Heritage Institute of Technology

(An Autonomous Institution)

Lecture Plans

PAPER NAME: CONTROL SYSTEMS

PAPER CODE: ECEN 2211

NAME OF THE FACULTY: DR. MOUSIKI KAR

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

2020-2021

Contact Hours per week	L	T	P	Credit Points
	3	0	0	3

COURSE OUTCOMES:

1. Students will be able to relate their pre-requisite knowledge from Mathematics and Signals & Systems.
2. They will develop the ability to understand mathematical model of physical systems and study their nature, configuration and relevant mapping into equivalent models.
3. The concept and classification of control systems, will be applied to identify, analyze and solve stability related issues in time response, error analysis and stability analysis in an advanced way.
4. Students will be able to evaluate, categorize and justify the margin of stability with respect to the system's nature using frequency domain analysis tools.
5. Students will be able to conceptualize different methods of evaluating system behavior with the help of models compatible to simulation.
6. Students will be able to design controllers according to desired performance specifications which can be applied for system design in higher semesters.

MODULE – I

INTRODUCTION: Concepts of Control Systems- Open Loop and Closed Loop Control Systems, Different Control Systems - Classification of Control Systems, Feed-Back Characteristics, Effects of feedback. [4L]

TRANSFER FUNCTION REPRESENTATION OF LTI SYSTEMS: Block diagram representation of systems -Block diagram algebra – Representation by Signal Flow Graph - Transfer function using Mason's Gain Formula. [5L]

MODULE -II

TIME DOMAIN ANALYSIS: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants. [5L]

STABILITY ANALYSIS: The concept of stability- Difference between absolute and relative stability-Routh's stability criterion, Root Locus Technique. [5L]

MODULE – III

FREQUENCY DOMAIN ANALYSIS: Frequency domain specifications-Bode diagrams, Phase margin & Gain margin-Stability Analysis from Bode Plots. [6L]

Polar Plots- Nyquist Plots-Stability Analysis. [4L]

MODULE –IV

CLASSICAL CONTROL DESIGN TECHNIQUES: Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. [5L]

STATE SPACE ANALYSIS OF CONTINUOUS TIME SYSTEMS: Concepts of state, state variables and state model, derivation of state models from block diagrams, Solving the Time invariant state Equations- State Transition Matrix and its properties – Concepts of Controllability and Observability . [6L]

TEXT BOOKS:

1. Automatic Control Systems– by B. C. Kuo, John Wiley and Sons.

2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Ltd.

3. Modern Control Engineering – by Katsuhiko Ogata , Prentice Hall of India Pvt. Ltd.

4. Modern Control Systems- by R.C. Dorf & R.H. Bishop- Addison- Wesley Longman.

REFERENCE BOOKS:

1. Control Systems Engg. by Norman S. Nise , John Wiley.

2. Control System Engineering by Ananda Natarajan , P. Ramesh Babu, Scitech Pub.

3. Automatic Control Systems- Basic analysis and design- by A. Wolovich- Oxford University Press.

LECTURE NO.	MODULE	TOPIC	REFERENCE
1	Module I	Concepts of Control Systems- Open Loop and Closed Loop Control Systems - their differences	Automatic Control Systems– by B. C. Kuo, Control Systems Engg. by Norman S. Nise , John Wiley
2		Different examples of Control Systems	
3		Feed-Back Characteristics, Effects of feedback	
4		Mathematical models – Differential equations, Impulse Response and Transfer Functions –	
5		Translational mechanical systems.	
6		Rotational mechanical systems	
7		LTI system- its advantage in analysis	
8		Laplace transform- its use in transfer function analysis.	
9		Block diagram representation	
10		Block diagram algebra	
11		Block diagram problems	
12		Block diagram problems	
13		Representation by Signal Flow Graph	
14		SFG problems	
15		SFG problems	

LECTURE NO.	MODULE	TOPIC	REFERENCE
16	Module II	Standard test signals	Automatic Control Systems– by B. C. Kuo
17		Time response of first order systems	
18		Transient response of second order systems	
19		Time domain specifications	
20		Time domain specifications	
21		Steady state response and error	
22		The concept of stability	
23		Routh's stability criterion	
24		Routh's stability criterion problems	
25	Module III	Bode diagrams	Control Systems Engineering – by I. J. Nagrath and M. Gopal
26		Phase margin & Gain margin	
27		Stability Analysis	
28		Numericals	
29		Numericals	
30		Polar Plots	
31		Nyquist Plots Stability Analysis	Automatic Control Systems– by B. C. Kuo
32		Nyquist Plots Stability Analysis	
33		Nyquist Plots Stability Analysis	

LECTURE NO.	MODULE	TOPIC	REFERENCE
34	Module IV	Compensation techniques	Modern Control Engineering – by Katsuhiko Ogata
35		Lag, Lead, Lead-Lag Controllers	
36		PID Controllers	
37		Concepts of state, state variables	
38		derivation of state models from block diagrams	
39		Solving the Time invariant state Equations	
40		State Transition Matrix	
41		Concepts of Controllability and Observability	
42		Numericals	
43		Numericals	
44		Numericals	
45		Numericals	

Heritage Institute of Technology

Department of Mechanical Engineering

LAB MANUAL

Sub: Fluid Mechanics & Hydraulic Machines Lab (MECH 2252)

Course Name : FLUID MECHANICS & HYDRAULIC MACHINES LAB

Course Code: MECH 2252

Course Outcomes: At the end of the course, a student will be able to	
CO 1	Identify different flow patterns and regimes.
CO 2	Evaluate Coefficient of Discharge of Flow Measuring Devices.
CO 3	Understand the determination of airflow velocity by a Pitot Static Tube.
CO 4	Analyze the validity of the Bernoulli‘s equation for steady flow of water in a tapered duct.
CO 5	Demonstrate practical understanding of friction losses in internal pipe flow.
CO 6	Evaluate the overall efficiencies of Pelton turbine, Francis Turbine and Centrifugal pump.

<u>List of Experiments / Jobs to be carried out during the semester</u>

1. Characteristics of Laminar & Turbulent flow.
2. Verification of Bernoulli's Equation.
3. Determination of Coefficient of Discharge of Flow Measuring Devices in pipe flow.
4. Pipe friction characteristics in different flow regimes for flow through pipes.
5. Determination of Coefficient of Discharge of V-Notch & Rectangular Weir.
6. Determination of airflow velocity by a Pitot Static Tube.
7. Performance test of a Centrifugal Pump.
8. Performance test of a Pelton Turbine.
9. Performance test of a Francis Turbine.

PAPER NAME: ANALOG CIRCUITS

PAPER CODE: ECEN 2101

NAME OF THE FACULTY: DR. MOUSIKI KAR

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

2020-2021

Course Name : Analog Circuits					
Course Code : ECEN2101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

COURSE OUTCOMES:

After going through this course, the students will be able to

1. Apply the previous knowledge gathered from Basic Electrical and Basic Electronics papers.
2. Understand the concepts of BJT, MOSFET and biasing techniques of BJT and MOSFET basedamplifier circuits.
3. Analyze frequency response of amplifier circuits.
4. Design different types sinusoidal oscillators and multivibrator circuits.
5. Construct algebraic equations based amplifier and analog computers using OP-AMP
6. Design stable high-gain amplifier circuits.

MODULE 1: Analog Signals and Devices [9L]

Basic concepts and device biasing [5L]:

Analog, discrete and digital signals. Diode: piecewise-linear model, clipping and clamping operation. BJT biasing circuits, Q-point and stability.

Small Signal analysis of Amplifiers [4L]:

Small signal (h-parameter and re model) analysis of BJT CE mode amplifier circuit (derive input impedance,output impedance, voltage gain, current gain for the amplifiers).

MODULE 2: Oscillators and Frequency Responses of Amplifiers [9L]

Frequency Responses of Amplifiers [2L]:

Frequency response of CE mode RC-coupled amplifier; effect of external and parasitic capacitors on cut-offfrequencies.

Feedback & Oscillator Circuits [7L]:

Concept of feedback, Effects of negative feedback in amplifiers, Oscillators circuits: Phase-shift, Wien-Bridge,Hartley, Colpitt and crystal Oscillators.

MODULE 3: Operational Amplifiers (OPAMPs) [7L]

Fundamentals of OPAMP [4L]:

Basic building blocks of OPAMP: Differential Amplifiers, Current source and current mirror circuits. Types ofdifferential amplifiers, AC and DC analysis of differential amplifiers; Characteristics of an ideal OPAMP.

Applications of OPAMP [3L]:

Inverting and non-inverting OPAMP amplifiers, Log-antilog amplifiers, Instrumentation amplifier, Precisionrectifiers, basic comparator, Schmitt Trigger.

MODULE 4: Analog Circuit Applications [7L]

Power Amplifiers [4L]:

Concepts and operations of Class A, B and AB amplifiers; Calculation of DC power, AC power and efficiencyof these amplifiers.

Applications Analog IC [3L]:

Description of 555 Timer IC, astable and mono-stable operations using 555. Study of 78XX and 79XX voltageregulator ICs.

Books:

1. Microelectronic Circuits by Adel S. Sedra, Kenneth C. Smith
2. Electronics Devices and Circuits by Robert L. Boylestad, Louis Nashelskey
3. Fundamentals of Microelectronics by Behzad Razavi
4. Integrated electronics by Jacob Millman, Christos C. Halkias

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
1	Concepts of Analog, discrete and digital signals. Diode Characteristics	**05.08.2020**	**05.08.2020**	*1. Sedra, Adel S., Smith, Kenneth C. and Chandorkar Arun N. (2017). Microelectronic circuits Theory and Application (7th Edition). Oxford University Press.* ***ISBN:*** *9780199476299.* *2. Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* ***ISBN:*** *9788122440249.* *3. Millman, J., & Halkias, C. (1972). Integrated Electronics: Analog Digital Circuits and Systems. McGraw-Hill, Inc..* ***ISBN:*** *0074622455.* *4. Boylestad, R. L., & Nashelsky, (2013). Electronic devices and circuit (11th Edition). Prentice-Hall.* ***ISBN*** *9780132622264.*
2	Diode: piecewise-linear model	**06.08.2020**	**06.08.2020**	
3	Diode series & parallel clipper circuits with and without bias	**07.08.2020**	**07.08.2020**	
4	Diode clamper circuits with and without bias	**11.08.2020**	**11.08.2020**	
5	Concept of biasing, DC load line & Q-point	**12.08.2020**	**12.08.2020**	
6	Concepts of amplification and stability factors of BJT biasing circuits	**13.08.2020**	**13.08.2020**	
7	Study of BJT fixed bias, Collector to base bias	**14.08.2020**	**14.08.2020**	
8	Study of BJT voltage divider biasing circuit	**18.08.2020**	**18.08.2020**	
9	Concepts of ac load line & small signal analysis, introduction to small signal models	**19.08.2020**	**19.08.2020**	
10	h-parameter model of BJT CE mode amplifier circuit, derivation of input impedance, output impedance, voltage gain, current gain	**20.08.2020**	**20.08.2020**	
11	r_e model of BJT CE mode amplifier circuit with voltage divider bias	**21.08.2020**	**21.08.2020**	
12	Derivation of input impedance, output impedance, voltage gain, current gain	**25.08.2020**	**25.08.2020**	

