



**BANGLADESH TECHNICAL EDUCATION BOARD**

Agargaon, Dhaka-1207

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM  
SYLLABUS (PROBIDHAN-2016)

**ELECTRONICS TECHNOLOGY**

TECHNOLOGY CODE: **668**

7th SEMESTER

DIPLOMA IN ENGINEERING  
PROBIDHAN-2016

**ELECTRONICS TECHNOLOGY(668)**

**7<sup>th</sup> SEMESTER**

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	66871	Computer Control System & Robotics	3	3	4	60	90	25	25	200
2	66872	Microwave, Radar & Navigation Aids	3	3	4	60	90	25	25	200
3	66873	Bio-Medical Instrument	3	3	4	60	90	25	25	200
4	66874	Industrial Automation & PLC	3	3	4	60	90	25	25	200
5	66875	Electronic Project -2	0	6	2	0	0	50	50	100
6	65853	Innovation & Entrepreneurship	2	0	2	40	60	0	0	100
<b>Total</b>			<b>14</b>	<b>18</b>	<b>20</b>	<b>280</b>	<b>420</b>	<b>150</b>	<b>150</b>	<b>1000</b>

**AIMS**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of computer control system and robotics with special emphasis on:

- Computer control system
- Fuzzy logic controller
- Robotics fundamental
- Robot sensors and actuators
- Computer vision for robotic systems.

**SHORT DESCRIPTION**

Computer control system, Digital Control system, Threats of Computer system security, Controller; Fuzzy logic controller; Robotics fundamentals; Robots sensors; Robot actuators; Robot system, computer vision systems and Robot specification.

**DETAIL DESCRIPTION****Theory:****1. Understand Control System**

- 1.1 Define control system
- 1.2 Classify control system
- 1.3 Describe the elements of open-loop and close-loop system with block diagram.
- 1.4 Derive the formula for open-loop and close-loop gain.

**2. Understand the computer control system.**

- 2.1 Define computer control system.
- 2.2 Describe computer control system with block diagram.
- 2.3 Mention different types of computer control system.
- 2.4 Describe the on-line and off-line computer control system.
- 2.5 Describe the application of computer control system.
- 2.6 Explain the techniques of use of personal computer in control system
- 2.7 Describe the direct digital control system.
- 2.8 Describe the numerical control system.
- 2.9 Describe the supervisor control system

**3. Understand digital control system.**

- 3.1 Explain modern digital control system.
- 3.2 Discuss real time control & control stability.
- 3.3 Discuss basic element of computer control system.
- 3.4 Describe impulse response system.
- 3.5 Describe computer control architecture.
- 3.6 Mention hardware of computer control system.

**4. Understand the Threats of computer system security.**

- 4.1 Mention threats of computer system security.
- 4.2 Explain type of vulnerable for computer network security.
- 4.3 Discuss area of security protection.

- 4.4 Discuss the uncertainties of security of computer system.
- 4.5 Discuss security control system generation.
- 4.6 Explain terminal security definition and update.
- 5. Understand the controller.**
  - 5.1 Define controller.
  - 5.2 Describe the relay logic control system.
  - 5.3 Describe the function of motion controller.
  - 5.4 Describe the hardware of motion controller.
  - 5.5 Describe adaptive controller.
- 6. Understand the fuzzy Logic controller.**
  - 6.1 Define the terms: (a) Fuzzy logic (b) Fuzzy predicates (c) Fuzzy set.
  - 6.2 Describe the block diagram of a fuzzy logic controller.
  - 6.3 Compare the traditional and fuzzy logic controller.
  - 6.4 Describe the technique of temperature control in a room using a fuzzy logic (one- input system).
  - 6.5 Describe the fuzzy logic controller that uses two inputs.
- 7. Understand the fundamental of Robot.**
  - 7.1 Define the term: (a) Robot (b) Robotics (c) program Location (d) Tooling & Grippers (e) work cell.
  - 7.2 Mention the types of robot.
  - 7.3 Describe the basic components of robot.
  - 7.4 Discuss robot joints.
  - 7.5 Describe the base control robot motion.
  - 7.6 Describe the axes control robot motion.
  - 7.7 Differentiate low, medium & high Technology robots.
  - 7.8 Describe the robot reference frame.
  - 7.9 Describe the robot programming modes.
- 8. Understand the basic feature of manipulators & controllers.**
  - 8.1 Describe the robot co-ordinates.
  - 8.2 Describe the wrist rotation.
  - 8.3 State manipulator drives system.
  - 8.4 Describe work envelopes.
  - 8.5 Describe the general feature of controllers.
  - 8.6 Describe the internal component of a controller with block diagram.
  - 8.7 Discuss the master control board of controllers.
  - 8.8 Describe the signal path in the controllers.
- 9. Understand hydraulic and pneumatic drive system.**
  - 9.1 Define hydraulic & pneumatic system.
  - 9.2 Describe the principle of hydraulic and pneumatic system components.
  - 9.3 Draw the different symbols used in hydraulic and pneumatic system.
  - 9.4 Describe the different types of hydraulic and pneumatic valve.
  - 9.5 State the labeling of valve ports.
  - 9.6 Describe the operation of single acting and double acting cylinder

## **10. Understand robot gears and linkages.**

- 10.1 Define the term gear and linkages, gear ratio, gear direction, gear train.
- 10.2 List the gear used in robotic system.
- 10.3 Describe the energy transfer technique from motor to the End Effectors.
- 10.4 Describe the purposes of linkages for transfer of energy.

## **11. Understand End Effectors.**

- 11.1 Describe the function of End Effectors.
- 11.2 Describe the end-of-arm tooling.
- 11.3 Classify the gripper.
- 11.4 Describe the operation of different type of gripper.

## **12. Understand robotic sensor.**

- 12.1 Mention the types of sensor.
- 12.2 Describe the function of contact sensor.
- 12.3 Describe the function of non contact sensor.
- 12.4 Describe the function of proximity sensors.
- 12.5 Describe the function of electromagnetic sensors.
- 12.6 Describe the function of limit switches.
- 12.7 Describe the function of touch sensor.
- 12.8 Describe the function of tactile sensor.
- 12.9 Describe the function of vision sensor.

## **13. Understand robot specification & application.**

- 13.1 Mention the specification of an industrial robot.
- 13.2 Discuss the growth of robot application.
- 13.3 Describe the robot as a cell controller.
- 13.4 Describe the robot as a peripheral device.

### **PRACTICAL:**

1. Demonstrate the Open loop control System using servomotor motor.
2. Demonstrate Close loop control System using servomotor motor.
3. Perform the work of ON / OFF control by using PC.
4. Perform the work of three step control by using PC.
5. Perform the speed control of AC motor employing variable frequency variable voltage (VVVF) by using PC.
6. Perform the speed control of DC motor employing variable voltage (VVC) by using PC.
7. Perform the work of control of stepper motor by using PC.
8. Demonstrate the parts of a industrial robot.
9. Perform the movement control of Robot manipulators.
10. Develop and run program to perform the movement control of Robot manipulators.

