Jharkhand University of Technology												
Course Structure												
Session-2023-24												
Diploma (Second Semester)												
Branch: Automobile Engg./Mechanical Engg./Metallurgical Engg./ Mechanical Engineering (Automobile)												
Sl. No	**Course Category/Teaching Dept.**	**Course Code**	**Course Title**	**L**	**T**	**P**	**J**	**Cr**	**FM**	**Overall Pass Marks**	**Internal (CIE)**	**External(SEE)**
				Hours Per Week								
THEORY COURSES												
1	ES	SEC201	Project Management Skill	3	-	-	6	3	100	40	30	70
2	BS	AEC201	Statistic and Analytics	3	-	-		3	100	40	30	70
3	BS/ES	BSC201	Fundamental of Electrical & Electronic Engg.	3	-	-		3	100	40	30	70
4	ES/ME	MET201	Materials for Engg.	3	-	-		3	100	40	30	70
Total				**12**	-	-		**12**	**400**	--	--	--
PRACTICAL COURSES												
5	ES/ME	SEC201P	Project Management Skill Lab	-	-	3	-	1.5	50	25	30	20
6	BS/ES	BSC201P	Fundamental Electrical & Electronic Engg. Lab	-	-	3		1.5	50	25	30	20
7	BS/ES/CS	AEC201P	Statistic and Analytics Lab with using Excel/Python	-	-	3		1.5	50	25	30	20
8	ES/ME/CE	MEC201P	Advance Computer Aided Engineering Drawing	-	-	3		1.5	50	25	30	20
Total						**12**		**6**	**200**	--	--	--
AUDIT COURSES												
9	AU/SC	AUC201	Environment Sustainability	3	-	-	-	0	100	40	30	70
10	AU/PA	AUC202P	NSS/NCC/Creative Arts/Yogaand Meditation/Music/ Dance	6				0	50	25	30	20
								Student shall participate actively in any one of the activities and for award of Diploma "Participation Certificate" in activity will be mandatory. Student participation shall be monitored & participation record shall be maintained atinstitute level.				
INTERNSHIP												
11	INT	INT201P	Summer Internship	6 to 8 Weeks				**2**	--	--	**1/0**	--
Grand Total				**15**	0	**12**	**6**	**20**	**750**	--	--	--

Note-L-Lecture, T-Theory, P-Practical, ES- Engineering Science, BS- Basic Science, SC-Science, AU- Audit Course, PA- Physical Activity, INT- Internship (Completion of internship will be marked as-1; Non-completion of internship will be marked as-0 by the institution; The submitted write up & presentation record shall be kept safely by the institution), CIE- Continuous Internal Evaluation, SEE- Semester End Evaluation.

Project Management Skill

Subject Code – SEC201

Unit No And Name	DETAILED COURSE CONTENT
1. Introduction	1.2 Meaning of Project
	1.3 Definition and No Change Mode
	1.4 Features of a Project
	1.5 Types of Projects
	1.6 Benefits of Project Management
	1.7 Obstacles in Project Management
	1.8 Project Management – A Profession
	1.9 Project Manager and His Role
	1.10 Project Consultants
	1.11 What is Operation?
	1.12 Difference between Project and Operation
	1.13 What is Process in Project Management and Process Groups?
	1.14 What is Scope? Difference between Project Group Objectives and
	1.15 Project Scope
2. Project Administration	2.1 Essentials of Project Administration
	2.2 Project Team
	2.3 Project Design
	2.4 Work Breakdown Structure (WBS)
	2.5 Project Execution Plan (PEP)
	2.6 Contracting Plan
	2.7 Work Packing Plan
	2.8 Organization Plan
	2.9 Systems and Procedure Plan
	2.10 Project Procedure Manual
	2.11 Project Diary

	2.12 Project Execution System
	2.13 Project Direction
	2.14 Communication in a Project
	2.15 Project Co-ordination
	2.16 Pre-requisites for Successful Project Implementation
3. Project Lifecycle	3.1 Introduction
	3.2 Phases of Project Life Cycle
	3.3 Project Management Life Cycle – General
	3.4 Project Planning
	3.5 Project Execution
	3.6 Project Closure
	3.7 Project Risks
	3.8 Types of Risks: Illustrations
	3.9 Risk Assessment Techniques with Illustrations
	3.10 Project Cost Risk Analysis
	3.11 Estimating Time and Cost Overrun Risks
	3.12 Organization/Procedural/Systemic Reasons for Project Cost Overruns
	3.13 Time Overruns
4. Project Planning, Schedulingand Monitoring	4.1 Introduction
	4.2 Nature of Project Planning
	4.3 Need for Project Planning
	4.4 Functions of Project Planning
	4.5 Steps in Project Planning
	4.6 Project Planning Structure
	4.7 Project Objectives and Policies
	4.8 Tools of Project Planning
	4.9 Project Scheduling
	4.10 Time Monitoring Efforts