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
13	Numericals on BJT amplifier circuits	**26.08.2020**	**26.08.2020**	*1.Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* ***ISBN:*** *9788122440249.* *2. Boylestad, R. L., & Nashelsky, L. (2013). Electronic devices and circuits. (11th Edition). Prentice-Hall.* ***ISBN:*** *9780132622264.*
14	Numericals on BJT amplifier circuits	**27.08.2020**	**27.08.2020**	
15	Frequency response of CE mode RC-coupled amplifier	**28.08.2020**	**28.08.2020**	
16	Effect of external and parasitic capacitors on cut-off	**01.09.2020**	**01.09.2020**	
17	Concept of feedback, feedback topologies	**02.09.2020**	**02.09.2020**	
18	Effects of negative feedback in amplifiers	**03.09.2020**	**03.09.2020**	
19	Concept of Oscillators circuits, Wein bridge oscillator	**04.09.2020**	**04.09.2020**	
20	Phase-shift oscillator	**08.09.2020**	**08.09.2020**	
21	General LC oscillators	**22.09.2020**	**22.09.2020**	
22	Hartley & Colpitt oscillators	**23.09.2020**	**23.09.2020**	
23	Crystal Oscillator & oscillator related problems	**24.09.2020**	**24.09.2020**	
24	Concept of differential amplifiers, types of differential amplifiers, DC analysis of differential amplifiers	**25.09.2020**	**25.09.2020**	*1. D. Roy Choudhury, & Jain, S. (1991). Linear Integrated Circuits. Wiley. ISBN: 9788122414707* *2. Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International. ISBN: 9788122440249.* *3. Franco, S. (2002). Design with operational amplifiers and analog integrated circuits (Vol. 1988).*
25	AC analysis of differential amplifiers	**29.09.2020**	**29.09.2020**	
26	Current source and current mirror circuits	**30.09.2020**	**30.09.2020**	
27	Block diagram of a basic OPAMP, Characteristics of an ideal OPAMP	**01.10.2020**	**01.10.2020**	
28	Inverting and non-inverting OPAMP amplifiers, Adder, Subtractor	**06.10.2020**	**06.10.2020**	
29	Log-antilog amplifiers	**07.10.2020**	**07.10.2020**	

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
30	Instrumentation amplifier, Precision rectifiers	**08.10.2020**	**08.10.2020**	*1. D. Roy Choudhury, & Jain, S. (1991). Linear Integrated Circuits. Wiley. ISBN: 9788122414707* *2. Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International. ISBN: 9788122440249.* *3. Franco, S. (2002). Design with operational amplifiers and analog integrated circuits (Vol. 1988).*
31	Basic comparator, Schmitt Trigger	**09.10.2020**	**09.10.2020**	
32	Numericals	**13.10.2020**	**13.10.2020**	
33	Concepts and operations of Class A, B and AB amplifiers	**14.10.2020**	**14.10.2020**	*1.Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* ***ISBN:*** *9788122440249.* *2. Boylestad, R. L., & Nashelsky, L. (2013). Electronic devices and circuits. (11th Edition). Prentice-Hall.* ***ISBN:*** *9780132622264.*
34	Class A series fed power amplifier, calculation of DC power, AC power and efficiency	**15.10.2020**	**15.10.2020**	
35	Class A transformer coupled power amplifier, calculation of DC power, AC power and efficiency	**16.10.2020**	**16.10.2020**	
36	Class B & AB power amplifiers	**20.10.2020**	**20.10.2020**	
37	Description of 555 Timer IC	**03.11.2020**	**03.11.2020**	
38	Mono-stable operation using 555	**04.11.2020**	**04.11.2020**	
39	Astable multivibrator operation using 555	**06.11.2020**	**06.11.2020**	
40	Study of 78XX and 79XX voltage regulator ICs	**10.11.2020**	**10.11.2020**	

PAPER NAME: BASIC ELECTRONICS ENGINEERING

PAPER CODE: ECEN 1011

NAME OF THE FACULTY: DR. MOUSIKI KAR

DEPARTMENT: COMPIUTER SCIENCE AND ENGINEERING

SESSION: 2020-2021

Course Name : Basic Electronics Engineering					
Course Code : ECEN 1001					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	3	**1**	**0**	**4**	**4**

Course Outcomes:

1. Categorize different semiconductor materials based on their energy bands and analyze the characteristics of those materials for different doping concentrations based on previous knowledge on semiconductors acquired.

2. Describe energy band of P-N Junction devices and solve problems related to P-N Junction Diode both from device and circuit perspectives.

3. Design different application specific circuits associated with diodes operating both in forward and reverse bias.

4. Analyze various biasing configurations of Bipolar Junction Transistor and categorize different biasing circuits based on stability.

5. Categorize different field-effect transistors based on their constructions, physics and working principles and solve problems associated with analog circuits based on operational amplifiers.

6. Design and implement various practical purpose electronic circuits and systems meant for both special purpose and general purpose and analyze their performance depending on the type of required output and subsequently the applied input.

Syllabus:

Module	Topics	Hours
1	**Semiconductors :** Crystalline material, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.	5
	Diodes and Diode Circuits : Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener Diode and its Application, Zener and Avalanche breakdown. Simple diode circuits, load line, piecewise linear model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.	5
2	**Bipolar Junction Transistors :** Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off, active and saturation modes of operation, transistor action, input & output characteristics, load line & amplifier operation and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor.	10
3	**Field Effect Transistors :** Junction field effect transistor (JEET): Principle of operation, JFET parameters, eqv. Circuit, JFET biasing, self bias, design of bias circuits, load line, amplifier characteristics.	3
	MOSFETs : Construction & principle of operation of p- & n-channel enhancement & depletion mode MOSFETs, drain & transfer characteristics, threshold voltage & its control.	3
	Cathode Ray Osilloscope : Construction and working principle of CRO, Lissajous pattern.	3
4	**Feed Back Amplifier :** Concept-block diagram, properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, condition of oscillation, Barkhausen criteria.	4
	Operational Amplifier : Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; Concept of op-amp saturation, inverting and noninverting mode of operation, Adders, Subtractors, Voltage follower, Integrator, Differentiator, Basic Comparator Circuit.	5

References :

1. Boylestad & Nashelsky:Electronic Devices & Circuit Theory.
2. R.A Gayakwad:Op Amps and Linear IC's, PHI.
3. D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications.
4. Adel S. Sedra, Kenneth Carless Smith: Microelectronics Engineering.
5. Millman & Halkias: Integrated Electronics.
6. Salivahanan: Electronics Devices & Circuits.
7. Albert Paul Malvino: Electronic Principle.

LECTURE PLAN

SERIAL NO.	TOPICS	REFERENCES
Lecture 1	➢ Module 1 :- Semiconductors - Crystalline Material, Energy Band Theory	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 2	➢ Module 1 :- Semiconductors – Fermi Levels	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1

Lecture 3	➢ Module 1 :- Semiconductors – Conductors, Semiconductors and Insulators: Electrical Properties, Energy Band Diagrams	a) D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 4	➢ Module 1 :- Semiconductors – Semiconductors: Doping, Intrinsic and Extrinsic Energy Band Diagram	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky :Electronic Devices & Circuit Theory – Chapter 1
Lecture 5	➢ Module 1 :- Semiconductors – Electrical Conduction Phenomenon, P-type and N-type Semiconductors	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 6	➢ Module 1 :- Semiconductors – Drift Current	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1 Class Notes
Lecture 7	➢ Module 1 :- Semiconductors – Diffusion Current	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1 Class Notes

Lecture 8	➢ Module 1 :- Diodes and Diode Circuits - Formation of P-N Junction, Energy Band Diagram	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 5 2) Salivahanan : Electronics Devices & Circuits – Chapter 4 3) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1 Class Notes
Lecture 9	➢ Module 1 :- Diodes and Diode Circuits - Built-In-Potential, Forward and Reverse Biased P-N Junction	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 5 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 10	➢ Module 1 :- Diodes and Diode Circuits - Formation of Depletion Zone, Voltage-Current Characteristics	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 5 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 11	➢ Module 1 :- Diodes and Diode Circuits -Zener Diode and its Application as Voltage Regulator	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 5 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 12	➢ Module 1 :- Diodes and Diode Circuits -Zener and Avalanche Breakdown – Comparison	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 5 b) Salivahanan : Electronics Devices & Circuits – Chapter 4 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 1
Lecture 13	➢ Module 1 :- Diodes and Diode Circuits –Simple Diode Circuits, Load Line, Piecewise Linear Model	a) Salivahanan : Electronics Devices & Circuits – Chapter 4

Lecture 14	➢ Module 1 :- Diodes and Diode Circuits -Rectifier Circuits : Half Wave, Full Wave, Bridge – Comparison of various Rectifier Parameters - PIV/PRV(Peak Inverse/Reverse Voltage), DC Voltage and Current, Ripple Factor	a) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 6
Lecture 15	➢ Module 1 :- Diodes and Diode Circuits - Rectifier Circuits : Half Wave, Full Wave, Bridge – Comparison of various Rectifier Parameters - Efficiency, Idea of Regulation – Percentage Load Regulation, Transformer Utilization Factor	a) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 4 b) Salivahanan : Electronics Devices & Circuits – Chapter 6
Lecture 16	➢ Module 2 :- Bipolar Junction Transistors -Formation of PNP / NPN junctions	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 7 b) Salivahanan : Electronics Devices & Circuits – Chapter 6 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 3
Lecture 17	➢ Module 2 :- Bipolar Junction Transistors - Energy Band Diagram	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 7 b) Salivahanan : Electronics Devices & Circuits – Chapter 6 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 3
Lecture 18	➢ Module 2 :- Bipolar Junction Transistors -Transistor Mechanism and Principle of Transistors	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 7 b) Salivahanan : Electronics Devices & Circuits – Chapter 6 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 3

Lecture 19	➢ Module 2 :- Bipolar Junction Transistors – Common Emitter, Common Base, Common Collector Configuration of Transistor Biased Circuits	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 7 b) Salivahanan : Electronics Devices & Circuits – Chapter 6 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 3
Lecture 20	➢ Module 2 :- Bipolar Junction Transistors -Transistor Characteristics: Cut-Off, Active and Saturation Modes of Operation	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 7 b) Salivahanan : Electronics Devices & Circuits – Chapter 6 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 3
Lecture 21	➢ Module 2 :- Bipolar Junction Transistors - Transistor Action, Input & Output Characteristics	a) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 7 b) Salivahanan : Electronics Devices & Circuits – Chapter 6 c) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 3
Lecture 22	➢ Module 2 :- Bipolar Junction Transistors -Load Line & Amplifier Operation	a) Salivahanan : Electronics Devices & Circuits – Chapter 6 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 4
Lecture 23	➢ Module 2 :- Bipolar Junction Transistors - Current Amplification Factors for Common Base and Common Emitter Modes of Transistor Biased Circuits	a) Salivahanan : Electronics Devices & Circuits – Chapter 6 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 4
Lecture 24	➢ Module 2 :- Bipolar Junction Transistors -Biasing and Bias Stability	a) Salivahanan : Electronics Devices & Circuits – Chapter 6 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 4
Lecture 25	➢ Module 2 :- Bipolar Junction Transistors - Calculation of Stability Factor	a) Salivahanan : Electronics Devices & Circuits – Chapter 6 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 4