### **REFERENCE BOOKS**

1. Robotics an introduction - Douglas R. Malcolm, Jr.
2. Introduction to Robotics - Saeed B. Niku.
3. Robotics Engineering Richard -D. Klafter,A. ChmieleWski. B. Michael Negin.
4. Modern Control Technology - Kilian.
5. Mechatronics -Bolton

## AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of microwave, radar & navigation aids with special emphasis on:

- Concept of microwave.
- Microwave components
- Wave guides
- Microwave tubes
- Microwave measurements
- Microwave antenna.
- Semiconductor microwave devices
- Radar system
- Navigation aids

## SHORT DESCRIPTION

Concept of microwave; Microwave components; Wave guide; Microwave tubes; Microwave measurements; Microwave antenna; Semiconductor microwave devices; Radar; Navigation aids.

## DETAIL DESCRIPTION

### Theory :

#### 1. Understand the concept of microwave.

- 1.1. Define the term microwave.
- 1.2. Mention the application of microwave with frequency range
- 1.3. List the characteristics of microwave
- 1.4. Mention the problems associated with conventional tubes at UHF.
- 1.5. Describe the characteristics of tubes for ultra high frequency.
- 1.6. Describe the basic principles of acorn tube.
- 1.7. Describe the basic principle of disk seal tube.

#### 2. Understand the features of wave guide.

- 2.1. Define the term wave guide.
- 2.2. List advantages of wave guide over coaxial line.
- 2.3. Mention different modes of a wave guide.
- 2.4. Describe phase velocity and group velocity in a wave guide.
- 2.5. Describe the field pattern of TE<sub>10</sub>, TE<sub>20</sub> and TM<sub>11</sub> modes.
- 2.6. Explain the methods of mode excitation in rectangular wave guide.
- 2.7. Describe behavior field pattern and disadvantages of circular wave guide.
- 2.8. State the relationship between cut-off wave guide length & free space wave length.

#### 3. Understand the concept of microwave components.

- 3.1. Describe the construction and function of basic microwave components, (i) wave guide tees, (ii) magic tee, (iii) isolating device, (iv) adjustable phase shifter, (v) hybrid ring (rat-race), (vi) coupling probes, (vii) coupling loops, (viii) wave guide flanges, (ix) rotating joints, (x) travelling detector, (xi) mode suppressors, (xii) irises, (xiii) tuning posts and screws.
- 3.2. Describe the working principle of wave meters.
- 3.3. Describe the working principle of directional couplers.

- 3.4. Describe the constructions two of isolators and circulators.
- 3.5. Describe the principle of isolators and circulators.
- 3.6. Describe the principle of operation of cavity resonator.
- 4. Understand the features of klystron tube.**
  - 4.1. Describe the construction and operation of two cavity klystron tube.
  - 4.2. Describe schematic diagram for klystron amplifier.
  - 4.3. Describe the construction and operation of multi cavity klystron tube.
  - 4.4. Mention the performance and application of multi cavity klystron tube.
  - 4.5. Describe the construction and operation of reflex klystron tube.
  - 4.6. Mention the performance and applications of reflex klystron tube.
- 5. Understand the features of magnetron and travelling wave tube.**
  - 5.1. Describe constructional features of cavity magnetron.
  - 5.2. Describe the mechanism of oscillations in a magnetron.
  - 5.3. Describe the construction and operation of travelling wave tube.
  - 5.4. Mention performance, properties and applications of travelling wave tube.
- 6. Understand the basic concept of microwave measurements.**
  - 6.1. Describe the method of measurements of low microwave power by bolometer and microwave thermocouple.
  - 6.2. Describe the method of measurement of medium and high microwave power by calorimeter-wattmeter measuring system.
  - 6.3. Describe the method of measurement of microwave frequency and wavelength.
  - 6.4. Describe the method of measurement of standard wave ratio.
  - 6.5. Describe the method of measurement of impedance.
  - 6.6. Describe the method of measurement of attenuation.
- 7. Understand the features of microwave antennas.**
  - 7.1. Mention the characteristics of microwave antennas.
  - 7.2. Describe the construction of horn antennas.
  - 7.3. Describe the operation of antennas with parabolic reflectors.
  - 7.4. Describe the function of feed antennas.
  - 7.5. Describe the operation of dielectric lens antenna.
- 8. Understand the concept of semi conductor microwave devices.**
  - 8.1. Describe the construction, performance and application of microwave transistor.
  - 8.2. Describe the construction, operation and characteristic of varactor diode.
  - 8.3. Describe the basic principle of parametric amplifiers.
  - 8.4. Describe the constructional features and applications of gun diode.
  - 8.5. Describe the theory of microwave amplification by stimulated emission of radiation (MASER).
  - 8.6. Describe the theory of microwave amplification solid state RUBY MASER
  - 8.7. Describe the construction and performance of IMPATT/TRAPATT (impact avalanche and transit time) and Gun diode.
- 9. Understand the basic concept of radar.**
  - 9.1. Describe the basic principle of radar.
  - 9.2. Express the deduction of the radar range equation.
  - 9.3. Mention the factors influencing maximum range.

- 9.4. Mention the effect of noise.
- 9.5. Describe power and frequencies used in radar.
- 9.6. Mention different types of radar.
- 9.7. List the special considerations in radar receiver.

**10. Understand the features of radar system.**

- 10.1. Describe the operation of basic pulse radar system.
- 10.2. Describe the working principle of Duplexer.
- 10.3. Describe the working principle of moving target indicator (MTI).
- 10.4. Describe the basic principle of tracking radar system and search radar system.
- 10.5. Describe the working principle of Doppler radar.
- 10.6. Mention the advantages and limitations of CW Doppler radar.
- 10.7. Describe the working principle of FM CW radar.
- 10.8. Describe the radar antenna scanning pattern.
- 10.9. Describe the Precision approach radar (PAR).
- 10.10. Explain hazards due to microwave radiation.

**11. Understand the features of Tracking and Imaging Radar .**

- 11.1. Describe the function of Tracking and Imaging Radar.
- 11.2. Describe the working principle of Monopulse tracking.
- 11.3. Describe the working principle Conical scan and sequential lobbing.
- 11.4. Describe the working principle Low angle tracking.
- 11.5. Describe the working principle Air Surveillance Radar,
- 11.6. Describe the working principle Introduction to Synthetic aperture radar (SAR).

**12. Understand the features of Radar Display**

- 12.1. Define the Radar Display.
- 12.2. Describe the function of basic Radar Display.
- 12.3. Describe the function of A-scope/A-display. B-scope & C-scope
- 12.4. Describe the function of PPI (Plan position indicator) Display.
- 12.5. Describe the function of Beta Scan Scope Display.
- 12.6. Mention the limitations of A-scope, B-scope & C-scope
- 12.7. Mention performance, properties and applications of A-scope, B-scope & C-scope PPI Display.

**13. Understand the basic concept of radio aids.**

- 13.1. Describe the basic principles of radio direction finding.
- 13.2. Derive the equation of resultant voltage of a rectangular loop antenna.
- 13.3. Mention the step for finding the direction by loop antenna.
- 13.4. Describe the construction and application of loop, modified loop and Adcock antenna.
- 13.5. Explain the basic principle of very high frequency omnidirectional range (VOR).
- 13.6. Describe the operation of distance measuring equipment (DME).