	4.11 Bounding Schedules
	4.12 Scheduling to Match Availability of Manpower
	4.13 Scheduling to Match Release of Funds
	4.14 Problems in Scheduling Real-life Projects
	4.15 Introduction
	4.16 Situation Analysis and Problem Definition
	4.17 Setting Goals and Objectives
	4.18 Generating Structures and Strategies
	4.19 Implementation
	4.20 What is Project Evaluation?
	4.21 Why is Project Evaluation Important?
	4.22 What are the Challenges in Monitoring andEvaluation?
5. Project Control, Review andAudit	5.1 Introduction
	5.2 Projected Control Purposes
	5.3 Problems of Project Control
	5.4 Gantt Charts
	5.5 Milestone Charts
	5.6 Critical Path Method (CPM)
	5.7 Construction of a Network
	5.8 Network Technique in Project Scheduling
	5.9 Crashing Project Duration through Network
	5.10 Project Review
	5.11 Initial Review
	5.12 Post Audit
	5.13 Performance Evaluation
	5.14 Abandonment Analysis

	5.15 Objectives of Project Audit
	5.16 Functions of Project Auditor
	5.17 Project Audit Programme
	5.18 Difficulties in Establishing Audit Purpose and Scope
6. Digital Project Management	6.1 Digital Technology trends in Project management
	6.2 Cloud Technology, IoT, AR and VR applications in Project management, Smart Cities
	6.3 Data Science and Analytics in Project Management
	6.4 Case Studies

SUGGESTED LEARNING RESOURCES

Sl No.	Author	Title of Books	Publication/Year
1	**Dr. Lalitha Balakrishnan & Dr. Gowri Ramachandran**	**Project Management**	**Himalaya Publishing, 2019**
2	Shailesh Kumar Shivakumar	Complete Guide to Digital Project Management	Apress, 2019
3	Prasanna Chandra	Project planning, analysis, selection, implementation and review	Tata McGraw Hill
4	Gopala Krishnan	Project Management	Mcmillan India Ltd.

STATISTICS AND ANALYTICS

Subject Code – AEC201

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics
UNIT-1 **STATISTICAL DATA COLLECTION AND TYPES**	Able to collect statistical data. Able to distinguish the data types. Understands the usage of data collection tools Able to specify problem statement for data collection Able to collect data pointing the root cause of the problem statement.	a Definition of data and classification (qualitative quantitative discrete and continuous data). b Data collection tools i) Questionnaires. ii) Survey. iii) Interviews. iv) Focus group discussion. 1.3 Data cleaning.
UNIT-2 **SUMMARIZATION OF DATA**	Sketches bar, pie and histograms on Microsoft Excel spread sheet. Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. Sketches bar, pie and histograms on Microsoft Excel spread	a Descriptive statistics v) Datatabulation(frequency table vi) Relative frequency table. b Grouped data vii) Bar graph viii) Pie chart ix) Line graph x) Frequency polygon xi) Frequency curve xii) Relative frequency polygon xiii) Histograms xiv) Box plot xv) Leaf-stem plot To be done in Microsoft excel.

	sheet. Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet.	
UNIT-3 **MEASURE OF LOCATION AND DISPERSION**	Able to determine the descriptive statistical variables using Microsoft Excel. Able to determine the absolute measures of dispersion of the given data set. Explain the symmetry and asymmetry of the distributed data.	a Determination of central tendencies Range, Mean, Mode and Median for the data in Microsoft excel. b Determination of absolute measures of dispersion for data like range quartile deviation, mean deviation, standard deviation and variance in Microsoft Excel. c Skewness and kurtosis graphs in Microsoft excel and interpretations of results.

UNIT-4 **INTRODUCTION TO PYTHON PROGRAMMING**	Able Install and run the Python interpreter. Create and execute Python programs. Understand the concepts of file I/O. Able to read data from a text file using Python. Learn variable declarations in Python. Learn control structures.	4.1 Introduction to PYTHON. 4.2 Syntax of PYTHON. 4.3 Comments of PYTHON. 4.4 Data types of PYTHON. 4.5 Variables of PYTHON. 4.6 If-else in PYTHON. 4.6 Loops in PYTHON. 4.7 Arrays and functions in PYTHON.

STATISTICS AND ANALYTICS LAB

Subject Code – AEC201P

SL NO	Practical outcomes/Practical exercises
1	Prepare a questionnaire (closed end) containing 25 questions for a specified problem statement: for example experience of an individual in a restaurant.
2	Prepare a Google form for a specified problem statement to collect the dataset. (for example questionnaire to conduct online quiz)
3	Send out a survey on your problem statement to number of 50 (By Google forms) and collect the data.
4	Remove duplicate or irrelevant observations. Remove unwanted observations from the dataset provided, including duplicate observations or irrelevant observations.
5	In Microsoft Excel spread sheet draw the frequency distribution table for the given data (data set should contain minimum 50 data).
6	In Microsoft Excel spread sheet draw the relative frequency distribution table for the given data (data set should contain minimum 50 data).
7	Using Microsoft Excel spread sheet plot bar graph for the data collected from 100 people(for example, conduct a survey on the favorite fruit of a person in your locality(restricting to 5 to 6 fruits). Explain the bar graph with minimum 30 words.
8	Using Microsoft Excel spread sheet plot pie chart for the data collected from 50 people(for example, conduct a survey on the smokers with respect to their ages in your locality. Explain the pie chart with minimum 30 words.
9	Using Microsoft Excel spread sheet draw a line graph for the given dataset.
10	Using Microsoft Excel spread sheet draw frequency polygon and frequency curve for the data collected from 50 people. (For example, marks obtained by the students in your class in 5 subjects in previous examination). Explain your observations from the graph in minimum 30 words.

