GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110016
BASIC ELECTRONICS
1st Year

Type of course: Engineering Science

Prerequisite: High School Education & Physics

Rationale: Electronics is playing a key role in all engineering applications. All engineers should have basic knowledge of electronics. Purpose of this subject is make students familiar with basic electronics concepts. Students will be able to operate electronic test and measurement equipment like multi-meter, CRO, DC power supply and function generator.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Diode theory and applications** Basic idea about forward bias, reverse bias and VI characteristics, ideal diode, second and third approximation, surface mount diodes, Zener diode, Testing of diode with multi-meter, half wave rectifier, full wave rectifier, bridge rectifier, RC and LC filters, Design of un-regulated DC power supply, Clipping circuit, Clamping circuit, voltage multiplier circuit, Reading datasheet of semiconductor diode.	10	20%
2	**Bipolar junction transistors and its biasing** BJT operation, BJT voltages and currents, CE, CB and CC characteristics, DC load line and bias point, base bias, emitter feedback bias, collector feedback bias, voltage divider bias, Thermal stability, biasing BJT switching circuits, transistor power dissipation and switching time, Testing of bipolar junction transistor with multi-meter, Reading datasheet of BJT.	10	20%
3	**Special purpose diodes and transistors** Light emitting diode (LED). Zener diode, Zener diode circuit for voltage regulation, Photo diode, Solar cell, PIN diode, Varactor, Schottky diode, Varistors, Tunnel diode, Seven Segment display, Sixteen segment display, Identify segments on pin using multi-meter, Dot-matrix LED display, Photo transistor, Opto-coupler, Reading datasheet of opto-electronics devices	4	10%

4	**AC Analysis of BJT circuits and small signal amplifier** Coupling and bypass capacitors, AC load lines, Transistor models and parameters, Common emitter circuit analysis, common base circuit analysis, common collector circuit analysis, Comparison of CE, CB and CC circuits, Transistor as a switch	**10**	20%
5	**Field effect transistors (FET) and its biasing** Junction field effect transistors(JFET), Comparison of BJT and FET, JFET characteristics, FET, Biasing in ohmic region and active region, Trans-conductance, amplification and switching, MOSFETs (D-type and E-type MOSFET), CMOS introduction, E-MOSFET amplifier. MOSFET testing, Reading datasheet for FET and MOSFET.	**10**	20%
6	**Digital Circuits** Basic gates AND, OR,NOT, NAND, NOR, EX-OR, EX-NOR, Building AND, OR Gate with diodes, Digital logic families RTL, DTL, TTL, CMOS, Comparison of logic families	**4**	10%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30 %	**30%**	**40%**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

[1] David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth edition
[2] Albert Malvino & David, "Electronic Principles", Tata McGraw-Hill, Seventh edition
[3] R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education
[4] Jaccob Millman, Chritos Halkias, Chetan D Parikh, "Integrated Electronics", Tata McGraw-Hill, Second edition
[5] Albert Malvino & David, "Problems and Solutions in Basic Electronics, McGraw Hill Education

Course Outcomes:

Sr. No.	CO statement	% weightage
CO-1	Analyze the general – and special-Purpose diode circuits	30
CO-2	Design biasing circuits for BJT	20
CO-3	Analyze BJT Circuits in small-signal domain	20
CO-4	Analyze basic FET Circuits	20
CO-5	Verify the functionalities of basic digital gates and logic families	10
CO-6	Construct and test circuit using basic electronic devices in a group	From Lab work

w.e.f. AY 2018-19

List of Experiments:
(General guidelines. Institute may change list of experiments)

- To measure DC voltage and current, AC voltage and current with multi-meter
- To observe waveforms on oscilloscope, measure basic parameters amplitude and frequency of sine wave and square wave.
- Obtain VI characteristics of semiconductor rectifier diode, LED, Photo-diode
- To observe waveform at the output of half wave rectifier with and without filter capacitor. To measure DC voltage, DC current, ripple factor with and without filter capacitor
- To observe waveform at the output of full wave rectifier with and without filter capacitor. To measure DC voltage, DC current, ripple factor with and without filter capacitor
- To observe waveform at the output of bridge rectifier with and without filter capacitor. To measure DC voltage, DC current, ripple factor with and without filter capacitor
- To construct clamper circuits on breadboard and To observe waveforms at the output of clamper circuits
- To construct clipper circuits on breadboard and To observe waveforms at the output of clipper circuits
- Construct AND gate & OR gate with help of diode and verify truth table
- To obtain common emitter characteristics of NPN transistor
- To obtain common base characteristics of NPN transistor
- To obtain common collector characteristics of NPN transistor
- To design common emitter amplifier and construct circuit on breadboard. Measure gain at different frequencies and plot frequency response
- To understand working of transistor as a switch. To draw DC load line for given circuit.
- To observe input-output waveforms of common collector (CC) amplifier. To measure gain of amplifier at different frequencies and plot frequency response
- To obtain characteristics of field effect transistor (FET)
- To measure gain of FET common source (CS) amplifier
- Verify truth table of basic digital logic gates OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR
- To test individual circuit prepared by the student (Get circuit from the faculty, build it, draw circuit diagram and test it in the laboratory. Write test results in this practical)