**14. Understand the basic concept of navigation aids.**

- 14.1. Describe the working principle of instrument landing system (ILS).
- 14.2. Describe the working principle of Ground Control Approach (GCA).
- 14.3. Describe the basic principle of marker beacons and transponders.



## **Practical :**

### **1. Measure the tuning range of a reflex klystron.**

- 1.1. Select reflex klystron, power supply, klystron mounts detector & necessary meters, equipment and materials.
- 1.2. Connect the klystron tube and associated components properly.
- 1.3. Set up the signal detector.
- 1.4. Switch on the power supply.
- 1.5. Set the tuning control at minimum.
- 1.6. Measure the frequency.
- 1.7. Measure the frequency for the maximum control.
- 1.8. Determine the tuning range.

### **2. Measure the VSWR of a microwave signal for a given load.**

- 2.1. Select a micro wave tube (klystron) and require apparatus & materials.
- 2.2. Connect the klystron, wave guide / slotted line, load and necessary equipment.
- 2.3. Switch on the power supply.
- 2.4. Adjust the controls properly.
- 2.5. Measure the VSWR.

### **3. Measure the input impedance of a horn antenna.**

- 3.1. Select a horn, VSWR meter, necessary apparatus.
- 3.2. Set up the apparatus and connect circuits properly.
- 3.3. Switch on the power supply.
- 3.4. Make proper adjustment.
- 3.5. Collect required data.
- 3.6. Use smith chart to determine the impedance of a horn antenna.
- 3.7. Use admittance meter to determine input impedance.

### **4. Study the operation of two cavity klystron amplifier.**

- 4.1. Select a klystron tube and required apparatus & materials.
- 4.2. Set up the apparatus and connect the circuit properly.
- 4.3. Switch on the power supply.
- 4.4. Apply known signal to the input.
- 4.5. Make necessary adjustment.
- 4.6. Measure the signal from output.
- 4.7. Determine amplification.

### **5. Study the operation of travelling wave tube amplifier.**

- 5.1. Select the tube and required tools & materials.
- 5.2. Connect the circuits and equipment properly.
- 5.3. Switch on the power supply.
- 5.4. Apply known signal to the input.
- 5.5. Make proper adjustment.
- 5.6. Observe the output.
- 5.7. Determine the amplification.

### **6. Study the operation of magnetron tube oscillator.**

- 6.1. Select the tube, required apparatus and materials.
- 6.2. Set up the equipment and connect the circuit.
- 6.3. Switch on the power supply.

- 6.4. Make proper adjustment.
- 6.5. Observe the output frequencies.
- 6.6. Determine the modes of the tube.
- 7. Measure the klystron frequency by slotted selection method.**
  - 7.1. Select klystron supply, mount, isolator, slotted section and required apparatus & materials.
  - 7.2. Connect the circuit and set up equipment properly.
  - 7.3. Switch on the power supply.
  - 7.4. Make necessary adjustment.
  - 7.5. Measure frequency.
- 8. Measure the directivity and coupling of a directional coupler.**
  - 8.1. Select klystron supply, mount, isolator, directional coupler and required equipment & materials.
  - 8.2. Set up the apparatus and connect the circuits.
  - 8.3. Switch on the power supply.
  - 8.4. Make proper adjustments.
  - 8.5. Measure the coupling.
  - 8.6. Measure the directivity.
- 9. Plot the radiation pattern of horn antenna in horizontal and vertical plane**
  - 9.1. Select klystron supply, klystron mount, isolator, two horn antenna, wave guide to coaxial adapter etc.
  - 9.2. Set up the apparatus and connect the circuits.
  - 9.3. Switch on the power supplies.
  - 9.4. Make proper adjustment.
  - 9.5. Obtain data for horizontal and vertical plane.
  - 9.6. Plot the radiation pattern.
- 10. Verify the properties of magic tee.**
  - 10.1. Select magic tee and required apparatus.
  - 10.2. Setup the equipment and connect the circuits.
  - 10.3. Switch on the power supply.
  - 10.4. Make proper adjustment.
  - 10.5. Observe the magic tee.
- 11. Study the characteristics of a parabolic dish antenna.**
  - 11.1. Select a dish antenna and required apparatus.
  - 11.2. Set up the equipment and connect the circuits.
  - 11.3. Switch on the power supply.
  - 11.4. Collect the data.
  - 11.5. Determine radiation pattern.
- 12. Study the operation of pulse radar.**
  - 12.1. Select the apparatus and required materials.
  - 12.2. Set up the equipment and connect the circuits.
  - 12.3. Switch on the power supply.
  - 12.4. Rotate the antenna to a target.
  - 12.5. Transmits the pulse.
  - 12.6. Receive the echo pulse.
  - 12.7. Determine the angle and distance.

**13. Study the operation of an instrumental landing system.**

- 13.1. Select an aircraft landing station.
- 13.2. Observe the run way localizer.
- 13.3. Observe the guide path equipment.
- 13.4. Observe the marker beacons.
- 13.5. Observe the operation of controlling equipment.

**14. Study the operation of a semi conductor micro wave device.**

- 14.1. Select the micro wave semi conductor PIN diode, required apparatus & materials.
- 14.2. Set up the equipment and connect the equipment.
- 14.3. Switch on the power supply.
- 14.4. Make proper adjustments.
- 14.5. Observe the output frequencies.

\* Visit nearest microwave, radar and navigation station and prepare a report.

**REFERENCE BOOKS**

1. Microwave Engineering  
– Sanyeeva Gupta
2. Network Filters and transmission Lines  
- R. P. Jain
3. Microwave devices and circuit Samuel Liao, PHI.
4. Microwave and radar — A K Maini, Khanna Publishers.
5. Microwave and Radar Engg. — M Kulkarni.
6. Introduction to radar systems — Merrill I Skolnik, McGraw Hill.
7. Radar systems and radio aids to navigation — A K Sen & A B Bhattacharya.

**AIMS**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of biomedical instruments with special emphasis on:

- Electrocardiography.
- Human respiratory equipments and anesthesia.
- Medical laboratory and its equipments.
- Cardiac devices.
- Hemodialysis system.
- Ultrasound imaging system.
- Radiographic imaging system.
- Biomedical measuring instruments.
- Radiation & basis for radiation safety.

**SHORT DESCRIPTION**

Medical terminology; Electrocardiography, Measurement of blood pressure, Blood flow meter, Respiratory equipment and anesthesia, Pathological laboratory equipment, Cardiac devices, Hemodialysis machine, Ultrasound imaging system, Radiographic imaging machine, Biomedical measuring instruments .

**DETAIL DESCRIPTION****Theory :****1 Understand the concept of medical terminology.**

- 1.1 Define cell.
- 1.2 Explain the term cell physiology.
- 1.3 Describe resting and action potential.
- 1.4 Describe the process of excitation and rhythmicity.
- 1.5 Explain rhythmic excitation of heart.

**2 Understand the concept of electrocardiography.**

- 2.1 Define ECG&ETT.
- 2.2 Explain waveform of electrocardiogram (ECG).
- 2.3 Describe the principle of operation of ECG machine.
- 2.4 Mention the process of maintenance of ECG machine.
- 2.5 Describe the operation of online ECG system.
- 2.6 Describe the operation of ETT machine.