Lecture 26	➢ Module 3 :- Field Effect Transistors - Junction Field Effect Transistor (JFET): Principle of Operation	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 5
Lecture 27	➢ Module 3 :- Field Effect Transistors - JFET parameters, Equivalent Circuit of JFET	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 5 3) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 13
Lecture 28	➢ Module 3 :- Field Effect Transistors - JFET Biasing, Self Bias, Design of Bias Circuits	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 6
Lecture 29	➢ Module 3 :- Field Effect Transistors - Load Line, Amplifier Characteristics	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 6
Lecture 30	➢ Module 3 :- Metal Oxide Semiconductor Field Effect Transistors (MOSFET) -Construction of p- & n-channel Enhancement & Depletion Mode MOSFETs	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 5 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 13
Lecture 31	➢ Module 3 :- Metal Oxide Semiconductor Field Effect Transistors (MOSFET) – Principle of Operation of p- & n-channel Enhancement & Depletion Mode MOSFETs	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 5 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 13
Lecture 32	➢ Module 3 :- Metal Oxide Semiconductor Field Effect Transistors (MOSFET) -Drain & Transfer Characteristics of MOSFETs	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 5 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 13

Lecture 33	➢ Module 3 :- Metal Oxide Semiconductor Field Effect Transistors (MOSFET) -Threshold Voltage of MOSFET & its control	a) Salivahanan : Electronics Devices & Circuits – Chapter 7 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 5 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 13
Lecture 34	➢ Module 3 :- Cathode Ray Oscilloscope (CRO) -Construction and Working Principle of CRO	a) Salivahanan : Electronics Devices & Circuits – Chapter 23 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 22 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 17
Lecture 35	➢ Module 3 :- Cathode Ray Oscilloscope (CRO) -Lissajous Pattern	a) Salivahanan : Electronics Devices & Circuits – Chapter 23 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 22 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 17
Lecture 36	➢ Module 4 :- FeedBack Amplifier - Concept-Block Diagram, Properties, Positive and Negative Feedback	a) Salivahanan : Electronics Devices & Circuits – Chapter 14 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 18 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 10
Lecture 37	➢ Module 4 :- FeedBack Amplifier - Loop Gain, Open Loop Gain, Closed Loop Gain, Feedback Factors	a) Salivahanan : Electronics Devices & Circuits – Chapter 14 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 18 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 10
Lecture 38	➢ Module 4 :- FeedBack Amplifier - Topologies of Feedback Amplifier	a) Salivahanan : Electronics Devices & Circuits – Chapter 14 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 18 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 10

Lecture 39	➢ Module 4 :- FeedBack Amplifier - Effect of Feedback on Gain	a) Salivahanan : Electronics Devices & Circuits – Chapter 14 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 18 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 10
Lecture 40	➢ Module 4 :- FeedBack Amplifier - Condition of Oscillation	a) Salivahanan : Electronics Devices & Circuits – Chapter 14 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 18 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 10
Lecture 41	➢ Module 4 :- FeedBack Amplifier - Barkhausen Criteria	a) Salivahanan : Electronics Devices & Circuits – Chapter 14 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 18 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 10
Lecture 42	➢ Module 4 :- Operational Amplifier – Introduction to Integrated Circuits, Operational Amplifier and its Terminal Properties	a) Salivahanan : Electronics Devices & Circuits – Chapter 20 b) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 14 c) D. Chattopadhyay, P. C. Rakshit : Electronics Fundamentals and Applications – Chapter 14
Lecture 43	➢ Module 4 :- Operational Amplifier – Application of Operational Amplifier, Concept of Op-Amp Saturation	a) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 15
Lecture 44	➢ Module 4 :- Operational Amplifier – Inverting and Non-Inverting Modes of Operation – Derivation of Expression of Voltage Gain, Adder, Subtractor, Voltage Follower	a) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 15
Lecture 45	➢ Module 4 :- Operational Amplifier – Integrator, Differentiator, Basic Comparator Circuit	a) Boylestad & Nashelsky : Electronic Devices & Circuit Theory – Chapter 15

PAPER NAME: RESEARCH METHODOLOGY AND IPR

PAPER CODE: ECEN 5103

NAME OF THE FACULTY: DR. MOUSIKI KAR

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

2020-2021

Course Title : Research Methodology and IPR					
Course Code : ECEN5103					
Contact Hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	2	**0**	**0**	**2**	**2**

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Understand research problem formulation
2. Analyze research related information
3. Follow research ethics
4. Understand the ultimate importance of ideas, concept and creativity
5. Importance of IPR for individuals and nations
6. Appreciate that IPR protection provides incentive to inventors for further research work

Syllabus Contents:

Module I (6L)

Meaning of research problem, Sources of research problem, Criteria and characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problems, data collection, analysis, interpretation, necessary instrumentations.

Module II (6L)

Effective literature studies approaches and analysisPlagiarism, Research ethics

Module III (6L)

Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by areview committee

Module IV (6L)

Nature of Intellectual Property: Patents, Design, Trade and Copyright, Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual property. Procedure for grants of patents, Patenting under PCT.

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information anddatabases. Geographical indication. New developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge case studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research and methodology: An introduction forscience & engineering students'"
- Wayne Goddard and Stuart Melville, "Research and methodology: An introduction"
- Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007
- Mayall, "Industrial Design", McGraw Hill, 1992
- Niebel, "Product Design", McGraw Hill, 1974
- Asimov, "Introduction to Design", Prentice Hall, 1962
- Robert P. Merges, Peter S. Menell, Mark A Lemley, "Intellectual Property in NewTechnological Age", 2016
- T. Ramappa, "Intellectual Property Rights Under WTO", S Chand, 2008

Lecture No.	**Topic**	**Date (Tentative)**	**Date (Executed)**	**References**
1	Meaning of research problem.	**19.11.2020**	**19.11.2020**	1. Yogesh Kumar, Singh. "Fundamentals of Research Methodology and Statistics." (2019). 2. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2	Sources of research problem.	**19.11.2020**	**19.11.2020**	
3	Criteria and characteristics of a good research problem.	**26.11.2020**	**26.11.2020**	
4	Errors in selecting a research problem, Scope and objectives of research problem.	**26.11.2020**	**26.11.2020**	
5	Approaches of investigation of solutions for research problems.	**03.12.2020**	**03.12.2020**	
6	Data collection, analysis, interpretation, necessary instrumentations.	**03.12.2020**	**03.12.2020**	
7	Effective literature studies approaches and analysis	**10.12.2020**	**10.12.2020**	
8	Plagiarism	**10.12.2020**	**10.12.2020**	
9	Research ethics	**17.12.2020**	**17.12.2020**	
10	Effective technical writing, how to write report, Paper.	**17.12.2020**	**17.12.2020**	
11	Developing a Research Proposal.	**24.12.2020**	**24.12.2020**	
12	Format of research proposal, a presentation and assessment by areview committee	**24.12.2020**	**24.12.2020**	

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
13	Nature of Intellectual Property: Patents, Design, Trade and Copyright.	**14.01.2021**	**14.01.2021**	1. Yogesh Kumar, Singh. "Fundamentals of Research Methodology and Statistics." (2019). 2. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
14	Process of Patenting and Development: technological research, innovation, patenting, and development.	**14.01.2021**	**14.01.2021**	
15	International Scenario: International cooperation on Intellectual property. Procedure for grants of patents, Patenting under PCT.	**21.01.2021**	**21.01.2021**	
16	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.	**21.01.2021**	**21.01.2021**	
17	Patent information and databases. Geographical indication.	**28.01.2021**	**28.01.2021**	
18	New developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge case studies, IPR and IITs.	**28.01.2021**	**28.01.2021**	

PAPER NAME: ANALOG CIRCUITS

PAPER CODE: ECEN 2101

NAME OF THE FACULTY: DR. MOUSIKI KAR

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

2021-2022

Course Name : Analog Circuits					
Course Code : ECEN2101					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

COURSE OUTCOMES:

After going through this course, the students will be able to

1. Apply the previous knowledge gathered from Basic Electrical and Basic Electronics papers.
2. Understand the concepts of BJT, MOSFET and biasing techniques of BJT and MOSFET basedamplifier circuits.
3. Analyze frequency response of amplifier circuits.
4. Design different types sinusoidal oscillators and multivibrator circuits.
5. Construct algebraic equations based amplifier and analog computers using OP-AMP
6. Design stable high-gain amplifier circuits.

MODULE 1: Analog Signals and Devices [9L]

Basic concepts and device biasing [5L]:

Analog, discrete and digital signals. Diode: piecewise-linear model, clipping and clamping operation. BJT biasing circuits, Q-point and stability.

Small Signal analysis of Amplifiers [4L]:

Small signal (h-parameter and re model) analysis of BJT CE mode amplifier circuit (derive input impedance,output impedance, voltage gain, current gain for the amplifiers).

MODULE 2: Oscillators and Frequency Responses of Amplifiers [9L]

Frequency Responses of Amplifiers [2L]:

Frequency response of CE mode RC-coupled amplifier; effect of external and parasitic capacitors on cut-offfrequencies.

Feedback & Oscillator Circuits [7L]:

Concept of feedback, Effects of negative feedback in amplifiers, Oscillators circuits: Phase-shift, Wien-Bridge,Hartley, Colpitt and crystal Oscillators.

MODULE 3: Operational Amplifiers (OPAMPs) [7L]

Fundamentals of OPAMP [4L]:

Basic building blocks of OPAMP: Differential Amplifiers, Current source and current mirror circuits. Types ofdifferential amplifiers, AC and DC analysis of differential amplifiers; Characteristics of an ideal OPAMP.

Applications of OPAMP [3L]:

Inverting and non-inverting OPAMP amplifiers, Log-antilog amplifiers, Instrumentation amplifier, Precisionrectifiers, basic comparator, Schmitt Trigger.

MODULE 4: Analog Circuit Applications [7L]

Power Amplifiers [4L]:

Concepts and operations of Class A, B and AB amplifiers; Calculation of DC power, AC power and efficiencyof these amplifiers.

Applications Analog IC [3L]:

Description of 555 Timer IC, astable and mono-stable operations using 555. Study of 78XX and 79XX voltageregulator ICs.