Major Equipment:

1. CRO
2. Function generator
3. DC Power Suppy
4. Bread board and discrete electronics components

List of Open Source Software/learning website:

- http://nptel.ac.in/syllabus/117103063/
- https://swayam.gov.in/course/3595-basic-electronics
- eSIM available on FOSSEE website: https://fossee.in/

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110013
ENGINEERING GRAPHICS & DESIGN
1st YEAR

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE Viva (V)	PA (I)	
2	0	4	4	70	30	30	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction to Engineering Graphics:** Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction	2 (Lab teaching)	20%
2	**Loci of Points:** Path of the points moving on Simple mechanisms, Slider crank mechanism, Four bar mechanism	2	
3	**Engineering Curves:** Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spirals along with normal and tangent to each curve	6 (Lab teaching)	
4	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes	8	30%
5	**Projections of Planes:** Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	6	
6	**Projections of Solids, Section of Solids and Development of Surfaces:** Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes, Section of such solids and the true shape of the section, Development of surfaces	10	15%
7	**Orthographic Projections:** Fundamental of projection along with classification, Projections from the pictorial view of the object on the	2	25%

	principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view		
8	**Isometric Projections and Isometric View or Drawing:** Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing of simple objects	2 (Lab teaching)	
9	**Computer Aided Drawing:** Introduction to AutoCAD, Basic commands for 2D drawing like : Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc..	4 (Lab teaching)	10%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**30**	**30**	**5**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:
1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
2. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi
4. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi
5. Engineering Drawing by B. Agrawal and C M Agrawal, Tata McGraw Hill, New Delhi

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Know and understand the conventions and the methods of engineering drawing.	15
CO-2	Interpret engineering drawings using fundamental technical mathematics.	25
CO-3	Construct basic and intermediate geometry and comprehend the theory of projection.	25
CO-4	Improve their visualization skills so that they can apply these skills in developing new products.	25
CO-5	Improve their technical communication skill in the form of communicative drawings.	05
CO-6	Use computer software for engineering drawing.	05

List of Practical:

Students must prepare sketch book and drawing sheets on the following topics. **Minimum three problems must be given for sheet number 3 to 9.**

1. Practice sheet (which includes dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil)

2. Plane scale and diagonal scale

3. Loci of points (only sketch book)

4. Engineering curves

5. Projection of line

6. Projection of plane

7. Projection of solid, section of solid and development of surfaces

8. Orthographic projection

9. Isometric projection

10. At least one orthographic drawing (three views) using above mentioned AutoCAD commands.

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110007

ENVIRONMENTAL SCIENCE
1st Year

Type of course: Mandatory Course

Prerequisite: Interest in natural systems sustaining the life on the earth.

Rationale: To inculcate the environmental values translating into pro-conservation actions. Honorable Supreme Court of India has made it 'mandatory' to introduce a basic course on environment at the undergraduate level.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	ESE (V)	PA(I)	
2	2	0	0	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**INTRODUCTION TO ENVIRONMENT** Definition, principles and scope of Environmental Science. Impacts of technology on Environment, Environmental Degradation, Importance for different engineering disciplines	02	8
2	**ENVIRONMENTAL POLLUTION** a) Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution, Classification of water pollutants, Effects of water pollutants b) Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO_2, NO_X, Auto exhaust, Effects of common air pollutants c) Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects d) Solid Waste: Generation and management e) Bio-medical Waste: Generation and management f) E-waste: Generation and management	14	44
3	**GLOBAL ENVIRONMENTAL ISSUES** Sustainable Development, Climate Change, Global Warming and Green House Effect, Acid Rain, Depletion of Ozone layer, Carbon Footprint, Cleaner Development Mechanism (CDM), International Steps for Mitigating Global Change	06	24