**3 Understand the concept of measurement of blood pressure & blood Flow.**

- 3.1 List the different methods of blood pressure measurements.
- 3.2 Describe the operation of systolic-diastolic and mean detector circuits.
- 3.3 Explain the basic principle of magnetic blood flow meter.
- 3.4 Describe the operation of ultrasonic and Doppler type blood flow meter.
- 3.5 Describe the operation of pulse beat monitor.
- 3.6 State the operation of fiber optic oximeter.

**4 Understand the concept of human respiratory equipment and anesthesia system.**

- 4.1 Define the terms inhalators, ventilators and respirators.
- 4.2 Define kymograph.
- 4.3 Describe the function of impedance pneumograph.
- 4.4 Describe the operation of ultrasonic nebulizer machine.
- 4.5 Describe the operation of spirometer.
- 4.6 Define the term anesthesia.
- 4.7 Describe the stages and operating procedure of anesthesia.

- 5 Understanding the concept of pathological laboratory equipments.**
  - 5.1 Describe the function of colorimeter.
  - 5.2 State the function of auto-analyzer.
  - 5.3 Describe the operation of electronic microscope.
  - 5.4 Describe principle and operation of coulter counter and picoscale blood cell counter.
  - 5.5 Describe the construction and operation of a digital thermometer.
  - 5.6 Describe the function of a catheterization Lab.
- 6 Understand the instruments used for surgery**
  - 6.1 List different types of surgery.
  - 6.2 Explain the sterilization process and its necessity
  - 6.3 List different types of operation theater's equipments.
  - 6.4 State the principle of surgical diathermy.
  - 6.5 Describe the operation of diathermy machine with block diagram.
  - 6.6 Application of the Laser in surgery ,diagnosis and therapeutic purpose.
- 7 Understand the cardiac device.**
  - 7.1 Define pacemaker
  - 7.2 List different types of pacemaker.
  - 7.3 Describe the function of different types of pacemaker with block diagram.
  - 7.4 Explain the term rate responsive pacing.
  - 7.5 Describe different types of power source for implantable pacemaker.
  - 7.6 Define defibrillator and cardioverter and AED (Automated External defibrillator)
  - 7.7 Describe the operation of a defibrillator and cardioverter.
  - 7.8 List the name of machines used for open heart surgery.
- 8 Understand the prosthetic device and stimulator.**
  - 8.1 Define electric & magnetic stimulator.
  - 8.2 Different between electric and magnetic stimulator.
  - 8.3 Describe the operation of a transcutaneous RF-power electric stimulator.
  - 8.4 Describe the operation of cochlear and drop foot prosthesis with block diagram.
  - 8.5 Describe the function of pain suppression and transcutaneous nerve stimulation.
  - 8.6 Explain magnetic stimulation for pain suppression.
- 9 Understand the hemodialysis system.**
  - 9.1 Define hemodialysis and lithotripsy.
  - 9.2 State the principle of dialysis in the artificial kidney.
  - 9.3 List different types of dialyzer.
  - 9.4 Describe the operation different types of dialyzer with block diagram.
  - 9.5 Describe the function of portable kidney machine.
  - 9.6 Describe the function of lithotripsy .
- 10 Understand the concept of electroencephalography, electroretinography, NCV (Nerve Conduction Velocity).**
  - 10.1 Define the term electroencephalography(EEG)
  - 10.2 Describe the function of electrooculography(EOG).
  - 10.3 Describe the function of electroretinograph (ERG).
  - 10.4 Discuss the function of electroencephalography with block diagram.
  - 10.5 Define the term magnetography
  - 10.6 Discuss the function of SQUID for magnetograph.
- 11 Understand the concept of ultrasound imaging system .**
  - 11.1 Define ultrasound.
  - 11.2 State the properties of ultrasound.
  - 11.3 Describe the method of production and detection of ultrasound.
  - 11.4 Describe the use of pulse echo technique in ophthalmology system.
  - 11.5 Explain the principle of A-Scan, B-Scan and M-Scan method of pulse echo display.
  - 11.6 Describe the function of echocardiograph.
  - 11.7 Describe the operation of color Doppler ultra sonogram machine.

**12 Understand the features of radiographic imaging system.**

- 12.1 Define the term radiography , tomography, angiography and mammography.
- 12.2 Explain the operation of X-ray tube.
- 12.3 Describe the operation of an X-ray machine with block diagram.
- 12.4 Describe the operation of a fluoroscopic machine with block diagram.
- 12.5 Describe the operation of computerized tomography (CT) scanner.
- 12.6 Describe the operating principle of linear accelerator (LINAC) .
- 12.7 Describe the operation of DSA (digital Subtraction Angiography) unit.
- 12.8 Describe C-ARM and DR (Digital Radiography)

**13 Understand nuclear medical imaging system.**

- 13.1 Explain the principle of nuclear imaging system.
- 13.2 Describe the operation of gamma camera.
- 13.3 Describe the operation of renogram.
- 13.4 Explain the principle of positron emission tomography-CT (PET-CT).
- 13.5 Explain the operating principle of nuclear magnetic resonance (NMR)imaging system.
- 13.6 Describe the operation magnetic resonance imaging (MRI) machine.
- 13.7 Describe the operation of single photon emission computerized tomography (SPECT).
- 13.8 Compare CT and MRI imaging system.

**14 Understand radiation and basis for radiation safety.**

- 14.1 Define radiation.
- 14.2 Mention the sources of radiation.
- 14.3 Describe the units of radiation.
- 14.4 Describe the nature of radiation.
- 14.5 Describe the biological effect of radiation.
- 14.6 Describe the application of radiation in medical science.
- 14.7 State remedial measures of radiation hazard.

**15 Understand the operation of biomedical measuring instruments.**

- 15.1 Describe the setting and calibration of ECG and EEG machine
- 15.2 Describe setting and calibration of ultrasonogram(USG)machine.
- 15.3 Describe miliampere setting meter for the calibration of x-ray machine.
- 15.4 Describe dose rate / dosimeter for measuring X-ray radiation.
- 15.5 Describe the procedure of hemodialysis machine using tachometer, pressure gauge & conductivity meter.
- 15.6 Describe the operation of Flow analyzer.

**Practical :**

1. Observe the operation of ECG machine.
2. Demonstrate the operation of pulse beat monitor.
3. Study the characteristics of pacemaker.
4. Demonstrate the operation of conventional & digital blood pressure machine.
5. Demonstrate the operation of anesthesia machine.
6. Identify with different parts and repairing techniques X-ray machine.
7. Demonstrate the operation of X-ray machine with safety precaution.
8. Demonstrate the operation of a fluoroscopic machine.
9. Observethe operation of hemodialysis machine.
10. Demonstrate the operation of ultrasonogram machine.
11. Demonstrate the operation of CT scanner.
12. Demonstratethe operation of MRI machine.
13. Visit a nearestnuclear medicine centre and submit a report.