11	Using Microsoft Excel spread sheet construct a box plot for the given dataset. (For example dataset can be the number of passengers in a flat form at different time in a day).
12	Using Microsoft Excel spread sheet construct a leaf plot for the given dataset. Explain the graph with minimum 30 words.
13	Using Microsoft Excel spread sheet find the Mean, Mode and Median for the data (univariate data) given and also represent them in a Histogram.
14	Generate a 50 random data sample (even and odd number dataset) using Microsoft Excel spread sheet and determine the range and Quartiles.
15	Collect the current yield of a crop from 50 different persons (problem statement can be changed according
	to priorities of the tutor) in your locality and determine mean deviation and Quartile deviation in Microsoft excel spread sheet and brief your inference with less than 30 words.
16	Collect the data of any 2 livestock population from 50 different houses in your locality (problem statement can be changed according to priorities of the tutor) and determine standard deviation for both the two separately in Microsoft excel spread sheet and brief your inference with less than 30 words.
17	Collect the data of two wheeler (with a rider and a pillion) crossing a busy junction in your locality in the peak hours (problem statement can be changed according to priorities of the tutor) and determine the variance of the data in Microsoft excel spread sheet and brief your inference with less than 30 words.
18	Using Microsoft Excel spread sheet draw a Skewness graph and kurtosis graph for randomly generated dataset.
20	Write a python program to add 2 integers and 2 strings and print the result.
21	Write a python program to find the sum of first 10 natural numbers.
22	Write a python program to find whether the number is odd or even.
23	Write a python program to find the variance and standard deviation for the given data..
24	Write a python program to display student marks from the record.

25	Write a python program to create a labeled bar graph using matpoltlib. pyplot.
26	Write a python program to create a labeled pie chart using matpoltlib. pyplot.

SUGGESTED LEARNING RESOURCES:

1. Statistical Analysis with Excel For Dummies (For Dummies Series) Paperback – Import, 9 April 2013 by Joseph Schmuller (Author)
2. https://www.brianheinold.net/python/A_Practical_Introduction_to_Python_Programming_Heinold.pdf
3. http://www.bikeprof.com/uploads/9/0/6/5/9065192/excel_stats_handout_npl.pdf
4. https://adminfinance.umw.edu/tess/files/2013/06/Excel-Manual1.pdf
5. https://www.brianheinold.net/python/A_Practical_Introduction_to_Python_Programming_Heinold.pdf
6. Introduction to Python programming for beginners by Vivian Baily Kindle edition.
7. PYTHON PROGRAMMING: Python programming: the ultimate guide from a beginner to expert by Clive Campbell.
8. Open source for python: https://hub.gke2.mybinder.org/user/jupyterlab-jupyterlab-demo-zfkdwy4y/lab

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code -BSC201

Sl No	Unit skill set (In cognitive domain) *On successful completion of the class, the students will be able to*	Topics/Sub topics	Practical	
		UNIT-1 **Electrical Safety**		
1	Comply with the Electrical safety	1. Electrical Symbols 2. Electrical safety • Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution • Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation http://nreeder.com/Flash/sym	1. Electrical symbols related to electrical engineering. 2. Electrical safety	
		bols.htm http://bouteloup.pierre.free.fr/ iufm/as/de/house/safety.html		
		UNIT-2 **Electrical Fundamentals**		

2	1. Identify and select the different measuring devices. 2. Identify different electrical supply systems 3. Identify open circuit, close circuit and short circuit conditions.	1. Describe the sources of electrical energy. 2. Electrical current, voltage, emf, potential difference, resistance with their SI units. 3. Mention the meters used to measure different electrical quantities. 4. Explain supply systems like AC, DC. 5. Describe open circuit, close circuit and short circuit http://nreeder.com/Flash/units.htm	1. Identification of measuring devices. 2. Measure current, voltage and analyses the effects of shorts and opens in series/parallel circuits.	
3	Calculate basic electrical quantities	• Behavior of V, I in Series and Parallel DC circuits. • Relationship between V, I and R. http://nreeder.com/Flash/ohmsLaw.htm	1. Measure the voltage and current against individu al resistance in electrical circuit. 2. Compare the theoretical values with actual in the circuit.	
4	Connect resistances in different combination	1. Equation to find the Resistances connected in series 2. Equation to find Resistances connected in parallel series and 3. Resistances connected parallel combinations 4. Simple problems.	1. Determine the equivalent Resistance of series connected resistances. 2. Determine the equivalent Resistance of parallel connected resistances.	
5	Calculate and measurement of different parameters of an AC quantity.	**Ac sinewave: S**inusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, and their units. http://nreeder.com/Flash/freqPeriod.htm http://nreeder.com/Flash/oscilloscope.htm	Demonstrate the measure ment of frequency, time period and phase difference of AC quantity using CRO and function generator.	

