:** generalized instrumentation systems block diagram representation, scope of instrumentation in Industrial organization. Measurement systems: static (accuracy, sensitivity, linearity, precision, resolution, threshold, range, hysteresis, dead band, backlash, drift), impedance matching and loading, dynamic characteristics (types, fidelity, speed of response, dynamic error).

### Unit-2

**Definition of errors:** systematic errors, instrumental errors, environmental errors, random errors, loading errors, random errors, source of errors in measuring instruments, Uncertainties types, propagation of uncertainties)

### Unit- 3

**Transducers:** Classification, Active, Passive, Mechanical, Electrical, their comparison. Selection of Transducers, Principle and working of following types: Displacement transducers - Resistive (Potentiometric, Strain Gauges – Types, Gauge Factor, bridge circuits, Semi-conductor strain gauge) Capacitive (diaphragm), Inductive (LVDT-Principle and characteristics, Hall effect sensors).

### Unit- 4

**Sensors:** Piezoelectric (Element and their properties, Piezo Electric coefficients. Equivalent circuit and frequency response of P.E. Transducers), light (photo-conductive, photo emissive, photo voltaic, semiconductor, LDR), Temperature (electrical and non-electrical). Pressure (force summing devices, load cell)

#### Suggested Books:

1. Measurement Systems by Doebelin& Manek; McGraw Hill,New York
2. Electronic Instrumentation by H.S Kalsi; McGraw Hill, 4th edition
3. Measurement & Instrumentation by DVS Murthy; PHI
4. Sensors and Transducers by D. Patranabis; PHI, 2nd edition

<b>Course Code: DSE-EEM-5</b>	<b>Course Name: MAJOR ROJECT</b>	
<b>Paper Code: EEM-503</b>		
<b>Type: DSE Course;</b>	<b>Course Credits: 02;</b>	<b>Contact Hours: 04 hours/week;</b>
<b>Examination Duration: 3 Hours;</b>	<b>Mode: Lab. Work</b>	
<b>External Maximum Marks: 40;</b>	<b>Internal Maximum Marks: 10</b>	

**Course Objectives:** The aim of this course is to train the students to learn hand-on practice by developing a Lab. Project on the basis of already studied theoretical and practical concepts.

**Course Outcomes (CO):** At the end of this course, with an advisory support from a faculty member as Supervisor, the students will be able to:

- Acquire advanced practical skill/knowledge.
- Develop any productive idea based on Electronics fundamentals in solving a problem encountered in daily life.
- Hand-on practice in developing the project with an experimental investigation in the Lab.
- Apply the knowledge in solving/analyzing/exploring a real life problem.

**Course Details:** The Student should design, fabricate and assemble one Electronic project in their respective Institute/Department. After successful completion of Lab. Project, each student would prepare a report and submit it at the time of the final examination duly certified by the concerned faculty guide (as an Internal Examiner) and an External Examiner, deputed by the University. Institute/Department faculty shall ensure that the entire project work is carried out in their respective Institute/Department by utilizing the Lab. Classes assigned and, therefore, will be able to:-

- demonstrate creativity and critical thinking ability
- gain confidence in application of theoretical knowledge to practical aspects
- design circuits, PCB and solder components on the PCB
- final testing of the project and fault finding and rectification (if any)

**Process of doing Project/Dissertation:**

- Familiarity with research ethics & plagiarism
- Literature review
- Problem formulation and definition of the project work
- Modular design and its implementation
- PCB design and soldering of the tested circuit
- Report writing
- Correction by Supervisor
- Printing & Hard binding

**Evaluation of Project:**

- Internal Assessment (Lab. Work: 5 + Attendance: 5 Marks)
- Distribution of External Marks (40): Project Demonstration (10), Project Report Evaluation (10) and Viva-Voce (20): Evaluation of Project would be carried out by two examiners (the Supervisor, as an Internal Examiner and an External Examiner)