## REFERENCE BOOKS

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  - Jogneph J. Carr
  - John M. Brown
2. Biomedical Instrumentation and Measurements
  - Leslie Cromrwell
  - Fred J. Weibell
  - Erich A. Pfeiffer.
3. Medical Instrumentation application and design
  - John G Webster.
4. Hand book of Biomedical instrumentation
  - Khandpur.
5. Health physics
  - Harman camber
  - Thomas E. johnson

**AIMS:**

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of PLC with special emphasis on:

- Relay Logic Control
- Hardware of PLC.
- Ladder diagram.
- Ladder diagram Programming

**SHORT DESCRIPTION:**

Relay Logic Control, Fundamentals of PLC, Input output (I/O) module, memory system and I/O interaction, PLC Ladder diagram Programming, Internal Relay, Jump and Call, Timer Counter, Shift Register, PID Control, PLC and Networking.

**DETAILS DESCRIPTION****Theory:****1. Understand Relay Logic Control.**

- 1.1 Define Automation
- 1.2 Mention the application of automation in Industry.
- 1.3 *Analyze the working principle of electromechanical relay.*
- 1.4 *State the concept of relay in control process.*
- 1.5 *Describe the use of relay to implement control logic AND, OR, NOT and Flip-Flop.*
- 1.6 *Explain relay logic ladder diagram.*
- 1.7 *Mention the limitation of relay logic control.*
- 1.8 *Mention the advantages of PLC over relay logic in control process.*

**2. Understand the Fundamentals of Programmable Logic Controller (PLC).**

- 2.1 *Define PLC.*
- 2.2 *Mention the difference between computer and PLC.*
- 2.3 *Mention the difference between Microcontroller and PLC.*
- 2.4 *List the component that makes up a typical PLC.*
- 2.5 *Describe the Architecture of PLC.*
- 2.6 *Mention the configuration of typical PLC*

**3. Understand the Input output (I/O) module.**

- 3.1 Define I/O Module
- 3.2 Mention the functions of input and output module.
- 3.3 State the meaning of Digital (Discrete) and analog module.
- 3.4 List the analog and digital I/O devices used in PLC.
- 3.5 Describe AC and DC input module circuits.
- 3.6 Describe AC and DC output module circuits.
- 3.7 List specialized modules of PLC.
- 3.8 Describe the centralized and distributed I/O.



**4. Understand the memory system and I/O interaction.**

- 4.1 Mention the need for memory system in PLC.
- 4.2 Describe the executive memory and the application memory.
- 4.3 Illustrate the memory map of PLC.
- 4.4 Describe different types of data file.
- 4.5 Describe the relationship between memory position and the I/O terminals.
- 4.6 Describe the setup procedure of PLC.
- 4.7 Explain PLC operation.

**5. Understand the PLC Ladder Diagram Programming.**

- 5.1 List the PLC languages defined by International Electrotechnical Commission (IEC) .
- 5.2 Define ladder diagram.
- 5.3 Mention the conventions adopted in drawing ladder diagram.
- 5.4 Identify the standard IEC symbol used for input and output devices.
- 5.5 Mention the notation used for I/O address.
- 5.6 Draw the ladder diagram for Logic functions, Latching and multiple outputs.

**6. Understand the Internal Relay (IR) in PLC.**

- 6.1 State the meaning of internal relay
- 6.2 Describe the method of using internal relay.
- 6.3 Mention the different way of expressing internal relay address.
- 6.4 State the necessity of battery backup and master control relay.
- 6.5 Describe the One-shot and Set/Reset operation.
- 6.6 Application of Internal relay.

**7. Understand the Jump, Call and Comparator.**

- 7.1 Discuss the conditional Jump in ladder diagram.
- 7.2 Describe Jump within Jump.
- 7.3 Describe the use of subroutine in ladder diagram.
- 7.4 Describe functional block.
- 7.5 Discuss the comparator instruction in ladder diagram.
- 7.6 Application of above instruction.

**8. Understand the Timer in PLC.**

- 8.1 State the necessity of timer in PLC.
- 8.2 Mention how timer behaves in PLC
- 8.3 Describe the types of timer with symbol.
- 8.4 Solve problem.

**9. Understand the Counter in PLC.**

- 9.1 Define Counter.
- 9.2 State the necessity of counter in PLC.
- 9.3 Describe the types of counter with symbol.
- 9.4 Describe counter application.

**10. Understand the Shift Register in PLC.**

- 10.1 Define register.
- 10.2 State the necessity of shift register in PLC.

10.3 Describe the types of shift register with symbol.

10.4 Describe shift register application.

10.5 Solve problem.

**11. Understand the GRAFCET.**

11.1 Define GRAFCET.

11.2 Mention the application of GRAFCET.

11.3 Describe the different elements of GRAFCET.

11.4 Describe the translation method of GRAFCET into PLC Ladder diagram.

**12. Understand the Supervisory Control and Data Acquisition (SCADA).**

12.1 Define SCADA

12.2 Describe the basic SCADA diagram.

12.3 Mention the Essential composing parts of SCADA

12.4 List the Fields of applications of SCADA

**13. Understand the Human Machine Interface(HMI) .**

13.1 Define interface.

13.2 Define HMI

13.3 List the Fields of applications of HMI

13.4 Mention the basic types of HMI

13.5 Describe the block diagram of HMI.

13.6 Describe the advantage of an HMI over a PLC alone.

**14. Understand the PLC and Networking.**

14.1 Define Network.

14.2 Mention the topologies of network.

14.3 Describe the three levels of network.

14.4 Describe the communication (network) module.

**Practical:**

**1. DC Motor Control using Relay logic.**

1.1 Select relay

1.2 Draw the relay logic ladder diagram.

1.3 Connect components according to the logic diagram.

1.4 Observe the result

**2. Implementation of Basic Logic Gates Using Ladder diagram.**

2.1 Select a PLC

2.2 Identify the I/O address

2.3 Connect the Input and output

2.4 Draw the ladder diagram.

2.5 Connect PLC with PC

2.6 Load program to PLC

2.7 Run the Program

2.8 Observe the result

### **3. Blinking light.**

- 3.1 Select a PLC
- 3.2 Identify the I/O address
- 3.3 Connect the Input and output
- 3.4 Draw the ladder diagram.
- 3.5 Connect PLC with PC
- 3.6 Load program to PLC
- 3.7 Run the Program
- 3.8 Observe the result

### **4. Dc motor Control Using PLC.**

- 4.1 Select a PLC
- 4.2 Identify the I/O address
- 4.3 Connect the switches and DC Motor with driver circuit.
- 4.4 Draw the ladder diagram.
- 4.5 Connect PLC with PC
- 4.6 Load program to PLC
- 4.7 Run the Program
- 4.8 Observe the result

### **5. Temperature Control System Using PLC.**

- 5.1 Select a PLC
- 5.2 Identify the I/O address
- 5.3 Connect thermometer with analog module.
- 5.4 Draw the ladder diagram.
- 5.5 Connect PLC with PC
- 5.6 Load program to PLC
- 5.7 Run the Program
- 5.8 Observe the result

### **6. Conveyor system Control Using PLC.**

- 6.1 Select a PLC
- 6.2 Identify the I/O address
- 6.3 Arrange the system and connect to PLC.
- 6.4 Draw the ladder diagram.
- 6.5 Connect PLC with PC
- 6.6 Load program to PLC
- 6.7 Run the Program
- 6.8 Observe the result

### **7. Bottling Plant Control using PLC.**

- 7.1 Select a PLC
- 7.2 Identify the I/O address
- 7.3 Arrange the system and connect to PLC.
- 7.4 Draw the ladder diagram.
- 7.5 Connect PLC with PC
- 7.6 Load program to PLC
- 7.7 Run the Program
- 7.8 Observe the result