4	**BASIC CONCEPT OF GREEN BUILDING AND SMART CITIES** Green Building: Introduction, Objectives, Fundamental Principles, Benefits of Green Building, Examples of Green Building Smart Cities: Concept	04	16
5	**CONCEPT OF 4R's** Principles, Application of 4R's	02	8

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	**40**	**20**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition,2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP -Lambert Academic Publishing , Germany
3. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify the types of pollution in society along with their sources	45
CO-2	Realize the global environmental issues	25
CO-3	Conceptualize the principles of Green Buildings and Smart cities	15
CO-4	Implement the concept of recycle and reuse in all fields of engineering	15

List of Tutorials: Based on

1. Introduction to Environment
2. Water Pollution
3. Air Pollution
4. Noise Pollution
5. Solid Waste
6. Bio-medical Waste
7. E-waste
8. Global Environmental Issues
9. Concept of Green Building
10. Concept of Smart Cities
11. Concept of 4R's

List of Open Source Software/learning website: MOEF, NPTEL

Type of course: Basic Science Course

Prerequisite: Calculus, fourier series

Rationale: To compute line integrals, solution techniques of higher order ordinary differential equations, fourier integral representation.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	2	0	5	70	30	0	0	100

Sr. No.	Content	Total Hrs	% Weightage
01	Vector Calculus: Parametrization of curves, Arc length of curve in space, Line Integrals, Vector fields and applications as Work, Circulation and Flux, Path independence, potential function, piecewise smooth, connected domain, simply connected domain, fundamental theorem of line integrals, Conservative fields, component test for conservative fields, exact differential forms, Div, Curl, Green's theorem in the plane (without proof).	14	33 %
02	Laplace Transform and inverse Laplace transform, Linearity, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals, ODEs, Unit Step Function (Heaviside Function), Second Shifting Theorem (t-Shifting), Laplace transform of periodic functions, Short Impulses, Dirac's Delta Function, Convolution, Integral Equations, Differentiation and Integration of Transforms, ODEs with Variable Coefficients, Systems of ODEs.	07	22 %
03	Fourier Integral, Fourier Cosine Integral and Fourier Sine Integral.	02	
04	First order ordinary differential equations, Exact, linear and Bernoulli's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	05	12 %
05	Ordinary differential equations of higher orders, Homogeneous Linear ODEs of Higher Order, Homogeneous Linear ODEs with Constant Coefficients, Euler–Cauchy Equations, Existence and Uniqueness of Solutions, Linear Dependence and Independence of Solutions, Wronskian, Nonhomogeneous ODEs, Method of Undetermined Coefficients, Solution by Variation of Parameters.	08	20 %
06	Series Solutions of ODEs, Special Functions, Power Series Method, Legendre's Equation, Legendre Polynomials, Frobenius Method, Bessel's Equation, Bessel functions of the first kind and their properties.	06	13%

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110015
Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**25**	**35**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

(**1**)   Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley and Sons.
(2)   Peter O'Neill, Advanced Engineering Mathematics, 7th Edition, Cengage.
(3)   Dennis G. Zill, 4th edition, Advanced Engineering Mathematics, 4th Edition, Jones and Bartlett Publishers.
(4)   Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendentals, 13e, Pearson, 2014.
(5)   Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.

Course Outcomes:

The objective of this course is to familiarize the prospective engineers with techniques in vector calculus, ordinary differential equations, fourier integrals and laplace transform. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Sr. No.	Course Outcomes	Weightage in %
1	To apply mathematical tools needed in evaluating vector calculus and their usage like Work, Circulation and Flux.	33
2	To apply the laplace transform as tools which are used to solve differential equations and fourier integral representation.	22
3	To apply effective mathematical tools for the solutions of first order ordinary differential equations.	12
4	To apply effective mathematical methods for the solutions of higher order ordinary differential equations.	20
5	To use series solution methods and special functions like Bessels' functions.	13

List of Open Source Software/learning website:

Scilab, MIT Opencourseware.