6	1. Calculate and measure electric power and energy 2. Identify and differentiate Single phase and Three phase supply	1. Electrical work, energy, power and power factor • SI units • Mention the meters used to measure them 2. Single phase and Three phase supply http://nreeder.com/Flash/powerLaw.htm	• Measure the voltage, current, power and energy using relevant measuring instruments in a single-phase load. • Compare the theoretical values with actual in the circuit. • Measure the voltages in Single phase and Three phase supply.	
UNIT-3 **Protective Devices and Wiring circuit s**				
7	Identify and select Protective Devices for given current and voltage rating	1. Necessity of Protective Devices 2. Various Protective devices and their functions • fuse wire, • Glass cartridge fuse • HRC fuse • Kit-kat fuse • MCB • MCCB • RCCB • ELCB • Relay 3. Earthing • Types • Pipe earthing • Plate earthing	1. Identification and Selection of various prot ective devices 2. Inspection of their instal lation in the college buil ding/public building.	
8	Identify and select the various electrician tools	1. Different types of electrician tools and their function. 2. Describe various wiring tools. 3. State procedure of care and maintenance of wiring tools.	Identification and selection of different tools.	

9	1. Identify and select Wiring systems for a given applications 2. Identify and select the cables used for different current and voltage ratings. 3. Draw the wiring diagram	1. Describe different types of wiring systems. • Surface conduit • concealed conduit • PVC casing capping 2. Wiring systems and their applications. 3. Describe the types of wires, cables used for different current and voltage ratings.	1. Identification and selection of different Wiring systems. 2. Wire up and test PVC Conduit wiring to control of 2 sockets and 2 lamps. 3. Wire up and test PVC Conduit wiring to control one lamp from two different places.	
10	Estimate and plan electrical wiring	Explain Plan and estimate the cost of electrical wiring for one 3m × 3m room consisting of 2 lamps, 1ceiling fan, 2 three pin sockets.	Prepare the estimation and plan	
UNIT-4 **Electrical Machines and Batteries and UPS**				
11	1. Identify the types of transformer. 2. verify the transformation ratio.	**Transformer** • working principle • Transformation ratio • Types and applications with their ratings	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	
12	1. Start and run the induction motor. 2. Troubleshoot DOL/Stardelta starter and induction motor	1. **Induction motor** • Types Induction motor and applications • Difference between single and three phase motors • Necessity of starters for AC motors • Describe different types of starters and applications 2. What are different causes and remedies for a failure of starter and induction motor.	1. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Stardelta starter. 2. Troubleshoot the DOL/S tar-delta starter and induction motor	
13	Select and test the battery for a given application	**Battery** • Types of batteries (Lead acid battery, lithium, sealed maintenance free (SMF) battery, Modular battery). • Selection criteria of batteries for different applications. • Ampere-Hour Capacity. • Efficiency	Testing Condition of a Lead-acid battery	

14	Select the size of the UPS for a given application	**UPS** • List the types and applications • Selection criteria of UPS • Sizing of UPS	Sizing of UPS	
UNIT-5 **Introduction to Electronic Devices and Digital Electronics**				
15	Identify and differentiate Conductors, insulators and semiconductors.	Compare Conductors, insulators and semiconductors with examples http://nreeder.com/Flash/resistor. htm	Identification of types and values of resistors-color codes. Determine the value of resistance by color code and compare it with multimeter readings.	
16	Identify and test PN junction Diode	**PN junction diode** • Symbol • Characteristics • Diode as switch. • Types of diodes and ratings • Applications	Identify the terminals of a Diode and test the diode for its condition.	
17	Build and test bridge rectifier circuit	**Rectifier** • Need for AC to DC conversion • Bridge rectifier with and without C filter, • Rectifier IC.	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.	
18	1. Identify and test Transistor 2. Build and test transistor as an electronic switch	**Transistor (BJT)** • Symbol • Structure • Working principle	1. Identification of transistor terminals and test. 2. Construct and test the transistor as an electronic switch	
19	1. Identify and test various Sensors and actuators.	**1. Sensors** • Concept • Types: Temperature, Pressure, Water, Light, Sound, Smoke, proximity Sensors, Flow, humidity, voltage, vibration, IR (Principle/working, ratings/ specifications, cost, and applications) **2. Actuators** • Concept • Types and applications.	1. Connect and test an IR proximity sensor to a Digital circuit. 2. Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)	