<b>Course Code: DSE-EEM-6</b>	<b>Course Name: ELECTRONIC EQUIPMENT MAINTENANCE</b>
<b>Paper Code: EEM- 601</b> Elective-III; Option (i)	
<b>Type: DSE Course</b> <b>Course Credits: 02</b> <b>Contact Hours: 02 hours/week.</b> <b>Examination Duration: 3 Hours</b> <b>Mode: Lecture</b> <b>External Maximum Marks: 40</b> <b>Internal Maximum Marks: 10</b>	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to train the students with the troubleshooting concepts of electronic equipment.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the fundamentals of troubleshooting procedure and their evolution in general.
<b>CO2</b>	Learn the steps for the installation, maintenance and repair of general equipment.
<b>CO3</b>	Familiarize with the servicing practices of surface mount devices.
<b>CO4</b>	Understand safety measures & maintenance management concepts for electronic equipment.

<b>CO-PO Mapping Matrix for Course Code: DSE-EEM-6</b>											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	2	3	2	3	2	2	3	2	2	2
<b>CO2</b>	3	2	3	2	2	3	2	3	2	1	3
<b>CO3</b>	3	2	3	2	2	2	2	3	2	2	2
<b>CO4</b>	3	2	3	2	3	3	2	3	3	2	3

<b>CO-PSO Mapping Matrix for Course Code: DSE-EEM-6</b>			
COs	PO1	PO2	PO3
<b>CO1</b>	2	2	2
<b>CO2</b>	2	2	2
<b>CO3</b>	2	3	3
<b>CO4</b>	2	3	3

### Unit-I

**Fundamental Troubleshooting Procedures:** Equipment Failures, Causes of Equipment Failure, Nature of faults, Failure Rate, Mean Time Between Failures, Mean Time to Fail, Maintainability, Mean Time to Repair, Availability, Redundancy.

**Maintenance Aids and Records:** Test Instruments, Tools, Service Manual & its Importance, Logbook & its significance, Policy of a Service Engineer, Maintenance Terminology & Policy, Stages of Maintenance.

### Unit-II

**Troubleshooting and Repair Procedure:** Steps in Troubleshooting, Troubleshooting Process, Fault-Finding Aids, Identification of Faulty Stage, Identification of Faulty Component, Intermittent Faults, Fault Detection and Repair, Troubleshooting Techniques (preliminary observations, troubleshooting methods, systematic troubleshooting checks, thumb rules in troubleshooting).

### Unit-III

**Rework & Repair of Surface Mount Assemblies:** Surface Mount Technology, SMDs, Surface Mounting Semiconductor Packages, Packaging of Passive Components as SMD, Repairing SM PCBs.

**Installation and Safety Measures:** General Installation Guidelines, Preparation of Site, Provision of Suitable Physical Environment, Calculation of Power requirement, Layout of Electric and Signal Leads, Artificial Earth, General Safety Measures for Electronic Systems.

### Unit-IV

**Preventive Maintenance:** Indications for Preventive Maintenance Action, Preventive Maintenance of Electronic Circuits, Preventive Maintenance of Mechanical Systems.

**Maintenance Management:** Objectives, Maintenance Policy, Equipment Service Options, Essentials of a good Equipment Management Programme, Installation Procedures, Service and Maintenance Laboratory, Documentation, Professional Qualities and Work Habits.

### References:

1. Troubleshooting and repairing consumer electronics by Homer Davidson (McGraw Hill)
2. Modern Electronic Equipment: Troubleshooting, Repair and Maintenance by R.S. Khandpur

<b>Course Code: DSE-EEM-6</b>	<b>Course Name: COMPUTER HARDWARE &amp; MAINTENANCE - II</b>
<b>Paper Code: EEM- 601</b> Elective-III; Option (ii)	
<b>Type: DSE Course</b> <b>Course Credits: 02</b> <b>Contact Hours: 02 hours/week.</b> <b>Examination Duration: 3 Hours</b> <b>Mode: Lecture</b> <b>External Maximum Marks: 40</b> <b>Internal Maximum Marks: 10</b>	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to train the students with the troubleshooting concepts of computer system maintenance.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with the fundamentals concepts in the installation of a PC System.
<b>CO2</b>	Familiarize with diagnosis of common symptoms of faulty peripherals of a PC System.
<b>CO3</b>	Learn the troubleshooting techniques of various peripherals of a PC System.
<b>CO4</b>	Learn basic steps for the maintenance and upgradation of a PC System.