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110018
PHYSICS
1st YEAR
(For Group II Branches)

Type of course: Type of course: Basic Science (Physics)

Prerequisite: Basic understanding of Math's, Physics and chemistry

Rationale: The basic science physics program is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

SrNo	Topic	Teaching Hrs.	Module Weightage
1	**MODULE 1: ELECTRONIC MATERIALS** • Free electron theory • Density of states and energy band diagrams, • Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, • E-k diagram, Direct and indirect bandgaps, • Types of electronic materials: metals, semiconductors, and insulators, • Density of states, Occupation probability, • Fermi level, Effective mass, Phonons.	8	22%
2	**MODULE 2: SEMICONDUCTORS (10)** • Intrinsic and extrinsic semiconductors • Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics) • Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, • Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices	10	27%

3	**MODULE 3: LIGHT-SEMICONDUCTOR INTERACTION** • Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; • Joint density of states • Density of states for photons, • Transition rates (Fermi's golden rule) • Optical loss and gain; Photovoltaic effect, Exciton • Drude model.	6	17%
4	**Module 4: Measurements** • Four-point probe and Van Der Pauw measurements for carrier density, • Resistivity and hall mobility • Hot-point probe measurement, capacitance-voltage measurements, • Parameter extraction from diode I-V characteristics, DLTS, • band gap by UV-Vis spectroscopy, absorption/transmission.	6	17%

5	**Module 5: Superconductivity**
	• Introduction of Superconductivity
	• Properties of superconductor
	  • Effect of magnetic field
	  • Meissner effect
	  • Pressure effect
	  • Impurity effect
	  • Isotopic mass effect
	• Mechanism of Superconductivity : BCS Theory
	• Penetration depth : Magnetic field
	• Josephson's junction and its application
	Application of superconductors
		6	17%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	**40**	**30**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

References:
1. 1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. 2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. 3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4. 4. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications,

Oxford
5. University Press, New York (2007).
6. 5. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
7. Engineering Physics by Dattu R Joshi, McGraw hill Publications.

Extra Study Material
1. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
2. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Course Outcome:

Sr. No.	CO statement	% weightage
CO-1	The student will gain knowledge of basic theoretical and mathematical concept of electronic materials.	22%
CO-2	The student will demonstrate understanding of basic principles, properties and applications associated with semiconducting materials.	27%
CO-3	The student will demonstrate understanding of basic theory and properties associated with optoelectronic materials.	17%
CO-4	The student will gain knowledge of the different measurements techniques to characterize various semiconducting, electrical and optoelectrical materials and devices.	17%
CO-5	The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.	17%

List of Experiments:

1. To measure the dielectric constantofa material
2. To study the Hall-Effect.
3. To study the I-VCharacteristic of Silicon diode.
4. To study the I-VCharacteristic ofZenerdiode.
5. To study the I-VCharacteristic ofLED.
6. To determine the efficiency ofgiven solarcell.
7. To measure the Resistivity & Band gap ofGermanium Crystal (N-type)by Four Probe Method.
8. To measure thenumerical aperture ofopticalfiber.
9. To Study ofpropagation & bending loss in optical fiber.
10. P-N Junction diode as Bridge Rectifier.
11. Energy gap of Semiconductor
12. Study of cathode ray oscilloscope
13. Time constant of an R-C circuit.
14 L-C-R Circuit.
15.Logic Gates
16. Virtual Laser Optics Lab
17.Virtual Solid-State Physics Lab
18. Virtual Harmonic Motion & Waves Lab
19.Virtual Optics Lab
20. Virtual Modern Physics Lab
21.Virtual Physical Sciences Lab

w.e.f. AY 2018-19

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110012

WORKSHOP/ MANUFACTURING PRACTICES
B.E. 1st YEAR

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
0	0	4	2	0	0	80	20	100

Contents:
Introduction to various shops / sections and workshop layouts. Safety norms safety equipment's to be followed in a workshop.
Demonstration of hand tools, power tools, basic measuring instruments, marking and measurement. Overview of Carpentry, Fitting, Smithy shop, Welding, Tin smithy, Electrical and Electronic, Plumbing, Machine shop and machine tools.

Practice:
Students are required to prepare one job each in the following shops: Fitting, Carpentry, Smithy /Tin smithy, Electric Arc welding/ Resistance welding.
Demonstrations of Jobs in following machine shops: Lathe Machine, Drilling Machine, Hacksaw Machine

Course Outcome:

Sr. No.	CO statement
CO-1	Understand various manufacturing processes in machine shop and perform basic operations of welding, fitting, smithy and carpentry work a) perform basic operations of welding, fitting, smithy and carpentry work b) Explain various manufacturing processes in machine shop
CO-2	Discuss application of plumbing fitting, masonry items and about plastic molding and glass cutting for various engineering application
CO-3	Measure different electrical quantities and trouble shoot electrical and electronics appliances.
CO-4	Conduct experiments with various kits such as Raspberry and Arduino for embedded system development
CO-5	Use basic commands of computer operating systems

Workshop Practice:

1) Machine shop
2) Fitting shop
3) Carpentry
4) Welding shop
5) Electrical
6) Electronics
7) Casting
8) Smithy
9) Plastic moulding & Glass Cutting
10) Plumbing and its fitting
11) Masonry Work
12) IOT
13) **Software Tools & OS Commands**

List of Experiments

Machine shop
1. Demonstration of job on Lathe machine
2. Demonstration of job on Drilling machine
3. Study of different types of power tools

Fitting Shop

Hands on Practice and job making in Fitting shop

Carpentry

Hands on Practice and job making in Carpentry shop.