		• Relay as an actuator.		
20	1. Identify and test different digital IC	• Comparison of analog and digital signal • Digital systems, examples. • Binary numbers, Boolean identities and laws. • Digital system building blocks: Basic logic gates, symbols and truth tables. • IC-Definition and advantages.	• Test a Digital IC. • Identification and selection of suitable ICs for basic gates. • Verify NOT, AND, OR, NOR, EXOR and NAND gate operations (two inputs).	
21	Know the application of Microcontroller and PLC	• Microcontroller as a programmable device, and list of real-world applications. • PLC and Their applications.	• Identify different application microcontroller. • Identify commercially available PLC and their specifications	

FUNDAMENTAL OF ELE. & ELECTRONICS PRATICAL

Subject Code -BSC201P

Sl. No.	Practical Out Comes/Practical exercises
1	1. Collect/draw standard prominent electrical symbols related to electrical engineering. 2. Identify Various types of safety signs and what they mean
2	• Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a person from electrocution • Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionary activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation
3	1. Identification Measuring devices • Ammeter • Voltmeter • Wattmeter • Ohmmeter • Digital Multimeter • Megger • Tong tester 2. Measure current, voltage and analyses the effects of shorts and opens in series / parallel circuits.
4	Measure the voltage and current against individual resistance in electrical circuit. Compare the theoretical values with actual in the circuit.
5	1. Determine the equivalent Resistance of series connected resistances. 2. Determine the equivalent Resistance of parallel connected resistances.
6	Demonstrate the measurement of frequency, time period and phase difference of AC quantity using CRO and function generator.
7	Measure the voltage, current, power and energy using relevant measuring instruments in a Single-phase load. Compare the theoretical values with actual in the circuit. Measure the voltages in Single phase and Three phase supply.

8	1. Identification and selection of various protective devices. • HRC fuse • Kit kat fuse • MCB • MCCB • RCCB • ELCB • Relay Videos/Presentations/Discussion on different protective devices. 2. Inspection of their installation in the college building/public building.
9	Identification and selection of different tools. Handson use of the tools for appropriate applications. Combination plier, Cutting Plier, Nose plier, screw driver set, line tester, Poker, Hand Drill, Power Drill, Concrete Drill, Megger, Earth tester, Continuity tester, crimping tool, wire cutter, Wire splicer, wire stripper standard wire gauge, soldering iron, wooden mallet, ball pin hammer, testing board
10	1. Identification and selection of different tools. Handson use of the tools for appropriate applications. Surface conduit • concealed conduit • PVC casing capping 2. Wire up and test PVC Conduit wiring and practice control of 2 sockets and 2 lamps.
11	Wire up and test PVC Conduit wiring to control one lamp from two different places.
12	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 CFL 1ceiling fan, 2 three pin sockets.
13	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.
14	Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/star-delta starter.
15	Troubleshoot the DOL/Star-delta starter and induction motor
16	Testing Condition of a Lead-acid battery
17	Estimate the UPS rating for a computer lab with 50 computers/domestic.
18	1. Identification of types and values of resistors-color codes. 2. Determine the value of resistance by color code and compare it with multimeter readings
19	Identify the terminals of a Diode and test the diode for its condition.

20	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare the waveforms using CRO.
21	Identification of transistor terminals and test. Construct and test the transistor as an electronic switch.
22	Connect and test an IR proximity sensor to a Digital circuit.
23	Connect and test a relay circuit using an Optocoupler. (Photo Diode & Transistor)
24	Test an IC. Verify the truth-table AND, OR, NOT logic gates.
25	Verify the truth-table NAND, NOR, EX-OR, EX-NOR logic gates.
26	1. Identify MCS-51 variants 2. Identify commercially available PLC and their specifications.

Reference Books:

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014 Edition.
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineering byV. Mittle and ArvindMittle, McGrawHill Companies, 2005 Edition.
5. The 8051 Microcontroller & Embedded systemsusinkbnnnjbbh bb vvvvg assembly and C (2ndEdition)–M.A.Mazidi , J.C. Mazidi&R.D.McKinlay ISBN: 81-317-1026-2
6. Programmable Logic controllers, W BOLTON

e-Resources

1. https://www.youtube.com/watch?v=mc979OhitAg&list=PLWv9VM947MKi_7yJ0_FCfzTBXpQU-_Qd3K
2. https://www.youtube.com/watch?v=CWulQ1ZSE3c
3. en.wikipedia.org/wiki/Transformer
4. www.animations.physics.unsw.edu.au//jw/AC.html
5. www.alpharubicon.com/altenergy/understandingAC.htm
6. www.electronics-tutorials
7. learn.sparkfun.com/tutorials/transistors
8. www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
9. www.technologystudent.com/elec1/transis1.htm
10. www.learningaboutelectronics.com
11. www.electrical4u.com
12. https://www.youtube.com/watch?v=zLW_7TPf310
13. https://www.youtube.com/watch?v=8PTNjw-hQIM