<b>CO-PO Mapping Matrix for Course Code: DSE-EEM-6</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	3	2	2	2	2	3	2
<b>CO2</b>	3	2	3	3	3	2	2	2	2	2	2
<b>CO3</b>	2	3	3	3	2	2	2	2	2	1	2
<b>CO4</b>	3	3	2	2	3	3	2	3	2	2	2

<b>CO-PSO Mapping Matrix for Course Code: DSE-EEM-6</b>			
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>
<b>CO1</b>	3	2	3
<b>CO2</b>	2	3	3
<b>CO3</b>	3	2	3
<b>CO4</b>	2	3	3

### **Unit-I**

**PC Installation:**Room Preparation (Location, PC room pollution, air conditioning with principle of operation of an AC system, false flooring & false ceiling, fire protection system); PC Installation (basic steps).Boot Process (DOS & Windows), basic functions of POST and its test sequences.

**Power Supply for PC:** Clean power supply, p.s. problems, power conditioning, servo stabilizer, CVT, offline and online UPS (basic idea).

### **Unit-II**

**Troubleshooting PC Faults-I:** Motherboard;possible problems, diagnosis procedure and their troubleshooting; Keyboard (checks for proper functioning, possible problems, diagnosis procedure and their troubleshooting),Mouse(troubleshooting common symptoms), Monitor (troubleshooting commonsymptoms), Printers (possible problems, diagnosis procedure and theirtroubleshooting).

### **Unit-III**

**Troubleshooting PC Faults-II:** CDROM (Installation upgradation, replacement, troubleshootingcommon symptoms), FDD (Installation, replacement and troubleshooting common symptoms), HDD (Preparation Concepts, installation, replacement and troubleshooting common symptoms),Memory (upgradation, installation, and troubleshooting common symptoms)

### **Unit-IV**

**General PC Servicing:**PC maintenance using various diagnostic S/W, universal troubleshootingprocess,computer viruses and their types, virus protection techniques, quick startbench testing, tips for windows startup problems.

**PC Upgrading:** Introduction, Upgrade Essentials, Performance Upgrade, Capacity Upgrades, Features Upgrades.

#### **References:**

1. IBM PC Clones by Govindarajalu
2. PC Hardware: The Complete Reference by C. Zacker, J. Rourke
3. PC Hardware by Ron Gilster

<b>Course Code: DSE-EEM-6</b>	<b>Course Name: BIOMEDICAL EQUIPMENT MAINTENANCE</b>
<b>Paper Code: EEM- 602</b> Elective-IV; Option (i)	
<b>Type:</b> DSE Course <b>Course Credits:</b> 02 <b>Contact Hours:</b> 02 hours/week. <b>Examination Duration:</b> 3 Hours <b>Mode:</b> Lecture <b>External Maximum Marks:</b> 40 <b>Internal Maximum Marks:</b> 10	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to familiarize with the foundations of biomedical engineering.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Familiarize with working principle and applications of various types of biomedical instruments.
<b>CO2</b>	Understand signal analysis and various types of electrodes used in various biomedical instruments.
<b>CO3</b>	Familiarize with role of various types of sensors in biomedical instruments.
<b>CO4</b>	Understand the utility of monitoring, imaging and therapeutic instruments in biomedical sciences.

**CO-PO Mapping Matrix for Course Code: DSE-EEM-6**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
<b>CO1</b>	3	2	3	3	3	2	2	3	2	2	2
<b>CO2</b>	3	3	2	3	3	2	1	2	3	2	-
<b>CO3</b>	3	3	3	2	2	3	2	3	2	2	2
<b>CO4</b>	3	3	3	3	2	3	2	2	2	1	1

**CO-PSO Mapping Matrix for Course Code: DSE-EEM-6**

COs	PO1	PO2	PO3
<b>CO1</b>	3	3	3
<b>CO2</b>	3	3	2
<b>CO3</b>	2	2	3
<b>CO4</b>	3	3	2

### Unit 1

**Basic medical Instrumentation System,** Desirable Characteristics and Performance Requirements, General Constraints in design of Medical Instrumentation.