Books:

1. Microelectronic Circuits by Adel S. Sedra, Kenneth C. Smith
2. Electronics Devices and Circuits by Robert L. Boylestad, Louis Nashelskey
3. Fundamentals of Microelectronics by Behzad Razavi
4. Integrated electronics by Jacob Millman, Christos C. Halkias

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
1	Concepts of Analog, discrete and digital signals. Diode Characteristics	**05.08.2021**	**05.10.2021**	*1. Sedra, Adel S., Smith, Kenneth C. and Chandorkar Arun N. (2017). Microelectronic circuits Theory and Application (7th Edition). Oxford University Press.* ***ISBN:*** *9780199476299.* *2. Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* ***ISBN:*** *9788122440249.* *3. Millman, J., & Halkias, C. (1972). Integrated Electronics: Analog Digital Circuits and Systems. McGraw-Hill, Inc..* ***ISBN:*** *0074622455.* *4. Boylestad, R. L., & Nashelsky, (2013). Electronic devices and circuit (11th Edition). Prentice-Hall.* ***ISBN*** *9780132622264.*
2	Diode: piecewise-linear model	**06.08.2021**	**08.10.2021**	
3	Diode series & parallel clipper circuits with and without bias	**07.08.2021**	**26.10.2021**	
4	Diode clamper circuits with and without bias	**11.08.2021**	**27.10.2021**	
5	Concept of biasing, DC load line & Q-point	**12.08.2021**	**28.10.2021**	
6	Concepts of amplification and stability factors of BJT biasing circuits	**13.08.2021**	**02.11.2021**	
7	Study of BJT fixed bias, Collector to base bias	**14.08.2021**	**02.11.2021**	
8	Study of BJT voltage divider biasing circuit	**18.08.2021**	**03.11.2021**	
9	Concepts of ac load line & small signal analysis, introduction to small signal models	**19.08.2021**	**09.11.2021**	
10	h-parameter model of BJT CE mode amplifier circuit, derivation of input impedance, output impedance, voltage gain, current gain	**20.08.2021**	**10.11.2021**	
11	r_e model of BJT CE mode amplifier circuit with voltage divider bias	**21.08.2021**	**12.11.2021**	
12	Derivation of input impedance, output impedance, voltage gain, current gain	**25.08.2021**	**16.11.2021**	

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
13	Frequency response of CE mode RC-coupled amplifier	**28.08.2021**		*1.Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* ***ISBN:*** *9788122440249.* *2. Boylestad, R. L., & Nashelsky, L. (2013). Electronic devices and circuits. (11th Edition). Prentice-Hall.* ***ISBN:*** *9780132622264.*
14	Effect of external and parasitic capacitors on cut-off	**01.09.2021**		
15	Concept of feedback, feedback topologies	**02.09.2021**		
16	Effects of negative feedback in amplifiers	**03.09.2021**		
17	Concept of Oscillators circuits, Wein bridge oscillator	**04.09.2021**		
18	Phase-shift oscillator	**08.09.2021**		
19	General LC oscillators	**22.09.2021**		
20	Hartley & Colpitt oscillators	**23.09.2021**		
21	Crystal Oscillator & oscillator related problems	**24.09.2021**		
22	Concept of differential amplifiers, types of differential amplifiers, DC analysis of differential amplifiers	**25.09.2021**	**18.11.2021**	*1. D. Roy Choudhury, & Jain, S. (1991). Linear Integrated Circuits. Wiley. ISBN: 9788122414707* *2. Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International. ISBN: 9788122440249.* *3. Franco, S. (2002). Design with operational amplifiers and analog integrated circuits (Vol. 1988).*
23	AC analysis of differential amplifiers	**29.09.2021**	**23.11.2021**	
24	Current source and current mirror circuits	**30.09.2021**	**24.11.2021**	
25	Block diagram of a basic OPAMP, Characteristics of an ideal OPAMP	**01.10.2021**	**25.11.2021**	
26	Inverting and non-inverting OPAMP amplifiers, Adder, Subtractor	**06.10.2021**	**25.11.2021**	
27	Log-antilog amplifiers	**07.10.2021**		

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
28	Instrumentation amplifier, Precision rectifiers	**08.10.2021**		*1. D. Roy Choudhury, & Jain, S. (1991). Linear Integrated Circuits. Wiley. ISBN: 9788122414707* *2. Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* *3. Franco, S. (2002). Design with operational amplifiers and analog integrated circuits (Vol. 1988).*
29	Basic comparator, Schmitt Trigger	**09.10.2021**	**26.11.2021**	
30	Numericals	**13.10.2021**	**30.11.2021**	
31	Concepts and operations of Class A, B and AB amplifiers	**14.10.2021**		*1.Chattopadhyay, D. and Rakshit. P. C. (2016). Electronics (fundamentals and applications) (13th Edition). New Age International.* ***ISBN:*** *9788122440249.* *2. Boylestad, R. L., & Nashelsky, L. (2013). Electronic devices and circuits. (11th Edition). Prentice-Hall.* ***ISBN:*** *9780132622264.*
32	Class A series fed power amplifier, calculation of DC power, AC power and efficiency	**15.10.2021**		
33	Class A transformer coupled power amplifier, calculation of DC power, AC power and efficiency	**16.10.2021**		
34	Class B & AB power amplifiers	**20.10.2021**		
35	Description of 555 Timer IC	**03.11.2021**		
36	Mono-stable operation using 555	**04.11.2021**		
37	Astable multivibrator operation using 555	**06.11.2021**		
38	Study of 78XX and 79XX voltage regulator ICs	**10.11.2021**		

PAPER NAME: RESEARCH METHODOLOGY AND IPR

PAPER CODE: ECEN 5103

NAME OF THE FACULTY: DR. MOUSIKI KAR

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

2021-2022

Course Title : Research Methodology and IPR					
Course Code : ECEN5103					
Contact Hours per week	L	T	P	Total	Credit Points
	2	0	0	2	2

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Understand research problem formulation
2. Analyze research related information
3. Follow research ethics
4. Understand the ultimate importance of ideas, concept and creativity
5. Importance of IPR for individuals and nations
6. Appreciate that IPR protection provides incentive to inventors for further research work

Syllabus Contents:

Module I (6L)

Meaning of research problem, Sources of research problem, Criteria and characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problems, data collection, analysis, interpretation, necessary instrumentations.

Module II (6L)

Effective literature studies approaches and analysis Plagiarism, Research ethics

Module III (6L)

Effective technical writing, how to write report, Paper. Developing a Research Proposal, Format of research proposal, a presentation and assessment by areview committee

Module IV (6L)

Nature of Intellectual Property: Patents, Design, Trade and Copyright, Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual property. Procedure for grants of patents, Patenting under PCT.

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information anddatabases. Geographical indication. New developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge case studies, IPR and IITs.

References:

- Stuart Melville and Wayne Goddard, "Research and methodology: An introduction forscience & engineering students'"
- Wayne Goddard and Stuart Melville, "Research and methodology: An introduction"
- Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
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- Mayall, "Industrial Design", McGraw Hill, 1992
- Niebel, "Product Design", McGraw Hill, 1974
- Asimov, "Introduction to Design", Prentice Hall, 1962
- Robert P. Merges, Peter S. Menell, Mark A Lemley, "Intellectual Property in NewTechnological Age", 2016
- T. Ramappa, "Intellectual Property Rights Under WTO", S Chand, 2008

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
1	Meaning of research problem.	**19.11.2020**	**26.10.2021**	1. Yogesh Kumar, Singh. "Fundamentals of Research Methodology and Statistics." (2019). 2. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2	Sources of research problem.	**19.11.2020**	**26.10.2021**	
3	Criteria and characteristics of a good research problem.	**26.11.2020**	**02.11.2021**	
4	Errors in selecting a research problem, Scope and objectives of research problem.	**26.11.2020**	**02.11.2021**	
5	Approaches of investigation of solutions for research problems.	**03.12.2020**	**09.11.2021**	
6	Data collection, analysis, interpretation, necessary instrumentations.	**03.12.2020**	**09.11.2021**	
7	Effective literature studies approaches and analysis	**10.12.2020**		
8	Plagiarism	**10.12.2020**		
9	Research ethics	**17.12.2020**		
10	Effective technical writing, how to write report, Paper.	**17.12.2020**		
11	Developing a Research Proposal.	**24.12.2020**		
12	Format of research proposal, a presentation and assessment by areview committee	**24.12.2020**		

Lecture No.	Topic	Date (Tentative)	Date (Executed)	References
13	Nature of Intellectual Property: Patents, Design, Trade and Copyright.	**14.01.2021**		1. Yogesh Kumar, Singh. "Fundamentals of Research Methodology and Statistics." (2019). 2. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
14	Process of Patenting and Development: technological research, innovation, patenting, and development.	**14.01.2021**		
15	International Scenario: International cooperation on Intellectual property. Procedure for grants of patents, Patenting under PCT.	**21.01.2021**		
16	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.	**21.01.2021**		
17	Patent information and databases. Geographical indication.	**28.01.2021**		
18	New developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge case studies, IPR and IITs.	**28.01.2021**		

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture/Experiment Schedule

Heat Transfer (MECH 3152)

Days	Name of the Experiment	Remark
Day 1	Familiarisation with different components of I C Engine	To be covered online with vedio
Day 1	Determination of calorific value of a fuel with Bomb Calorimeter	To be covered online with vedio
Day 2	Valve Timing Diagram	To be covered online with vedio
Day 2	Orsat Apparatus	To be covered online with vedio
Day 3	Performance test on single cylinder 4-stroke Diesel Engine	To be covered online with vedio
Day 3	Demonstration of Catalytic converter	To be covered online with vedio
Day 3	Demonstration of MPFI system	To be covered online with vedio
Day 4	Morse Test on 4-cylinder 4-stroke S I Engine	To be covered online with vedio

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture/Experiment Schedule

Heat Transfer (MECH 4111)

Days	Name of the Experiment	Remark
Day 1	Familiarisation with different components of I C Engine	To be covered online with vedio
Day 1	Determination of calorific value of a fuel with Bomb Calorimeter	To be covered online with vedio
Day 2	Valve Timing Diagram	To be covered online with vedio
Day 2	Demonstration of Catalytic converter	To be covered online with vedio
Day 2	Demonstration of MPFI system	
Day 3	Performance test on single cylinder 4-stroke Diesel Engine	To be covered online with vedio
Day 3	Morse Test on 4-cylinder 4-stroke S I Engine	To be covered online with vedio
Day 3	Orsat Apparatus	To be covered online with vedio

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture/Experiment Schedule

Heat Transfer (MECH 3152)

Days	Name of the Experiment	Name of the Experiment
Day 1	Thermal Conductivity of metal bar	To be covered online with vedio
Day 1	Thermal Conductivity of metal insulating powder	To be covered online with vedio
Day 2	Emissivity of a gray body	To be covered online with vedio
Day 2	Experiment with Pin Fin	To be covered online with vedio
Day 3	Natural Convection Experiment	To be covered online with vedio
Day 3	Determination of dryness fraction of steam by separating & throttling Calorimeter	To be covered online; only theoretical discussion; no vedio

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture/Experiment Schedule

Heat Transfer (MECH 3152)

Days	Name of the Experiment	Name of the Experiment
Day 1	Thermal Conductivity of metal bar	To be covered online
Day 2	Thermal Conductivity of metal insulating powder	To be covered online
Day 3	Determination of dryness fraction of steam by separating & throttling Calorimeter	To be covered off-line
Day 4	Experiment with Pin Fin	To be covered off-line
Day 5	Emissivity of a gray body	To be covered off-line
Day 6	Parallel and Counter-flow heat exchanger	To be covered off-line

Subject: Microprocessors and Micro Controllers

paper code: AEIE 2205

Faculty: INDRAJIT NASKAR

Jan - Jun - 2021

MODULE 1: (6L): Introduction to 8 bit microprocessor: 8085 microprocessor internal architecture, 8085 pin configuration software instruction set, timing diagram of the Instruction.