MATERIALS FOR ENGINEERING

Subject Code- MET201

UNIT NO	Unit Learning outcomes (In cognitive domain)	Topics/Subtopics
UNIT-1 BASICS OF ENGINEERING MATERIALS	1. Identify the crystal structure of the given material 2. Explain specimen preparation procedure 3. Distinguish various engineering properties of materials	1.1 Classification of Engineering Material 1.2 Structure of metal-unit cell, BCC, FCC and HCP structures 1.3 Types of microscopes 1.4 Specimen preparation procedure 1.5 Properties of metals-Physical-mechanical-Thermal properties
UNIT-2 STEELS AND ALLOYS	1. Select relevant cast iron for the given job with justification 2. Select relevant steel for the given application 3. Able to designate different plain and alloy steel, cast iron as per BIS, ASME	2.1 Types of cast iron-White-grey-Nodular-malleable - Selection of appropriate cast iron for engineering application 2.2 Broad classification of steels I. Plain carbon steels-Definition-types-properties-composition and applications of low-medium-high carbon steels II. Alloy steels-definition-effect of alloying elements on properties of alloy steel III. Tool steel-cold worked-Hot work tool steel-High speed steel(HSS) IV. Stainless steel-Types and application V. Spring steel-composition and application 2.3 Steels for following-shaft -axles-bolts-nuts-Agriculture Equipment's-household utensils-Antifriction bearings. 2.4 Designation and coding (as per BIS,ASME) of plain & alloy steel and cast iron.
UNIT-3 NON FERROUS METALS AND ALLOYS	1. Describe the properties and application of the given copper alloy 2. Describe the properties and application of the given Aluminum alloy 3. Describe the properties and application of the given Nickel alloy 4. Describe the properties and application of the given Bearing material 5. Select relevant non ferrous material for specified application with justification	3.1 Copper and its alloys-Brasses-Bronzes-Chemical composition-Properties and applications 3.2 Aluminum and its alloys-Y-Alloy-Hindalium-duralium with their -Chemical composition-Properties and applications. 3.3 Nickel and its alloys with their -Chemical Composition-Properties and applications 3.4 Bearing materials like White metal (Sn based), Aluminum Bronzes-Self-lubricating Bearings

UNIT-4 **NON METALIC AND ADVANCED MATERIALS**	1. Distinguish between metallic and non metallic materials on the basis of given composition 2. Select relevant non metallic material for the given job with justification 3. Select relevant Composite material for the given job with justification 4. Select relevant Alternative material for the given job with justification	4.1 Polymeric materials-Polymer-types-characteristics 4.2 Classification of Polymers on basis of Thermal behavior -Thermo plastics and thermo setting plastics-Properties –uses 4.3 Ceramics-types of ceramics-properties and applications 4.4 Composite materials-properties and application of laminated and fiber reinforced materials 4.5 Advanced engineering materials-properties and application of, Biomaterials, nano materials and smart materials 4.6 Designation and coding of important non metallic materials as per BIS
UNIT-5	1. Interpret Iron–carbon equilibrium diagram of Mild steel 2. Identify the given phase diagram and reactions with justification 3. Conceptualize with sketches the specified heat treatment process 4. Select relevant Heat treatment process for the given material with justification	5.0 Concept of phase-pure metal-alloy –Solid solution 5.1 Iron–carbon equilibrium diagram indicating various phases-Critical temperature and its significance-Reactions on Iron carbon equilibrium diagram of Mild steel 5.2 Heat treatment-Definition- purpose of heat treatment-–Mechanism of heat treatment Types of heat treatment process 5.3 Annealing-purposes of annealing-Annealing temperature range-applications. 5.4 Normalizing- purposes of Normalizing-temperature range-Broad applications 5.5 Tempering-Purposes of tempering-Types of tempering-Applications 5.6 Hardening -purposes of hardening - temperature range- Broad applications of hardening 5.7 Case hardening- Carburizing-Nitriding-Cyaniding
UNIT-6 **SURFACE TREATMENT FOR MATERIALS**	1. Describe corrosion and its prevention 2. Select proper electrolysis process for surface coating	6.1 Corrosion-types and reasons for corrosion, protection from corrosion 6.2 Surface protection treatments-Methods of Surface treatments. 6.3 Electrolytes and Non-electrolytes – definition-Types of electrolytes 6.4 Construction and working of electro chemical cell 6.5 Electro-chemical series, galvanic series. 6.6 Surface coating through electrolysis-setup and working.

SUGGESTED LEARNING RESOURCES:

Sl.No.	Author	Title of Books	Publication/Year
1	J. W. Martin	Materials for engineering	WOODHEAD PUBLISHING LIMITED Cambridge England
2	GBS Narang	Materials science	Khanna Publishers, New Delhi.
3	R.K.Rajput	Materials science	Laxmi Publication, Dariyaganj, New Delhi.
4	R.S.Khurmi &R.S.Sedha	Materials science	S.Chand
5	D.S.Nutt	Materials science and metallurgy	S.K.Katariya and sons, Delhi.
6	V.Raghavan	Materials science and Engineering	EEE Edition, Prentice Hill, New Delhi.
7	Sidney Avner	Physical Metallurgy	Tata McGraw-Hill Education (2011).