**Origin of Bioelectric signals,** Resting and action potential, Various Bioelectric Potentials and their waveforms (ECG, EEG, EMG); Bio-Potential Electrodes: Equivalent circuit model of Electrode, Various types Recording Electrodes (Surface, Micro, Needle, Array electrodes).

### Unit -2

**Physiological Sensors:** Optical Fibre Sensors, Photometric Sensors, Pulse Sensors, Chemical Sensors, Biosensors, Smart Sensors.

**Biomedical Equipment:** (Principle of operation and Application) Electrocardiograph (ECG), Electroencephalograph (EEG), Electromyography (EMG).

**Patient Monitoring Systems:** Basic Principle and Mechanism of Cardiac Monitor, Heart Rate, Pulse Rate.

### Unit- 3

**Analytical Instruments**(Principle of operation and Application): Blood Gas Analyzers (pH & PCO<sub>2</sub> Measurement, Blood Cell Counter, Colorimeter, Spectrophotometer, Oximeter.

**Imaging systems** (Basic principle, Block diagram, Biological Effects, Advantages): X-ray machine, Computed Tomography (CT), Magnetic Resonance Imaging System.

**Therapeutic Equipment:** (Principle of operation and Application) Cardiac pacemakers, Hemodialysis machine, Ventilators, Humidifiers, Nebulizers.

### Unit -4

**Basic principle and operation:** Bedside patient monitor, Blood pressure Measurements, Audiometers and hearing aids, Single Channel Telemetry Systems and telemedicine.

**Patient Safety medical equipment:** Electrical Shock Hazards, Leakage current, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment.

### References:

1. Khandpur R. S. - Handbook of Biomedical Instrumentation, TMH
2. L.Cromwell et al- Biomedical Instrumentation and Measurements PHI

<b>Course Code: DSE-EEM-6</b>	<b>Course Name: EMBEDDED SYSTEMS &amp; ROBOTICS</b>
<b>Paper Code: EEM- 602</b> Elective-IV; Option (ii)	
<b>Type: DSE Course</b> <b>Course Credits: 02</b> <b>Contact Hours: 02 hours/week.</b> <b>Examination Duration: 3 Hours</b> <b>Mode: Lecture</b> <b>External Maximum Marks: 40</b> <b>Internal Maximum Marks: 10</b>	<b>Instructions For Paper Setter:</b> Examiner will be required to set NINE questions in all. Question No.1 will be compulsory and will consist of short conceptual type answers based on four Units. There shall be EIGHT more questions, two from each Unit. A Student is required to attempt a total of FIVE questions in all. In addition to the compulsory question, students will have to attempt FOUR more questions selecting ONE question from each UNIT. All questions will carry equal marks.

**Course Objectives:** The aim of this course is to learn the foundations of embedded systems and robotics engineering.

**Course Outcomes (CO):** At the end of this course, the students will be able to:

<b>CO1</b>	Learn the basics of popular microcontroller 8051, including memory map, interrupts, programming, etc.
<b>CO2</b>	Understand fundamentals of an embedded system and its basic design concepts.
<b>CO3</b>	Familiarize with interfacing techniques of a microcontroller in developing embedded systems.
<b>CO4</b>	Acquire the fundamental knowledge of Robotics and utility of embedded system in robotics technology.

<b>CO-PO Mapping Matrix for Course Code: DSE-EEM-6</b>											
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>
<b>CO1</b>	3	3	2	3	3	2	2	3	2	3	2
<b>CO2</b>	3	2	3	3	2	3	2	2	2	2	2
<b>CO3</b>	3	3	3	3	2	3	2	2	1	1	2
<b>CO4</b>	3	3	3	2	3	2	2	3	3	2	2

<b>CO-PSO Mapping Matrix for Course Code: DSE-EEM-6</b>			
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>
<b>CO1</b>	3	2	3
<b>CO2</b>	2	3	3
<b>CO3</b>	3	2	3
<b>CO4</b>	2	3	3

### Unit 1

**Introduction to RISC microcontrollers:** Von- Neumann and Harvard architectures, Introduction to 8051 family microcontrollers, 8051 architecture, Register banks and Special Function Registers, Block Diagram, Addressing Modes, Instruction Set, Timers, Counters, Stack Operation, Programming using PIC microcontroller.