## **8. Sorting of Objects for Packaging Using PLC Based Control.**

- 8.1 Select a PLC
- 8.2 Identify the I/O address
- 8.3 Arrange the system and connect to PLC.
- 8.4 Draw the ladder diagram.
- 8.5 Connect PLC with PC
- 8.6 Load program to PLC
- 8.7 Run the Program
- 8.8 Observe the result

## **9. Car Parking Control Using PLC.**

- 9.1 Select a PLC
- 9.2 Identify the I/O address
- 9.3 Arrange the system and connect to PLC.
- 9.4 Draw the ladder diagram.
- 9.5 Connect PLC with PC
- 9.6 Load program to PLC
- 9.7 Run the Program
- 9.8 Observe the result

## **10. Automatic Traffic Light Control Using PLC.**

- 10.1 Select a PLC
- 10.2 Identify the I/O address
- 10.3 Connect the Input and output
- 10.4 Draw the ladder diagram.
- 10.5 Connect PLC with PC
- 10.6 Load program to PLC
- 10.7 Run the Program
- 10.8 Observe the result

## **11. Water level Control Using PLC.**

- 11.1 Select a PLC
- 11.2 Identify the I/O address
- 11.3 Arrange the system and connect to PLC.
- 11.4 Draw the ladder diagram.
- 11.5 Connect PLC with PC
- 11.6 Load program to PLC
- 11.7 Run the Program
- 11.8 Observe the result

## **12. Washing Machine Control Using PLC.**

- 12.1 Select a PLC
- 12.2 Identify the I/O address
- 12.3 Arrange the system and connect to PLC.
- 12.4 Draw the ladder diagram.
- 12.5 Connect PLC with PC
- 12.6 Load program to PLC
- 12.7 Run the Program
- 12.8 Observe the result

### **13. Oven Control Using PLC.**

- 13.1 Select a PLC
- 13.2 Identify the I/O address
- 13.3 Arrange the system and connect to PLC.
- 13.4 Draw the ladder diagram.
- 13.5 Connect PLC with PC
- 13.6 Load program to PLC
- 13.7 Run the Program
- 13.8 Observe the result

#### REFERENCES:

1. Modern Control Technology Components and Systems. \_ Kilian
2. Programmable Logic Controllers. \_ W. Bolton
3. Programmable Logic Controllers: Programming Methods and Applications.  
\_ John R. Hackworth  
\_ Frederick D. Hackworth, Jr.

**AIMS:**

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of Electronic project with special emphasis on:

- Design and construction of Electronic appliances, equipments and systems.
- Developing innovative ideas of students for practical application.
- Improve operation of Electronic equipment through original thinking.

**SHORT DESCRIPTION:**

Electronic Projects Based on the availability of materials and facilities in the institutes and market. Possible projects may be the improvement of design and construction of Home Security system, fire detection & protection system, UPS, Satellite Home Receiver, Remote Controller, Frequency Counter, IC tester, Radio receiver, Volt Guard, LED message display, Digital Logic Trainer, Stepper Motor Controller, Digital Notice Board, Biometric Attendance system, Automatic Wash Basin Tap controller, Car parking, Automatic Rain detector, Quad and Hex Copter, Automatic Fan speed regulator. New ideas leading to actual construction will be given more importance.

**Special note:**

Students should have to be provided opportunities to select any one of the following **Projects**

**DETAIL DESCRIPTION:**

1. **Design and construct a Digital home security system .**
  - 1.1 Draw the circuit diagram.
  - 1.2 List the materials required for the Home Security system.
  - 1.3 Prepare the required PCB.
  - 1.4 Insert the components (Use IC base) on the PCB and solder them.
  - 1.5 Test the circuit.
  - 1.6 Prepare a report on the project.
2. **Design and construct a Digital fire detection & protection system**
  - 2.1 Draw the circuit diagram.
  - 2.2 List the materials required for the fire detection & protection system
  - 2.3 Prepare the required PCB.
  - 2.4 Insert the components (Use IC base) on the PCB and solder them.
  - 2.5 Draw the Flow-chart of the program for the fire detection & protection system (If required)
  - 2.6 Write the program using assembly/C language (If required)
  - 2.7 Convert the program into executable form. (If required)
  - 2.8 Transfer the program to the program memory of the microcontroller. (If required)
  - 2.9 Construct a case and place the PCB into the case.
  - 2.10 Test the circuit.
  - 2.11 Prepare a report on the project.
3. **Design and construct a Digital clock using microcontroller.**
  - 3.1 Select the microcontroller.
  - 3.2 Draw the circuit diagram.
  - 3.3 List the materials required for the clock
  - 3.4 Prepare the required PCB.
  - 3.5 Insert the components (Use IC base) on the PCB and solder them.
  - 3.6 Draw the Flow-chart of the program for the clock.
  - 3.7 Write the program using assembly/C language.

- 3.8 Convert the program into executable form.
- 3.9 Transfer the program to the program memory of the microcontroller.
- 4. Design and construct the UPS.**
  - 4.1 Study the related catalogue or manuals.
  - 4.2 Calculate the rating and develop specification.
  - 4.3 Draw the circuit diagram.
  - 4.4 List the materials required for the UPS
  - 4.5 Prepare the required PCB.
  - 4.6 Insert the components on the PCB and solder them.
  - 4.7 Construct a case and place the PCB into the case.
  - 4.8 Identify the input / output terminals.
  - 4.9 Test the UPS.
  - 4.10 Prepare a report on the project.
- 5. Design a Satellite Home Receiver.**
  - 5.1 Study the related catalogue or manuals.
  - 5.2 Draw the circuit diagram.
  - 5.3 List the materials required for the circuit.
  - 5.4 Prepare the required PCBs.
  - 5.5 Insert the components on the PCBs and solder them.
  - 5.6 Construct a case and place the PCB into the case.
  - 5.7 Identify the input / output terminals.
  - 5.8 Test the performance of the Satellite Home Receiver.
  - 5.9 Prepare a report on the project.
- 6. Design and Construct a Multi channel remote control system.**
  - 6.1 Study the related catalogue or manuals.
  - 6.2 Study the pin diagram of the ICs.
  - 6.3 Draw the circuit diagram.
  - 6.4 List the materials required for the remote controller.
  - 6.5 Prepare the required PCB.
  - 6.6 Insert the components on the PCB and solder them.
  - 6.7 Construct a case and place the PCB into the case.
  - 6.8 Test the circuit.
  - 6.9 Prepare a report on the project.
- 7. Design and Construct a Digital frequency counter.**
  - 7.1 Study the related catalogue or manuals.
  - 7.2 List the materials required for the Frequency counter.
  - 7.3 Study the pin diagram of the ICs.
  - 7.4 Draw the circuit diagram.
  - 7.5 Prepare the required PCB.
  - 7.6 Insert the components on the PCB and solder them.
  - 7.7 Construct a case and place the PCB into the case.
  - 7.8 Test the circuit.
  - 7.9 Prepare a report on the project.
- 8. Design and Construct a LED moving message display.**
  - 8.1 Select the microcontroller.
  - 8.2 Study the pin diagram and architecture of the microcontroller.
  - 8.3 Draw the circuit diagram of the traffic control system.
  - 8.4 Prepare the required PCB.
  - 8.5 Insert the components on the PCB and solder them.
  - 8.6 Draw the Flow-chart of the program for the traffic control system.
  - 8.7 Write the program using assembly/C language.
  - 8.8 Convert the program into executable form.