Module 2 (7L) Addressing modes and Assembly Language programming, Interrupt of 8085 processor: Classification of interrupts, Programming using interrupts. Counter and time delay. Support IC Chips 8255 - Block diagram, pin Configuration modes of Operation, Control words and Interfacing with processors.

Module 3: (7L): Introduction to 8086/8088: Architecture, Memory Segmentation, pin Configuration, clock generator, Instruction set, Addressing modes, and Assembly Language programming of 8086/8088.

Module 4: (6L): Introduction to Micro Controllers: Intel MCS-51 family features. 8051 architecture, pin Configuration. I/O ports and memory Organization Instruction set and basic assembly - Language programming, interrupts and return. Interrupts timer/counter and Serial Communication.

Brief Introduction to PIC micro Controller (16F877). Architecture, pin details. memory layouts etc.

MODULE 1 (6L):

Sr No	Topic to be discussed	Allotted class	Class to be taken
1	Introduction to 8 bit microprocessor:	1	1
2	8085 microprocessor internal Architecture	1	1 + 1
3	8085 pin Configuration	1	1 + 1
4	software Instruction Set	1	1 + 1
5	software Instruction Set	1	1
6	timing diagram of the Instruction	1	1 + 1

MODULE 2: (7L)

S. No	Topic to be discussed	Allotted class	Class to be taken
1	Addressing Modes	1	1
2	Assembly Language programming	1	1 + 1
3	Interrupts of 8085 processor; Classification of interrupts. programing using Interrupts	1	1 + 1
4	Counter and time delay	1	1
5	Support Ic chips 8255 - Block diagram, pin configration	1	1
6	Modes of operation, control words	1	1
7	Interfacing with processors (LED (ON, OFF), Blinking, scrolling, 7 segment display (Roll No, or Name) (4 segment) (Blinking, Scrolling)	1	1 + 1

MODULE 3 (7L)

Sr.No	Topic to be discussed	Allotted Class	Class to be taken
1	Introduction to 8086/8088 (Comparison Study with 8085)	1	1
2	Architecture and pin Configuration	1	1 + 1
3	Memory Segmentation clock generator	1	1
4	Instruction Set	1	1 +1
5	Instruction Set	1	1
6	Addressing Modes	1	1 + 1
7	Assembly Language programming of 8086/8088	1	1 + 1

MODULE 4: GL

Sr. No	Topic to be discussed	Allotted Class	Class to be taken
1	Introduction to 8051 micro Controller (Comparison study with 8085, 8086, 8051)	1	1
2	Intel 8051/MCS-51 family features, 8051 Architecture	1	1
3	pin Configuration, I/O ports and memory organization	1	1
4	Instruction set, basic Assembly Language programming	1	1 + 1
5	Interrupts and return, Interrupts timer and Counter and Serial Communication.	1	1 + 1
6	Brief Introduction to PIC micro Controller (16F877), Architecture, pin details Memory layout etc.	1	1

Non-Conventional Energy Sources
(NCES)

AEIE 3132:

July – Dec 2021:(

INDRAJIT NASKAR (AEIE)

Module I (8L)

Introduction: Fossil fuel based systems, impact of fossil fuel based systems, non-conventional energy, seasonal variations and availability, renewable energy – sources and features, hybrid energy systems, distributed energy systems and dispersed generation (DG); Concept of Energy management and Audit.

Module II (8L) Solar thermal system: solar radiation spectrum, radiation measurement, conversion technologies, application – heating, cooling, drying, distillation, power generation, Solar photovoltaic systems, Operating principle, photovoltaic cell concepts – cell module, array, series and parallel connections, maximum power point tracking, application battery charging, pumping, lighting. Solar cell power plant, Limitation.

Module III (10L) Wind Energy: Wind patterns and wind data, site selection, types of wind mills, characteristics of wind generators, performance and limitation of wind energy conversion systems. Load matching, recent developments. Energy from biomass: resources and conversion process: Bio gas conversion, bio-gas plant, bio-mass gasifier Cogeneration, bio-diesel.

Module IV (10L) Energy from ocean: Ocean thermal Electric Conversion (OTEC) system like open cycles, closed cycle, hybrid cycle, prospects of OTEC in India, Energy from TIDES; basic principle of tidal power, single basin and double basin tidal power plants, Advantages, Limitation and scope of tidal energy; Energy from wave: wave Energy conversion device, Advantages and disadvantages of wave energy. Geothermal energy: resources of geothermal energy, thermodynamics of geo-thermal energy conversion electric conversion, non electric conversion, Environmental consideration.

Module I (8L)

Sr. No.	Topic to be Discussed	Allotted Class	Class to be taken	
1	Fossil fuel based system, Impact of fossil fuel based system: (Sustainable development, R/p ratio, Energy planning, Energy system and Control	1	1	
2	(Discussion on coal, Thermal power plant, SCR, ESP, FGD) Environmental Effects: (Carbon monoxide, Sulphur dioxide, nitrogen oxides, particulate matter, Unburned Hydrocarbon Crude oil,	[illegible]	1 + 1	
3	Crude oil processing, distillation process, Nuclear power plant	1	1	
4	Non Conventional energy. Seasonal variation, availability, sources and features	1	1	
5	Hybrid energy system (wind, Biomass, Solar, Hydro	1	1	
6	(Basic formula used to extract / harness different nonconventional energy sources) (Also to be discussed in the respective parts)	[illegible]	1	
7	Distributed Energy system and DG (From generation to disposed) using basic Block diagram,	1	1	
8	(Conventional, non Convention type system) Distributed Energy system and Dispersed Generation (DG)	1	1	
9	Concept of Energy Management and audit	1	1	
10	(Basic concept of different device related to Audit)	1	1	

MODULE II : (8L)

Sr. No.	Topic to be discussed	Allotted Class	Class to be taken
1	Solar Radiation Spectrum (Concept of Air mass Coefficient, Solar irradiance / isolation, $E = \frac{1.24}{\lambda(\mu m)}$ (ev), photon-flux, Factors affecting Solar Radiation)	1	1
2	Radiation Measurement and Conversion technology (pyrheliometer, pyranometer, solar Sunshine recorder, Advantages and disadvantages)		1
3	Application (Heating, cooling, drying, distillation, Solar pond, solar refrigeration,	1	1
4	Solar photo voltaic system (Recap → PN junction diode, E-k diagram concept, electronic state, material	1	1
5	PV cell / Solar Cell (Semiconductor Devices) (Operating principle) efficiency, Fill factor		1
6	Calculation of MPPT Material related to Solar cell and their efficiency.	1	1
7	PV cell module Series, parallel Connection	1	1
8	Application Battery charging, pumping, lighting	1	1
9	Solar cell power plant, Limitation Advantages & Disadvantages	1	1
10	Problem	1	1

MODULE III : (10L)

Sr.No	Topic to be discussed	Allotted Class	Class to be taken
1	Wind Energy: Wind pattern and wind data, Site Selection, Types of Wind Mill	1	1
2	Characteristics of wind generation, performance and Limitation of wind Energy Conv. (Efficiency calculation, Torque Coefficient, Betz Criterion)	1	1
3	(Horizontal and Vertical axis wind turbine, Controlling techniques, Environmental effects:)		1
4	Load matching, recent Development	1	1
5	Energy from Bio mass, Resource and Conversion process	1	1
6	Bio gas conversion, Bio gas plant, Bio gas gassification, Cogeneration.	1	1
7	(Biomass feedstock for gassification, upstream processing and downstream processing	1	1
8	(Oxidation, Drying, Pyrolysis, Reduction) Factors affecting the gassification process	1	1
9	Problem on Wind Energy + Extra-discussion on.. up and down draft gassification		1
10	Bio diesel: Raw material for Bio diesel production, Transesterification (Block diagram)	1	1

MODULE IV: (10L)

Sr. No.	Topic to be discussed	Allotted class	class to be Taken	
1	Energy from Ocean: Ocean thermal Electric Conversion (OTEC) system, Open cycle	1	1	
2	closed cycle, Hybrid cycle. prospect of OTEC in India (Environmental imp (Advantages and Disadvantage, Related Technologies)	1	1 + 1	
3	Energy from Tides: Basic principle of tidal power (Calculation of power)	1	1	
4	Tidal range power, Single basin, double basin tidal power plant, Advantage, Limitation Social and Environmental Aspects	1	1 + 1	
5	Energy from wave: wave Energy Conversion Device, Advantage and Disadvantages	1	1	
6	(Derivation of Energy in the wave at particular location)	1	1	
7	(Oscillating of water column Devices Tapered channel Devices, the Pendulor Device, Mc Cabe wave pump	1	1	
8	(Environmental Impacts) Effects on the Ecology of the Area Effects on shipping and Navigation	1	1	
9	Geothermal Energy: Resource of Geothermal energy, thermodynamics of Geothermal energy Conversion (Dry steam power plant, Flash steam power plants, Primary cycles)	1	1 + 1	
10	Electric conversion, non Electric conversion, Environmental consideration. (Basic Block diagram,	1	1	

Subject: Fundamentals of Electronic Measurements

Paper Code: AEIE 3222

Faculty: INDRAJIT NASKAR

JAN- July- 2021

MODULE I (9L): Basics of Measurement systems: Static characteristics: Accuracy, Precision, Resolution, Reproducibility, Repeatability, static Errors: Dynamic characteristics: fidelity, Lag, drift, Errors, their analysis, standards of Errors Measurement:
Electronic Meters: Electronic voltmeter, Electronic Ammeter, Electronic ohmmeter, their constructional circuit Operation, types, Advantages, disadvantages, Concept of digital Frequency meters and digital multimeters.

MODULE II (9L): DC and AC Bridge: Measurement of resistance, Wheatstone Bridge, Kelvin double bridge Capacitance- shering bridge, Measurement of frequency Wien Bridge. Their Construction principle, Calculation Advantages, disadvantages, Industrial application. Q=factor, Errors, precautions and related problems

MODULE III (9L): Oscilloscope: Cathode Ray tube, Vertical and Horizontal Deflection systems, time base, Delay lines, Concept of dual trace - Dual Beam Oscilloscope. CRO Probe, Specification of an oscilloscope. Oscilloscope measurement techniques. Lissajous figure, Special Oscilloscope - Analog and Digital storage oscilloscope, sampling oscilloscope.

MODULE IV (9L): Signal generators and Analysis and DAS: Waveform generator - pulse, square, triangular, sinusoidal, Waveform Analyzer, Spectrum Analyzer Basic Concept of data Acquisition System.