Advance Computer Aided Engineering Drawing

Subject Code – MEC201

Unit	Major Learning Topics and Sub- Topics	Outcomes (in cognitive domain)
UNIT-1 Basic elements of Drawing	1.1 List the different drawing instruments and application 1.2 Convention of lines and its application (Thick, Thin, Axis etc.,) 1.3 Practice use of drawing instruments 1.4 Representative fraction 1.5 Scales - Full Scale, Reduced Scale and Enlarged Scale 1.6 Dimensioning a. Aligned system and Unidirectional system in the Sketches b. Chain dimensioning and Parallel dimensioning 1.7 Construct different polygons	1. Drawing equipments, instruments and materials. 2. Equipments-types, specifications, method to use them, applications. 3. Instruments-types, specifications, methods to use those and applications. 4. Pencils-grades, applications, Different types of lines. 5. Scaling technique used in drawing. 6. Dimensioning methods.- Aligned method. Unilateral with chain, parallel dimensioning. 7. Constructions of geometrical figures
UNIT-2 Introduction to Projections	2.1 Introduction to Projections-Principle Planes of Projection and Principle Views 2.2 Introduction to First angle and Third angle method, their symbols 2.3 Projection of points in All 4 Quadrants	1. Reference planes, orthographic projections. 2. Concept of quadrant, 1st angle and 3rd angle projection and their symbols. 3. Projection of points.
	2.4 Projection of Lines a) Parallel to both the planes b) Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another	1. Projection of lines determination of true length and inclinations for following cases. (a) Line parallel to one or both the plane. (b) Line perpendicular to one of the plane. (c) Line inclined to one plane and parallel to another.
	2.5 Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two b) Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP)	1. Projection of Planes. (a) Types of planes. (b) Projection of planes parallel to one of the reference planes. (c) Projection of plane inclined to one reference plane and perpendicular to another. Note: *Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.*

	2.6 Projection of Solids for the above conditions	1. Projections of solids in various positions with respect to the reference planes. (Parallel, perpendicular and inclined to HP and / or VP.)
UNIT-3 **EXPOSURE TO CAD**	3.1 Introduction to CAD- Hardware requirements. 3.2 Various CAD software available 3.3 Familiarization of CAD window - Commands like New file, Saving the file, Opening an existing drawing file, Creating templates 3.4 Setting up new drawing: Units, Limits, Grid, Snap. Standard sizes of sheet. 3.5 Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview 3.6 Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text Applying constraints - horizontal, vertical, parallel, concentric, perpendicular, symmetric equal, collinear 3.7 Insert title block for the drawing and take the Print out 3.8 Create objects by applying constraints and convert the objects to full scale , reduced scale and enlarged scale 3.9 Apply copy, mirroring, array, fillet and trim on the object created	1. Computer graphics & its terminology. 2. CAD definition, concept & need. 3. Commands used in CAD 4. Functional areas of CAD. - Coordinate systems. 5. Familiarization of Cad commands 6. Draw simple Geometrical figures using CAD

UNIT-4 Orthographic projections	4.1 Introduction to orthographic, Isometric projections 4.2 Conversion of pictorial view into Orthographic Views (USING SKETCH BOOK AND CAD)	1. Types of projections-orthographic, isometric projections: concept and applications. 2 Various term associated with orthographic projections. (a) Theory of projection. (b) Methods of projection. (c) Orthographic projection. (d) Planes of projection. 3. Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection. Note : (1) Problem should be restricted up to - Front view/Elevation, Top view/Plan and Side views only. Use First Angle Method only.
UNIT-5 Isometric projections	5.1 Introduction to Isometric Projections 5.2 Isometric Scales and Natural Scale 5.3 Isometric View and Isometric Projection 5.4 Conversion of Orthographic Views into Isometric (USING SKETCH BOOK AND CAD)	1. Isometric axis, lines and planes. 2. Isometric scales. 3. Isometric view and isometric drawing. 4. Difference between isometric projection and isometric drawing. 5. Illustrative problems limited to Simple elements
UNIT-6 CAD Drafting	6.1 Draw different types of 2D/3D modeling entities using viewing commands, to view them (Problems solved in chapter no 3 and 4 i.e Orthographic, isometric projection). 6.2 2D/3D modeling for Thread profiles,nuts,bolts,studs,setscrews,washer,Locking arrangements. (USING CAD)	1 Difference between 2D & 3D models. 2.2D/3D modeling – concept, Simple objects