- 8.9 Transfer the program to the program memory of the microcontroller.
  - 8.10 Construct a case and place the PCB into the case.
  - 8.11 Test the circuit.
  - 8.12 Prepare a report on the project.
- 9. Design and Construct a Digital Notice Board .**
- 9.1 Select the microcontroller.
  - 9.2 Study the pin diagram and architecture of the microcontroller.
  - 9.3 Draw the circuit diagram of the digital notice board.
  - 9.4 Prepare the required PCB.
  - 9.5 Insert the components on the PCB and solder them.
  - 9.6 Draw the Flow-chart of the program for the traffic control system.
  - 9.7 Write the program using assembly/C language.
  - 9.8 Convert the program into executable form.
  - 9.9 Transfer the program to the program memory of the microcontroller.
  - 9.10 Construct a case and place the PCB into the case.
  - 9.11 Test the circuit.
  - 9.12 Prepare a report on the project.
- 10. Design and Construct a Digital Logic Trainer.**
- 10.1 Study the related catalogue or manuals.
  - 10.2 Calculate the rating and develop specification.
  - 10.3 Draw the circuit diagram for power and clock circuit.
  - 10.4 List the materials required for the trainer.
  - 10.5 Prepare the required PCB.
  - 10.6 Insert the components on the PCB and solder them.
  - 10.7 Insert LEDs and switches for data and solder them.
  - 10.8 Construct a case and place the PCB & bread boards into the case.
  - 10.9 Prepare a report on the project.
- 11. Design and Construct a Power project board.**
- 11.1 Study the related catalogue or manuals.
  - 11.2 Calculate the rating and develop specification.
  - 11.3 Draw the circuit diagram.
  - 11.4 List the materials required for the power project board .
  - 11.5 Prepare the required PCB.
  - 11.6 Insert the components on the PCB and solder them.
  - 11.7 Construct a case and place the PCB & bread boards into the case.
  - 11.8 Prepare a report on the project.
- 12. Design and Construct an IC Tester.**
- 12.1 Study the related catalogue or manuals.
  - 12.2 List the materials required for IC Tester.
  - 12.3 Study the required ICs.
  - 12.4 Draw the circuit diagram.
  - 12.5 Prepare the required PCB.
  - 12.6 Insert the components on the PCB and solder them.
  - 12.7 Construct a case and place the PCB & bread boards into the case.
  - 12.8 Test the IC Tester
  - 12.9 Prepare a report on the project.
- 13. Design and Construct a Volt Guard (over & under voltage protection circuit).**
- 13.1 Study the related catalogue or manuals.
  - 13.2 Study the required ICs.
  - 13.3 Draw the circuit diagram.
  - 13.4 List the materials required for the project.



- 13.5 Prepare the required PCB.
- 13.6 Insert the components on the PCB and solder them.
- 13.7 Construct a case and place the PCB & bread boards into the case.
- 13.8 Test the Volt Guard.
- 13.9 Prepare a report on the project.
- 14. Design and Construct a Stepper Motor control circuit.**
  - 14.1 Select the microcontroller.
  - 14.2 Study the pin diagram and architecture of the microcontroller.
  - 14.3 Draw the circuit diagram of stepper motor control .
  - 14.4 Prepare the required PCB.
  - 14.5 Insert the components (Use IC base) on the PCB and solder them.
  - 14.6 Write the program using assembly/C language.
  - 14.7 Convert the program into executable form.
  - 14.8 Transfer the program to the program memory of the microcontroller.
  - 14.9 Construct a case and place the PCB into the case.
  - 14.10 Test the circuit.
  - 14.11 Prepare a report on the project.
- 15. Design and Construct a Biometric Attendance System.**
  - 15.1 Select the microcontroller.
  - 15.2 Study the pin diagram and architecture of the microcontroller.
  - 15.3 Draw the circuit diagram of Biometric attendance system.
  - 15.4 Prepare the required PCB.
  - 15.5 Insert the components (Use IC base) on the PCB and solder them.
  - 15.6 Write the program using assembly/C language.
  - 15.7 Convert the program into executable form.
  - 15.8 Transfer the program to the program memory of the microcontroller.
  - 15.9 Construct a case and place the PCB into the case.
  - 15.10 Test the circuit.
  - 15.11 Prepare a report on the project.
- 16. Design and Construct a Automatic Wash Basin Tap controller circuit.**
  - 16.1 Select the microcontroller.
  - 16.2 Study the pin diagram and architecture of the microcontroller.
  - 16.3 Draw the circuit diagram of automatic wash basin tap controller.
  - 16.4 Prepare the required PCB.
  - 16.5 Insert the components (Use IC base) on the PCB and solder them.
  - 16.6 Write the program using assembly/C language.
  - 16.7 Convert the program into executable form.
  - 16.8 Transfer the program to the program memory of the microcontroller.
  - 16.9 Construct a case and place the PCB into the case.
  - 16.10 Test the circuit.
  - 16.11 Prepare a report on the project.
- 17. Design and Construct a Car parking system.**
  - 17.1 Select the microcontroller.
  - 17.2 Study the pin diagram and architecture of the microcontroller.
  - 17.3 Draw the circuit diagram of Car parking system.
  - 17.4 Prepare the required PCB.
  - 17.5 Insert the components (Use IC base) on the PCB and solder them.
  - 17.6 Write the program using assembly/C language.
  - 17.7 Convert the program into executable form.
  - 17.8 Transfer the program to the program memory of the microcontroller.
  - 17.9 Construct a case and place the PCB into the case.
  - 17.10 Test the circuit.
  - 17.11 Prepare a report on the project.

- 18. Design and Construct a Automatic Rain detector circuit.**
  - 18.1 Select the microcontroller.
  - 18.2 Study the pin diagram and architecture of the microcontroller.
  - 18.3 Draw the circuit diagram of Automatic Rain detector .
  - 18.4 Prepare the required PCB.
  - 18.5 Insert the components (Use IC base) on the PCB and solder them.
  - 18.6 Write the program using assembly/C language.
  - 18.7 Convert the program into executable form.
  - 18.8 Transfer the program to the program memory of the microcontroller.
  - 18.9 Construct a case and place the PCB into the case.
  - 18.10 Test the circuit.
  - 18.11 Prepare a report on the project.
- 19. Design and Construct a Quad and Hex Copter.**
  - 19.1 Select the microcontroller.
  - 19.2 Study the pin diagram and architecture of the microcontroller.
  - 19.3 Draw the circuit diagram of Quad and hex copter.
  - 19.4 Prepare the required PCB.
  - 19.5 Insert the components (Use IC base) on the PCB and solder them.
  - 19.6 Write the program using assembly/C language.
  - 19.7 Convert the program into executable form.
  - 19.8 Transfer the program to the program memory of the microcontroller.
  - 19.9 Construct a case and place the PCB into the case.
  - 19.10 Test the circuit.
  - 19.11 Prepare a report on the project.
- 20. Design and Construct a Automatic Fan Speed Regulator .**
  - 20.1 Select the microcontroller.
  - 20.2 Study the pin diagram and architecture of the microcontroller.
  - 20.3 Draw the circuit diagram of automatic fan speed regulator.
  - 20.4 Prepare the required PCB.
  - 20.5 Insert the components (Use IC base) on the PCB and solder them.
  - 20.6 Write the program using assembly/C language.
  - 20.7 Convert the program into executable form.
  - 20.8 Transfer the program to the program memory of the microcontroller.
  - 20.9 Construct a case and place the PCB into the case.
  - 20.10 Test the circuit.
  - 20.11 Prepare a report on the project.
- 21. Design and construct a Robotics arm.**
  - 21.1 Study the related catalogue or manuals.
  - 21.2 List the materials required for the robotics arm.
  - 21.3 Draw the circuit diagram.
  - 21.4 Prepare the required PCB.
  - 21.5 Insert the components on the PCB and solder them.
  - 21.6 Construct a case and place the PCB into the case.
  - 21.7 Test the circuit.
  - 21.8 Prepare a report on the project.