MODULE I (9L)

Sr. No	Topic to be discussed	Allotted class	Class to be taken
1	Static characteristics – Accuracy, Precision, Resolution, Reproducibility, Repeatability Static Errors	1	1
2	Dynamic characteristics: Fidelity, lag, drift, Errors, Their Analysis, standards of Error Measurement	1	1
3	Electronic voltmeter (Circuit Operation, Advantage, disadvantages, Problem	1	1 + 1
4	(Different Circuit, Transistorised, FET etc) (Circuit analysis)	1	1
5	Electronic Ammeter (Circuit Operation, Advantage, Disadvantage Problem	1	1 + 1
6	(Different Circuit Analysis) (Problem)	1	1
7	Electronic Ohmmeter (Circuit Operation, Advantages and Disadvantage)	1	1
8	Digital frequency Meter	1	1
9	Digital Multimeter	1	1

MODULE II (9L):

Sr No	Topic to be discussed	Allotted class	Class to be taken
1	Dc Bridge – Measurement of resistance (Wheatstone Bridge – Construction principle Calculation of unknown resistance, Advantage, Disadvantage, Industrial Application, Problem	1	1
2	Kelvin double bridge – Construction principle calculation of unknown resistance, Advantage disadvantage, Industrial application, Problem.	1	1 + 1
3	Concept of Ac Bridge (Problem Analysis)	1	1
4	Capacitance – Shering bridge – Construction principle, Calculation, Advantages and Disadvantage Industrial Application	1	1
5	(Some other Bridges – Anderson Bridge)	1	1
6	Concept of wien Bridge (Calculation, frequency of oscillation, Condition of oscillation, Adv, Disadv, Probe.	1	1 + 1
7	More Problem	1	1
8	Concept of Q factor, Error Calculation, precaution for all the Dc and Ac Bridges,	1	1
9	Problem.	1	1

MODULE III (9L)

Sr.No	Topic to be discussed	Allotted Class	class to be taken
1	Oscilloscope: Cathode Ray tube (CRT), Vertical and horizontal Deflection system. (Construction of CRT)	1	1 + 1
2	time Base circuit Analysis Delay lines	1	1
3	Concept of Dual trace - Dual Beam oscilloscope	1	1
4	CRO probes, Specification of an oscilloscope	1	1
5	Oscilloscope Measurement techniques. (Amplitude (voltage), frequency, phase)	1	1
6	Lissajous figure	1	1
7	Special oscilloscope	1	1
8	Analog and Digital storage oscilloscope	1	1
9	Sampling oscilloscope	1	1

MODULE IV (9L)

Sr. No.	Topic to be discussed	Allotted class	Class to be taken
1	Waveform generator – Pulse (Circuit design Concept) Calculation	1	1
2	Waveform generator – Square (Circuit Design Concept) Calculation	1	1
3	Waveform generator – Triangular (Circuit design Concept) Calculation	1	1
4	Different Problem	1	1
5	Waveform Analyzer (Basic Block diagram)	1	1
6	Spectrum Analyzer (Basic Block diagram)	1	1
7	Basic Concept of Data Acquisition system (two variable transducer) (two channels)	1	1
8	16 Channel DAS	1	1
9	Problems, Discussion as a whole subjects, Recap.	1	1 + 1

Optical Instrumentation:

AEIE 4126, July-Dec (2021)

32

INDRAJIT NASKAR, AEIE

MODULE I: (9L)

Optical Detectors:

PIN photodiode, Avalanche photo diode, photo transistor, LDR, photo voltaic cell

LED: power and Efficiency calculation, structure of LED and its characteristics, heterojunction LED

MODULE II: (9L)

Optical fiber and their performance:

propagation of light through fiber, different types of fiber and their properties and characteristics. Different types of losses in optical fiber Communication dispersions, optical fiber connectors and splices

MODULE III: (9L)

LASER Fundamentals:

Fundamental characteristics of Laser three levels, four levels, properties of Laser, Laser modes, Resonator Configuration, Q-switching and mode-locking, Cavity pumping

Types of Lasers - Gas lasers, Liquid lasers, Semiconductor Lasers

Industrial Application of Lasers:

Laser for measurement of Distance, length, Velocity, Acceleration, Current, Voltage, atmospheric effect, Material processing, Laser heating, welding, melting and trimming of material Removal and vaporization.

MODULE IV: (Other Faculty) Optical fiber Sensor.

MODULE I (9L)

Sr. No	Topic to be discussed	Allotted Class	Class to be taken	
1	Optical Detector: (Starting with basic concept of PN junction diode)	1	1 + 1	
2	PIN photo diode, Avalanche photo diode, photo transistor	1	1	
3	LDR, photo voltaic cell	1	1	
4	LED: (Material) power and efficiency calculation	1	1 + 1	
5	Structure of LED	1	1	
6	Its Characteristics	1	1	
7	(homojunction LED)	1	1	
8	heterojunction LED (Comparison, Advantage and Disadvantage)	1	1 + 1	
9	(Application: (In different field))	1	1	

MODULE II : (9L)

Sr.No	Topic to be discussed	Allotted class	Class to be taken	
	Optical fiber and their performance (Starting with basic optics)	1	1	
	propagation of Light through fiber (Meridional Ray, Skew Ray)	1	1 + 1	
	(Different types of Dispersion and its losses)	1	1	
	Different types of fiber and their properties and Characteristics	1	1	
	Different types of losses in optical fiber Communication (Intrinsic loss & Extrinsic losses)	1	1	
	(Problem on losses)	1	1	
	Dispersion:	1	1	
	Optical fiber Connector and Splices	1	1	
	(Basic Construction of optical fiber)	1	1	

MODULE III : (9L)

Sr.No	Topic to be discussed	Allotted Class	class to be taken
1	Fundamental characteristics of Lasers: three levels, Four levels properties of laser	1	1
2	Laser modes. Resonator Configuration (Calculation of Einstein coefficients)	1	1
3	(Concept of population Inversion)		1
4	Q-switching and Mode locking Cavity pumping	1	1
5	(Semiconductor Laser characteristics Febrication/structure of Semiconductor Laser)	1	1
6	Types of Laser → Gas lasers, Liquid lasers, Semiconductor lasers.	1	1
7	(Concept of single frequency laser Laser)	1	1 + 1
8	Industrial Application: Laser for measurement of Distance, Length, Velocity, Acceleration.	1	1 +1
9	Current, voltage, Atmospheric effect Material Processing, Laser heating	1	1
10	Laser heating, welding, melting, trimming of material removal and Vapourization.	1	1 + 1

HERITAGE INSTITUTE OF TECHNOLOGY
LAB ASSIGNMENT
AI LAB (CSEN3161)
B.Tech (CSE) 3rd Year 1st Semester
Session: 2020 – 2021

Day 1: (Class discussion)

1. The following facts are given for a particular family tree:

    parent (pam, bob).
    parent (tom, bob).
    parent (tom, liz).
    parent (bob, pat).
    parent (bob, ann).
    parent (pat, jim).
    man(bob).
    man(tom).
    man(jim).
    woman(pam).
    woman(ann).
    woman(liz).

   Now formulate the relations GRANDPARENT (X, Y) & ANCESTOR (X, Y) to find out who is the grandparent of whom? & who is the ancestor of whom respectively?

2. A person may steal Y if X is a thief, X is a man, X likes Y & Y is valuable. Given the following facts, define a predicate steal(X,Y) & determines who steals what?

    man(john).
    woman(mary).
    valuable(gold).
    likes(john, gold).
    likes(john, mary).
    thief(john).
    thief(mary).

3. Write a Prolog program to check whether a given element is a member of a given list
4. Write a Prolog program to find the length of a given list.
5. Write a Prolog program to find the maximum of N numbers

Class Assignment: (Time: 1hr 30mins)

1. Given the following facts:

    man (ravi).
    man (john).
    man (me).
    woman (mary).

   Now if the rule says that anything is mortal if it is man, then find out who are mortals?

2. Write a prolog program to find the maximum of 3 numbers.
3. Write a prolog program to find the factorial of a number.

4. Write a prolog program to find the nth Fibonacci term.
5. Write a prolog program to find the GCD of 2 numbers.
6. Write a prolog program to find the sum of first N natural numbers.
7. Write a Prolog program to find the average of N numbers
8. Write a Prolog program to find the number of vowels in a given list

Weekly Home Assignment 1:

1. Consider the following facts & rules:

Facts are:

a) Hardware is easy course
b) Books for hardware are available
c) Logic is not easy course
d) Graphics is easy course
e) Graphics has 8 credits
f) Graphics has a lab component
g) Books for Database are available
h) Mary takes compiler

Rules are:

Rule1: X takes Y, if Y is easy course and books for Y are available

Rule2: X takes Y, if Y has 8 credits and Y has lab component

Write Prolog Program to answer the following queries:

A. Does Mary take graphics course?
B. Which courses Mary take?
C. Who takes Graphics course?

2. Consider an undirected graph represented by the following facts:

```
arc(a, b).
arc(b, c).
arc(a, c).
arc(a, d).
arc(b, e).
arc(e, f).
arc(b, f).
arc(f, g).
```

Now answer the following questions:

i. Find all the arcs in the given graph

ii. Find those nodes having edge to node 'a'

iii. Write a Prolog Program to check whether there is any path between two nodes in a graph.

iv. Write a program in Prolog to return a list containing the nodes of the graph

3. Write a Prolog program to insert an element at the Kth position of a given list

4. Write a Prolog Program to remove duplicates from a list.

Day 2:

(Class Discussion)

1. Write a prolog program to find the cube of various numbers. The process will stop when the user wants to do.
2. The program has "in mind" a word and you have to guess this word: letter by letter. Unless you don't guess the first letter the program does not ask for the next letter. If you guess the first letter the program says: OK and asks for the next one**.**
3. Write a prolog program to design a login module which asks user his login name followed by password. If password is not correct, it keeps on asking till correct password is given.
4. Write a Prolog program to insert an element at the Kth position of a given list
5. Write a Prolog program to reverse a given list
6. Discussion on CUT

Class Assignment: (Time: 1hr 30mins)

1. Write a Prolog program to check whether a given list is ordered or not.
2. Write a Prolog program to find the last & last-but-one element of a list.
3. Write a Prolog program to print the Fibonacci series up to Nth term.
4. Write a Prolog Program to check whether a given list is Palindrome or not.
5. Rewrite the above login module program using CUT
6. Write a Prolog Program to find the permutation of N elements present in a list.
7. Define a relation Split which splits a list into 2 sub lists, one of them contains all the positive elements (including 0) in the original list, and the second one contains the negative elements. (Do it using CUT).

Weekly Home Assignment 2:

1. Write a Prolog program to print the elements at the even positions of a list.
2. Write a Prolog program to concatenate two given lists.
3. Write a Prolog program to delete an element from the Kth position of a list.
4. Write a Prolog program to find the sum of the squares of the elements of a list.
5. Define a relation Setdiff (Set1, Set2, Result), where all the three sets are represented as lists. Find the Result set that is the difference between Set1 & Set2 using CUT.
6. Write a Prolog program to implement syntax checker of identifier of a programming language as per the following rules:
   <identifier>::<letter><rest>
   <rest>::<optional_underscore><letter|digit><rest>
   <optional_underscore>::'_'.
   <letter or digit>::<letter>|<digit>
   Hint: You may use the following built-in functions:
   % atom_chars (S, L) - convert word S to list L.
   % char_type (X, alpha) or char_type (X, digit)

Day 3:
Class Discussion & Assignment: (Time: 2hrs 10mins)

Structured object

1. Consider a structured object representing a course, where there is a relationship between 4 objects – a course name, time, a lecturer and a location. Let's define the following predicates:
   teacher_course (L, L1, C) –L teachers F. name, L1 L.name, course C
   teacher_on_day (L, D, C) –L teachers L.name, course C on day D
   duration (C, D) - course C of duration D
   Now answer the following queries:
   a) Who teaches the course 'logic'?
   b) Which course does Prof. saha teach?
   c) Which day does Prof. saha teach the course on 'Logic'?
   d) What is the duration of each course?
2. Write a Prolog program to find the length of a list using Accumulator.
3. a) Write a prolog program to create a binary tree and then print the tree in pre-order, in-order & post-order.
   b) Write a program to check whether a given element belongs to the binary tree or not
4. Write a Prolog Program to implement BFS & DFS.