### Unit 2

**Introduction to Embedded Systems:** Overview of Embedded Systems, Features, Requirements and Applications of Embedded Systems, Recent Trends in the Embedded System Design, Common architectures for the ES design, Embedded Software design issues, Communication Software, Introduction to Development and Testing Tools

### Unit 3

**8051 Interfacing:** 8051 interfacing with Keyboard, display Units (LED, 7-segment display, LCD), ADC, DAC, Stepper motor, Introduction to AVR family and its architecture. Interfacing and Communication Links Serial Interfacing: SPI / Micro wire Bus, I2C Bus, CAN Bus

### Unit 4

**Robotics:** Overview of Robotics, Pattern recognition and robots, Use of Embedded Systems in Robotics, Robots and Computer Vision.

#### References:

1. Design with PIC Microcontrollers by John B. Peatman (Pearson Education).
2. Embedded C Programming and the Microchip PIC by Richard Barnett, Larry O’Cull and Sarah Cox.
3. Robotic Engineering – An Integrated Approach by Richard D Klafter, Thomas A. Chmielewski and Michael Negin (PHI).

<b>Course Code: DSE-EEM-6</b>	<b>Course Name: PRACTICAL</b>
<b>Paper Code: EEM-603</b>	
<b>Type: DSE Course ;Course Credits: 02;</b>	<b>Contact Hours: 04 hours/week;</b>
<b>Examination Duration: 3 Hours;</b>	<b>Mode: Lab. Work</b>
<b>External Maximum Marks: 40;</b>	<b>Internal Maximum Marks: 10</b>

**Course Objectives:** The aim of this course is to learn the practical aspects of Theory Papers.

**List of Experiments: Minimum 6 experiments are to be performed in the Semester.**

**Electronic Instrumentation and Computer Maintenance**

1. Study the mechanism of CD-ROM/DVD Drive by noting voltages at various check points and its installation.
2. Installation and set-up of CCTV Camera(s) with DVR for the purpose of Home/Office Security.
3. Maintenance and servicing of Xerox Machine.
4. Measurement using R/L/C transducer.
5. Measurement of R/L/C utilizing following Bridges (any two)
  - (i) Kelvin's Bridge (ii) Maxwell Bridge (iii) Schering Bridge
6. To study the Characteristics of LDR and Photodiode with:
  - (i) Variable Illumination Intensity.
  - (ii) Linear Displacement of source.
7. Recording of ECG and identification of various peaks in ECG waveform.
8. Measurement of Heart Rate using conventional and modern electronic stethoscope. (an activity can be given for the design of electronic stethoscope using condenser Microphone)
9. Measurement of respiratory rate and various tidal volumes using spirometer. (an activity can be given for the design of respiratory rate monitor using Strain gauge/thermistor)
10. Measurement of body temperature using conventional mercury thermometer and modern electronic thermometer. (an activity can be given for the design of electronic thermometer using thermistor/thermocouple).
11. Write a program to convert a digital signal to analog signal using 8051 and PIC microcontrollers.
12. Write a program for temperature sensor interfacing through serial port on 8051 and PIC microcontroller kits.
13. Write a program for P W M control of DC Motor/Stepper Motor using 8051 and PIC microcontrollers.
14. Installation of Windows operating system and other software.
15. Installation of peripheral devices (Scanner, Printers) in a PC system.
16. Maintenance and cleaning of diskette drives, keyboard, mouse, etc.
17. To identify various cards, assembly and disassembly of a PC system.
18. Familiarization of Diagnostic tools and Antivirus Software for the repair/maintenance of PC.