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1. High Frequency Inverter.....S.K. Gupta.
2. Advance Stabilizer Circuits.....S.K. Gupta
3. IC Voltage Guide.....S.K. Gupta
৪. হবি ইলেকট্রনিক্স . দেবাশিস বন্দ্যোপাধ্যায়
৫. ইলেকট্রনিক্স মডেল বানাও... সন্দীপ সেন
৬. ইনভার্টার তৈরী ও সার্ভিসিং . দেবাশিস বন্দ্যোপাধ্যায়

**AIMS**

- To be able to understand the concept of entrepreneurship & entrepreneur.
- To be able to understand the concept of environment for entrepreneurship.
- To be able to understand the sources of venture ideas in Bangladesh.
- To be able to understand the project selection.
- To be able to understand business planning.
- To be able to understand the insurance and premium.
- To be able to understand the MDG & SDG.

**SHORT DESCRIPTION**

Concepts of entrepreneurship & entrepreneur; Entrepreneurship & economic development; Environment for entrepreneurship; Entrepreneurship in the theories of economic growth; Sources of ventures ideas in Bangladesh; Evaluation of venture ideas; Financial planning; Project selection; Self employment; Entrepreneurial motivation; Business plan; Sources of assistance & industrial sanctioning procedure; Concept of SDG; SDG 4,8 .

**DETAIL DESCRIPTION**Theory :**1. Understand the basic concept of entrepreneurship & entrepreneur.**

- 1.1 Define entrepreneurship & entrepreneur.
- 1.2 Discuss the characteristics and qualities of an entrepreneur.
- 1.3 Mention the classification of entrepreneur.
- 1.4 Discuss the necessity of entrepreneurship as a career.
- 1.5 Discuss the prospect of entrepreneurship development in Bangladesh.

**2. Understand the concept of entrepreneurship and economic development.**

- 2.1 Define economic development.
- 2.2 Discuss the economic development process.
- 2.3 Discuss the capital accumulation or rate of savings.
- 2.4 Discuss the role of entrepreneur in the technological development and their introduction into production Process.
- 2.5 Discuss the entrepreneur in the discovery of new product.
- 2.6 Discuss the discovery of new markets.

**3. Environment for entrepreneurship development:**

- 3.1 Define the micro environment.
- 3.2 Discuss individual income, savings and consumption.
- 3.3 Define macro environment.
- 3.4 Discuss political, socio-cultural, economical, legal and technological environment.
- 3.5 Difference between micro and macro environment .

**4. Understand the concept of entrepreneurship in the theories of economic growth.**

- 4.1 Define entrepreneurship in the theories of economic growth.
- 4.2 Discuss the Malthusian theory of population and economic growth.
- 4.3 Discuss the stage theory of growth.
- 4.4 Discuss the Schumpeterian theory of economic development.
- 4.5 Discuss the entrepreneurship motive in economic development.

## **5. Understand the sources and evaluation of venture ideas in Bangladesh.**

- 5.1 Define sources of venture ideas in Bangladesh.
- 5.2 Discuss different types of sources of venture ideas in Bangladesh.
- 5.3 Define evaluation of venture ideas.
- 5.4 Discuss the factors that influence the selection of venture idea.

## **6. Understand the concept of project selection and financial planning.**

- 6.1 Define project.
- 6.2 Discuss the idea of project.
- 6.3 Describe the guide lines for project ideas.
- 6.4 Discuss the sources of project ideas.
- 6.5 Discuss the evaluation of project ideas.
- 6.6 Describe the technical aspect of project.
- 6.7 Define financial planning.
- 6.8 Discuss the long term financial plan.
- 6.9 Discuss the short term financial plan.

## **7. Understand the concept of self employment.**

- 7.1 Define self employment.
- 7.2 Describe different types of employment.
- 7.3 Describe the importance of business as a profession.
- 7.4 Discuss the reasons for success and failure in business.

## **8. Understand the business plan and the concept of the environment for entrepreneurship.**

- 8.1 Define business plan.
- 8.2 Describe the importance of business plan.
- 8.3 Discuss the contents of business plan.
- 8.4 Define environment of business.
- 8.5 Describe the factors which effect environment on entrepreneurship

## **9. Understand the concept of sources of assistance & industrial sanctioning procedure.**

- 9.1 Define sources of assistance.
- 9.2 Describe different types of sources of assistance.
- 9.3 Discuss the aid of sources.
- 9.4 Discuss the industrial policy.
- 9.5 Define foreign aid.

## **10. Understand the insurance and premium.**

- 10.1 Define insurance and premium
- 10.2 Describe the essential conditions of insurance contract.
- 10.3 Discuss various types of insurance.
- 10.4 Distinguish between life insurance and general insurance.

## **11. Understand the concept of Sustainable Development Goals (SDG)**

- 11.1 Define Sustainable development
- 11.2 State UN targets of MDG
- 11.3 State UN targets of SDG
- 11.4 Describe the importance of SDG
- 11.5 Explain the objectives of SDG
- 11.6 State the Challenges to achieve SDGs
- 11.7 Explain the actions to face the challenges of SDGs
- 11.8 State the of 7<sup>th</sup> 5 years plan
- 11.9 Mention the link of 7<sup>th</sup> 5 years plan with SDGs
- 11.10 Write down the 5 ps of sustainable development goals

## **12. Understand SDG 4,8 and 17**

- 12.1 Describe SDG 4 and its targets
- 12.2 State the elements of Quality education for TVET
- 12.3 Describe the gender equality and equal access of TVET for economic growth
- 12.4 Describe SDG 8 and its targets
- 12.5 Explain Green development, Green Economy, Green TVET & Green Jobs
- 12.6 Explain the role an entrepreneur for achieving SDG

## **Reference book :**

1. A hand book of new entrepreneur-by p.c jain.
- 2.A manual on business opportunity Identification and selection-by j.B patel and S S modi.
- 3.Uddokta unnoyan Nirdeshika -Md.Sabur khan.
- 4.Entrepreneurship- bashu and mollik.
- 5.Business Entrepreneurship-kage faruke.
6. Website, Youtube and Google