Weekly Home Assignment 3:

1. Rewrite the program of reverse of a list using Accumulator.
2. Implement Bubble Sort & Insertion Sort using Prolog.

Day 4:

Class Discussion & Assignment: (Time: 2hrs 10mins)

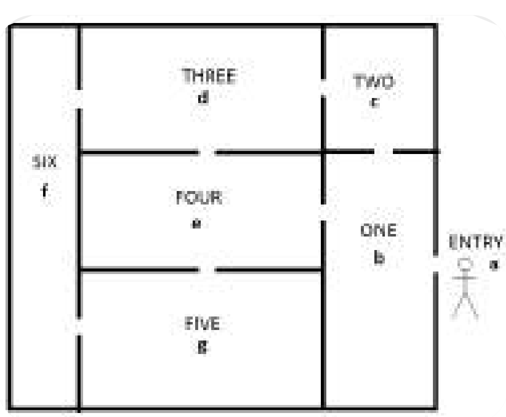
1. Write a Prolog Program to solve 8-queen problem (The objective is to place eight queens on a chessboard so that no two queens are attacking each other; i.e., no two queens are in the same row, the same column, or on the same diagonal. We generalize this original problem by allowing for an arbitrary dimension N of the chessboard.)
2. Write a Prolog Program to implement Resolution method to get the resolvent from two given clauses
 /* Example:- [not(a),b,c] and [a,not(b),c,d]-> [c,d] */

3. Write a Prolog Program to check whether a given 3x3 matrix is a magic square or not
 /* Example

```
                  -------          -------
                  1 5 9             1 5 9
                  6 7 2             8 3 4
                  8 3 4             6 7 2
                  -------          -------
*/
```

Weekly Home Assignment 4:

1. Problem: A house has six rooms & eight doors as shown in the figure below. Only room 6 has a telephone. A person is standing at position 'entry'. He wants to reach to the telephone after going through a number of doors. Write a Prolog program to find out all the sequences according to which he should traverse the rooms along with their cost.



2. Email is out of order at St. Mary's College and the teacher wants to tell Robert something urgent. The teacher meets Craig and asks him to tell Robert she wants to speak with him. Craig says that if he meets Robert its OK, but else he will send the message to everyone he meets and the message will go further. Each student tells each student he meets that the teacher waits for Robert in her office.

   The students meet each other (we don't know in what order):
   1) Craig meets John and Jason
   2) Jason meets Kiki and Adam and David
   3) Adam meets Scott and Jeremy
   4) Jeremy meets John and Scott
   5) Kiki meets Chris
   6) Chris meets David and Adam
   7) David meets Robert

   Do you think the teacher will wait forever in her office? Display all the possible paths from Craig to Robert.

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Odd & Even Semester (New Syllabus)

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - JAYITA SARKAR(JS), REETWIK BHADRA (RB)
Stream:- CIVIL ENGINEERING
Semester:- 2nd
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	Topic of the Lecture	No. of lectures	Name of the Faculty	Remarks
I	Basic terminology related to dc network, KCL, KVL.	1	JS	
	Nodal analysis and Mesh analysis, related problems.	1		
	Superposition Theorem and related problems.	1		
	Thevenin's and Norton's Theorem, related problems.	1		
	Maximum Power transfer theorem, star delta conversion.	1		
	Miscellaneous problem on network analysis and star delta conversion	1		
	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	JS	
	Biot Savart law, Ampere's circuital law and their application.	1		
	Magnetic circuit analysis, related problems.	1		
	Self and mutual inductance, coefficient of coupling.	1		
	B-H curve, losses in magnetic material, lifting power of electromagnet.	1		

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Odd & Even Semester (New Syllabus)

Module	Topic of the Lecture	No. of lectures	Name of the Faculty	Remarks
II	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	**RB**	
	RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1		
	AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1		
	AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1		
	General expression of power in an AC circuit, active, reactive, apparent power.	1		
	Resonance in RLC series circuit, problems related to ac series circuit.	1		
	Problems related to ac series circuit.	1		
	Introduction to ac parallel circuit, parallel resonance.	1		
	Problems related to ac parallel circuit.	1		
III	Generation of Three Phase AC power, balanced 3-phase system.	1	**RB**	
	Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1		
	Measurement of three phase power by two wattmeter method, problems.	1		
	Problems on three phase system.	1		
	Construction of dc machines and working principle of dc generator.	1	JS	
	Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1		
	Characteristics of dc generator.	1		
	Working principle of dc motor, concept of back E.M.F, torque equation.	1		
	Characteristics of dc motor.	1		
	Starting and speed control of dc motor.	1		
	Miscellaneous problem on dc machine (generator and motor).	1		

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Odd & Even Semester (New Syllabus)

Module	Topic of the Lecture	No. of lectures	Name of the Faculty	Remarks
IV	Introduction to Transformer, operating principle, EMF equation.	1	RB	
	Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1		
	Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1		
	Impedance transformation, equivalent cuircuit of a practical transformer.	1		
	Losses and Efficiency of transformer.	1		
	Condition of maximum efficiency of transformer, regulation, problems.	1		
	Open and short circuit test of transformer.	1		
	Problems on single phase transformer.	1		
	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	JS	
	Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1		
	Equivalent circuit and phasor diagram.	1		
	Torque equation and torque-slip characteristics, problems.	1		

FACULTY 1

FACULTY 2

HERITAGE INSTITUTE OF TECHNOLOGY

Name of Document	:	Lecture Plan
Faculty	:	SAIBAL DUTTA & BIDISHA ROY
Department	:	EE
Subject	:	**CIRCUIT THEORY**
Subject Code	:	ELEC 2101
Nature of the subject	:	Theory
Target students	:	EE 3rd Semester
Contact hours	:	3L+1T
Credits	:	4
Session	:	2021-2022

Lecture No.	**Topics**
1-3	Formulation of Node & Mesh equations. Loop and node variable analysis of transformed circuits.
4-5	Network Theorems: Superposition, Thevenin theorem applied to circuits containing dependent sources.
6-7	Network Theorems: Norton and maximum power transfer theorem applied to circuits containing dependent sources.
8	Coupled Circuits: Coefficient of coupling, Dot convention.
9-10	Analysis of coupled circuits.
11-12	Concept of complex frequency. Properties of Laplace transform linearity, differentiation, integration, initial value theorem and final value theorem.
13-14	Transform of standard periodic and non-periodic waveforms.
15	Circuit elements and their transformed equivalents, independent and dependent sources
16-17	Transient and steady state response of RL, RC, LC and RLC with or without stored energy.
18-19	Concept of natural frequency and damping. Sketching of transient response.
20	Treatment of mutual couplings in t & s domain.
21	Graph theory**:** Graph of network: Concept of path, tree, tree branch, tree link, loop
22	Incidence Matrix
23-24	tie set and cut set. Tie-set Matrix and f-cut set matrix and their properties.
25-26	Loop currents and node-pair potentials, formulation of loop and node equilibrium equations in view of graph theory.
27	Two port networks: Open circuit Impedance & Short circuit Admittance parameter.
28	Transmission parameters Hybrid parameters and inverse hybrid parameters.
29	Inter relation between parameters.
30-31	Inter connection between two port networks.
32	Driving point & transfer impedance & admittance.

Lecture No.	Topics
33	Filter Circuits: Concept of filters, Classification of filters.
34-35	Analysis and synthesis of Low pass, High pass
36-37	Band pass and Band reject filters using operational amplifier.
38-39	Filter approximations: Butterworth filters.
40	Chebyshev filters

Date: Signature of faculty

HERITAGE INSTITUTE OF TECHNOLOGY

Name of Document	:	Lecture Plan
Faculty	:	SAIBAL DUTTA & BIDISHA ROY
Department	:	EE
Subject	:	**CIRCUIT THEORY**
Subject Code	:	ELEC 2101
Nature of the subject	:	Theory
Target students	:	EE 3rd Semester
Contact hours	:	3L+1T
Credits	:	4
Session	:	2020-2021

Lecture No.	Topics
1-3	Formulation of Node & Mesh equations. Loop and node variable analysis of transformed circuits.
4-5	Network Theorems: Superposition, Thevenin theorem applied to circuits containing dependent sources.
6-7	Network Theorems: Norton and maximum power transfer theorem applied to circuits containing dependent sources.
8	Coupled Circuits: Coefficient of coupling, Dot convention.
9-10	Analysis of coupled circuits.
11-12	Concept of complex frequency. Properties of Laplace transform linearity, differentiation, integration, initial value theorem and final value theorem.
13-14	Transform of standard periodic and non-periodic waveforms.
15	Circuit elements and their transformed equivalents, independent and dependent sources
16-17	Transient and steady state response of RL, RC, LC and RLC with or without stored energy.
18-19	Concept of natural frequency and damping. Sketching of transient response.
20	Treatment of mutual couplings in t & s domain.
21	Graph theory**:** Graph of network: Concept of path, tree, tree branch, tree link, loop
22	Incidence Matrix
23-24	tie set and cut set. Tie-set Matrix and f-cut set matrix and their properties.
25-26	Loop currents and node-pair potentials, formulation of loop and node equilibrium equations in view of graph theory.
27	Two port networks: Open circuit Impedance & Short circuit Admittance parameter.
28	Transmission parameters Hybrid parameters and inverse hybrid parameters.
29	Inter relation between parameters.
30-31	Inter connection between two port networks.
32	Driving point & transfer impedance & admittance.

Lecture No.	Topics
33	Filter Circuits: Concept of filters, Classification of filters.
34-35	Analysis and synthesis of Low pass, High pass
36-37	Band pass and Band reject filters using operational amplifier.
38-39	Filter approximations: Butterworth filters.
40	Chebyshev filters

Date: Signature of faculty

Lesson Plan (PHYS-2101)

Module-2

Lagrangian and Hamiltonian mechanics

Lecture-1: Two basic commitments of Classical Mechanics and a few fundamental disadvantages with Newtonian formulation.

Lecture-2: Galore of variational extrema problems and road to action principle, contextualizing the Calculus of Variation.

Lecture-3: Introduction to calculus of variation, notion of action and Lagrangian and a necessary condition of extremum. The Euler-Lagrange Equation and Jacobi form. Shortest distance between two points on a plane is a straight line.

Lecture-4: Brachistrochrone Problem.

Lecture-5: Shape of a hanging chain. Isoperimetric problem. Maximum area covered by a loop is that corresponds to a circle.

Lecture-6: Newton's law and the hinges with reaction force. Inadequacy of free-body diagram. Least action principle and Euler-Lagrange equation for one particle system.

Lecture-7: Free particle and recovery of Newton's first law. Motion of a projectile.

Lecture-8: Comparing projectile motion and particle on an inclined plane (Same Lagrangian in Cartesian system but different dynamics). The notion of constraints.