Welding shop
1. Hands on Practice and job making using Electric arc Welding / Resistance welding process
2. Hands on Practice and job making using Soldering process

Casting:

Demonstration of Pattern Making by sand moulding

Smithy

Hands on Practice and job making in Smithy/ Tin smithy shop.

Plumbing and its fitting
1) Types of Pipes and Fittings
2) Joints (PVC and Metal)
3) Plumbers tools and equipment's
4) Cutting and bending of different mental pipes

5) Pipe fitting
6) Plumbing symbols
7) Plumbing services
8) Sanitary Pipes and Fittings
9) Joints

Plastic moulding & Glass Cutting

Masonry Work
1) Different types of Bricks
2) Different size and part of Bricks
3) Different types of Bonds
4) Types of tools used for various masonry works

Electrical

1. Measure voltage, current, frequency, phase difference, power, power factor for single and three-phase supply
2. Wire fan, tube light, two-way control (staircase wiring).
3. Wire MCB, ELCB for a given load circuit
4. Preparing the drawing for wiring a newly built room, without any electrical wiring along with a bill of materials with specifications; the room may be a class-room, an office, a shop, a clinic, a small workshop etc.
5. Identify and rectify open circuit, and short circuit faults in PCB/System
6. Solder and de-solder electronic components on different types of PCB
7. Identify various types of ports and connectors

Electronics:

1) Introduction to basic electronics components and its testing: Resistors, Inductors, Capacitor, Diode, BJT
2) Introduction to testing and Measurement Instruments: Power Supply, Function Generator, Oscilloscope

IOT

Arduino starter kits or raspberry pi

i.e. Arduino Starter kit mostly includes following:, Similarly for Raspberry pi use whatever required

- An Arduino or Raspberry
- Jumper wires
- Resistors
- Breadboard
- LEDs
- Buttons

Case Studies/Demonstration

1. Arduino LED On/Off

2. Or Raspberry LED/On

It requires

- LED
- Resistor
- Connecting wires

3. Arduino alarm system which detects movement of an intruder with a high pitched alarm sounds and flashing lights.

It requires

- An ultrasonic "ping" sensor –HC-SR04 or PIR
- A piezo buzzer
- LED strip light

4. Arduino Trafiic Light Controller

5. raspberry pi on screen keyboard app.

It requires

- Red, yellow and green LEDs.
- A breadboard.
- 6 x 220 resistors.
- Connecting wires.
- 1 x pushbutton switch.
- 1 x 10k resistor

Software Tools & OS Commands

- **Dream weaver Web development Too**l

Student Has to build his own Web Site consisting of basic profile about his department,his own personnel profile and basic Institute Details

Student Has to learn any of Two OS (Windows,Linux,Unix,MacOS,Apple,Android)

Student has to learn basic Windows and Linux/Ubuntu shell commands and have to develop simple shell script.

Journal is to be prepared covering the topics of demonstration and report about process / methodology /

inspection for making jobs.

Major Equipment: Lathe machine, drilling machine, grinding machine, Resistance and Arc Welding machine, Hacksaw machine, Fitting, Carpentry and Plumbing vice, various types of files for fitting shop, hand hacksaw, monkey spanner, die, chisels, jack plane, furnace, anvil, different types of hammers for various shops, tongs, scissors, hand shear machine, sheet cutter, welding goggles, welding gloves, Soldering iron, Moulding box, different wooden/ metal patterns.

List of Open Source Software/learning website: http://nptel.iitm.ac.in/courses.php

Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.
3. Workshop Technology Vol. 1 and 2 by Raghuvanshi B.S. Dhanpat Rai & Sons1998
4. Workshop Technology by Chapman W.A. J and Arnold E. Viva low priced student edition, 1998
5. Workshop Practices, H S Bawa, Tata McGraw-Hill,2009

P.S: Out of 13 activities, college has to opt for any 8 activities for a specific branch.
Each activity will be of 4 hours per semester.