PRACTICAL

Sl. No	Unit No	Practical Exercises (Outcomes in Psychomotor Domain)
1	1	1. Teacher will demonstrate a: Use of a. Drawing instruments. b. Planning and layout as per IS. c: Scaling technique.
		2. Draw following. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter.(Drawing sheet)
		Problem – 2 Indicate different convention of lines on the drawing. .(Drawing sheet)
		Problem – 3 Copy the sketch to the required scale and dimensioning adopting right system and positioning of dimensions using Tee and Set squares / drafter.(Drawing sheet)
		Problem 4. Draw regular geometric constructions Pentagon, Hexagon, Square, circle, Triangle and other shapes. .(Drawing sheet)
2	2	First angle Projection symbol Problem 5: Draw Projection of points in 1^{s} , 2nd ,3 ^{d} and 4 Quadrants.(Drawing sheet)
		Problem 6: Draw Projection of Lines a) Parallel to both the planes b) Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another. .(Drawing sheet)
		Problem 7: Draw Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two (Resting on Edge, Corner, Inclined to HP And VP)
		Problem 8: Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheets)
2	2	Problem 9: Draw Projection of Solids for the above conditions (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheet)
3	3	Use of CAD commands , plotting the drawing
		Problem 10:Drawing basic entities : Circle, Arc, Polygon, Ellipse, Rectangle, Multiline
		Applying constrains draw basic entities Insert title Block (CAD Drawings and Printout)

4	4	Problem 11: Draw Orthographic views for the given object. (Sketch book and CAD Drawing)
5	5	Problem 12: Draw Isometric projections for the given Orthographic views (Sketch book and CAD Drawing)
6	6	Problem 13:Produce Orthographic (2D) Drawings in CAD-Chap 3 Problem 14:Produce Isometric and 3D Drawings in CAD – Chap 4(CAD Drawings and Printout)
		Problem 15:create 3D models of Mechanical Elements such as Hexagonal headed bolt, Simple toy, ball bearing (CAD Drawings and Printout)

SUGGESTED LEARNING RESOURCES:

1. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS:Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010;ISBN: 978-93-80358-17-8.
3. Jain &Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi(ISBN: 978- 93-86173-478)
4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1
5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
6. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD* . PHILearning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. VikasPublishing HousePvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.
10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers* .Dreamtech Press; GalgotiaPublication, New Delhi, 2015; ISBN 978-9351199113.

9. SOFTWARE/LEARNING WEBSITES :

1. https://www.autodesk.com/learn/catalog/Fusion
2. https://www.autodesk.com/learn/catalog/autoCAD
3. https://www.autodesk.com/education/edu-software/overview?sorting=featured&filters=class-lab#card-acdist
4. https://www.machinedesignonline.com

Environmental Sustainability

Subject Code – AUC201

Unit No & Name	Detailed Course Content	CO	PO	Contact Hrs
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.	CO1	1,5,7	1
	Global warming - Causes, effects.	CO1	1,5,7	2
	Green House Effect, Ozone depletion - Causes, effects	CO1	1,5,7	3
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Made sources of air pollution	CO2	1,5,7	4
	Air pollutants and Types, Effects of Particulate Pollutants and control by Cyclone separator	CO2	1,5,7	5
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act 1981.	CO2	1,5,7	6
3. Water and Soil Pollution	Noise pollution: sources of pollution, Measurement of Noise pollution level.	CO3	1,5,7	7
	Effects and Control of Noise pollution. Noise pollution (Regulation and Control) Rules, 2000	CO3	1,5,7	8
4. Water and Soil Pollution:	Sources of water pollution. Types of water pollutants, Characteristics of water pollutants.	CO4	1,5,7	9
	Control measures of water pollution.	CO4	1,5,7	10
	Definition and list unit operations in water and WasteWater Treatment process, Water (prevention and control of pollution) act 1974.	CO4	1,5,7	11
	Water conservation – Importance of Rain Water Harvesting	CO4	1,5,7	12
	Soil pollution, Causes and Effects due to Fertilizers, Pesticides and Insecticides	CO4	1,5,7	13
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.	CO4	1,5,7	14
5. Renewable sources of Energy	Solar Energy: Basics of Solar energy. Solar collectors and advantages of Advanced solar collectors.	CO5	1,5,7	15
	Solar water heater, Solar stills and their uses.	CO5	1,5,7	16
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.			17
	Wind energy: Current status and future prospects of wind energy. Wind energy in India.	CO5	1,5,7	18
	Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy	CO5	1,5,7	19
	Environmental benefits of New Energy Sources- Ocean energy resources	CO5	1,5,7	20
	Environmental benefits of New Energy Sources-Tidal energy conversion.	CO5	1,5,7	21
	Solid waste generation, Sources, Characteristics of solid waste Solid Waste Management rules 2016	CO6	1,5,7	22

6. Solid Waste Management And Environmental Acts	E- Waste generation Sources and characteristics, E waste management rules 2016	CO6	1,5,7	23
	Plastic Waste generation Sources and characteristics, Plastic Waste Sources and characteristics	CO6	1,5,7	24
	Recycled plastic rules 2016,Importance of Environment (protection) act 1986,	CO6	1,5,7	25
	Occupational health and safety measures.	CO6	1,5,7	26
			Total	**26**

References

1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
4. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
5. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi.
6. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
1. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0- 07- 451871-8.
2. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
7. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
3. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502- 6
4. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
5. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com