Lecture-9: Constraints and their classification. Holonomic, non-holonomic, scleronomic and rheonomic constraints examples. Conditions of possibility of dynamics. The notion of degrees of freedom (dof) of a holonomic system. Steps to find out dof.

Lecture-10: Euler-Lagrange equation in generalized co-ordinates. Steps to find out equations of motion. Examples (i) pendulum (ii) pendulum moving with constant velocity (iii) pendulum moving with constant acceleration, (iv)inclined plane under various circumstances (v)Atwood machine.

Lecture-11: Conservation principle, cyclic coordinate and Jacobi integral. Examples.

Lecture-12: Hamilton's equations of motions from calculus of variation. Conservation principles and physical meaning of Hamiltonian. Examples.

Module-3

Small Oscillation

Lecture-1: Ubiquity of oscillation physics, from pendulum to lattice vibration.

Lecture-2: Rolle's theorem and the notion of stable and unstable equilibria. Examples.

Lecture-3: Small oscillation approximation and linearization. A primer to Simple Harmonic Motion.

Lecture-4: Coupled oscillation of a two-particle spring-mass system. Lagrangian and equations of motion.

Lecture-5: Normal modes, symmetric and anti-symmetric modes and their physical meaning.

Lecture-6: A two particle study of general theory of small oscillation. Normal frequencies and normal modes.

Lecture-7: General theory of small oscillation continued. T_{ij} and V_{ij} matrix.

Lecture-8: Eigenvalue equation and principal axis transformation. Illustrative examples

Lecture-9: Eigenvalue equation continued.

Lecture-10: Steps to find out normal modes and normal frequencies. Illustrative examples.

Lecture-11: Normal modes and normal frequencies. Physical meaning.

Lecture-12: Coupled pendulum.

Lecture-13: Three-particle coupled system.

Lecture-14: Problems and solutions.

HERITAGE INSTITUTE OF TECHNOLOGY

Name of Document	:	Lecture Plan
Faculty	:	SAIBAL DUTTA & ANIRBAN KOLAY
Department	:	EE
Subject	:	**CONTROL SYSTEM**
Subject Code	:	ELEC 3103
Nature of the subject	:	Theory
Target students	:	EE 5th Semester
Contact hours	:	3L + 1T
Credits	:	4
Session	:	2020-2021

Lecture No.	Topics
1-2	Introduction and elementary discussion on control system, Classification of control systems, open loop and closed loop systems. Properties of Control Systems, concepts of sensitivity and robustness, non minimum phase systems and time delay system
3-4	Block diagram representation of control systems. Block diagram algebra. Signal flow graph. Mason’s gain formula
5-6	Tutorial
7-8	Basic idea on Potentiometer, Synchro, Resolvers, Position encoders. DC and AC tacho-generators, Actuators, Block diagram representation of a system containing control system components
9-10	Review of transient & steady state response of first and second order systems, Concept of undamped natural frequency and damping
11-12	Effects of Poles and Zeros on transient response, Calculation of overshoot, rise time, peak time and settling time for a second order system,
13	Steady state errors in control systems due to step, ramp and parabolic inputs, Concepts of system types and error constants
14-15	Tutorial
16-17	Statement of Routh-Hurwitz stability criteria and its applications, analysis on Stability by pole location
18-19	Details on Root locus techniques, construction of Root Loci for simple systems, Effects of gain on the movement of Pole and Zeros
20-21	Review of frequency response of first and second order systems, Frequency Domain Specifications.
22	Tutorial
23-24	Detail discussion on Bode plots
25-26	Polar plots, concept of phase and gain margin
27-28	Nichols chart, M-circle and M-Contours in Nichols chart, Tutorial
29-30	Nyquist stability criteria, measure of relative stability
31-32	Brief discussion on compensator, Lead, Lag compensation, Lead- lag compensation
33-34	PI, PD and PID control action, Tutorial
35	Review on State variable formulation of control systems

Lecture No.	Topics
36-37	Observable and controllable canonical form realization
38-39	Diagonal form realization, Diagonalization
40-41	Concept of Controllability and Observability
42	Linear state feedback control action, Tutorial

Date: Signature of faculty

HERITAGE INSTITUTE OF TECHNOLOGY

Name of Document	:	Lecture Plan
Faculty	:	SAIBAL DUTTA & ANIRBAN KOLAY
Department	:	EE
Subject	:	**CONTROL SYSTEM**
Subject Code	:	ELEC 3103
Nature of the subject	:	Theory
Target students	:	EE 5th Semester
Contact hours	:	3L + 1T
Credits	:	4
Session	:	2021-2022

Lecture No.	**Topics**
1-2	Introduction and elementary discussion on control system, Classification of control systems, open loop and closed loop systems. Properties of Control Systems, concepts of sensitivity and robustness, non minimum phase systems and time delay system
3-4	Block diagram representation of control systems. Block diagram algebra. Signal flow graph. Mason's gain formula
5-6	Tutorial
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13	Steady state errors in control systems due to step, ramp and parabolic inputs, Concepts of system types and error constants
14-15	Tutorial
16-17	Statement of Routh-Hurwitz stability criteria and its applications, analysis on Stability by pole location
18-19	Details on Root locus techniques, construction of Root Loci for simple systems, Effects of gain on the movement of Pole and Zeros
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22	Tutorial
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27-28	Nichols chart, M-circle and M-Contours in Nichols chart, Tutorial
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Lecture No.	Topics
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38-39	Diagonal form realization, Diagonalization
40-41	Concept of Controllability and Observability
42	Linear state feedback control action, Tutorial

Date: Signature of faculty

CSEN 4101: Compiler Construction Lesson Plan (Odd Sem 2020)

Aug 2020:

Class No	Topic	Date	
	Week 1 (Ref: Ch1 and Ch2 of Aho)		
1.	**Introduction to Compiling**	5th Aug	
2.	**A simple One-pass Compiler**	6th Aug	
3.	**A simple One-pass Compiler (contd.)**	6th Aug	
4.	**Lab: Tutorial on Flex**	7th Aug	
	Week 2 (Ref: Ch3 of Aho)		
5.	**Lexical Analysis**	10th Aug	
6.	**Lexical Analysis** *(contd.)*	12th Aug	
7.	Code Generation (CG): Introduction, Target Machine	13th Aug	
8.	Code Generation: Algorithm, Registers Handling	13th Aug	
9.	CG: Registers Handling (contd.)	14th Aug	
	Week 3 (Ref: Ch9 of Aho)		
10.	CG: Basic Blocks, Flow graphs, conclude	17th Aug	
11.	Recap of theory till learnt / Tutorial etc. (no Lab.)	19th Aug	
12.	Lab: Flex complete	20th Aug	
13.	Lab: Assignment of Lab projects to first four groups	20th Aug	
14.	Lab: Assignment of Lab projects to next four groups (Attendance optional)	21st Aug	
	Week 4 (Ref: Ch7 of Aho)		
15.	Run Time Environment (RTE) : Intro	24th Aug	
16.	RTE: Parameter Passing	26th Aug	
17.	RTE: Activation Record	27th Aug	
18.	RTE: Storage Allocation Strategies, Access Links, Displays	27th Aug	
19.	Recap	28th Aug	
	Week 5(Ref: Ch 4 of Aho)		

20.	Symbol Table	31st Aug	
21.	Introduction to Parsing and CFG	2nd Sep	
22.	Top Down Parsing / LL(1) Parsers	3rd Sep	
23.	Top Down Parsing / LL(1) Parsers (contd.)	3rd Sep	
24.	Top Down Parsing / LL(1) Parsers (contd.)	4th Sep	
	Week 6 (Ref: Ch4 of Aho)		
25.	Bottom Up Parsers	7th Sep	
26.	Bottom Up Parsers / LR Parsers	~~9th Sep~~	21st Sep[1]
27.	Bottom Up Parsers / LR Parsers (contd.)	~~10th Sep~~	23rd Sep
28.	Bottom Up Parsers / LR Parsers (contd.)	~~10th Sep~~	24th Sep
29.	Bottom Up Parsers / LR Parsers (contd.)	~~11th Sep~~	24th Sep
30.	Bottom Up Parsers / LR Parsers - concluded		25th Sep
	Week 7		
31.	LR(1) parsers	~~14th Sep~~	28th Sep
	~~LALR Parsers~~	~~16th Sep~~	
32.	Lab: Bison	~~17th Sep~~	30th Sep
33.	Lab: Bison (contd.)	~~17th Sep~~	01st Oct
34.	Lab: Bison (contd.)		01st Oct
	~~LALR Parsers (contd.) – optional material~~	~~18th Sep~~	
	Gandhi Jayanti – No class	02nd Oct	
	Week 8 (Ref Ch5 of Aho)		
35.	Syntax directed definitions: Synthesized attributes, Inherited attributes. Construction of Syntax trees: Expressions, DAG for Expressions.	05th Oct	
36.	Bottom-up Evaluation of S-Attributed Definitions: Synthesized attributes on the Parser stack. L-Attributed definitions: Translation schemes.	07th Oct	
37.	Top-down Translation: Elimination left recursion. Bottom-up Evaluation of Inherited Attributes: Removing Embedding actions, Inheriting attributes, Simulating the Evaluation of Inherited attributes, Replacing Inherited by Synthesized attributes.	08th Oct	

[1] All Classes were suspended between 8th Sep and 20th Sep via a notice from the HIT Mgmt.

38.	--- contd ----	08th Oct	
39.	**Intermediate Code Generation:** Intermediate Languages: Graphical representation, Three-address code: different types, Translation into Three-address code, Quadruples / Triples / Indirect Triples, their comparisons. (Ch 8 of Aho)	09th Oct	
	Week 9 (Ref Ch8 of Aho)		
40.	Translation of Declarations statements: Procedures, Records. Assignment statements.	12th Oct	
41.	Addressing array elements. Boolean expressions, Flow of control statements, Case statements.	14th Oct	
42.	Backpatching: Boolean expression, Flow-of-control statements. Procedure calls.	15th Oct	
43.	Contd ---	15th Oct	
44.	Contd ---	16th Oct	
	Puja vacation coming – No class (Teacher's decision)	19th Oct	
	Week 10[2]		
45.	Code optimization basics	5th Nov	
46.	-as above-	5th Nov	
47.	RE to DFA directly via Firstpos() etc.	?? Nov	
48.	-as above-	?? Nov	

Ref: Compilers: Principles, Techniques and Tools: By Aho, Sethi, Ullman

[2] All classes were suspended between 21st Oct and 31st Oct via a notice from the HIT Mgmt. on account of the Puja vacation

Department of CSE
Heritage Institute of Technology

Course Handout

Summer 2021

CSEN2152 Software Tools

COURSE HANDOUT

CSEN2152: Software Tools					
B. Tech CSE, Semester III, June 2021					
Contact Hours per Week	Lecture	Tutorial	Practical	Total	Credit Points
	0	0	3	3	1.5

1. Class Meetings

- Mondays 14:00 (Group 2, 3)
- Tuesdays 14:00 (Group 1, 5)
- Thursdays 14:00 (Group 4, 6)

(Completely Online until further notice)

2. Class Platform

- Google Meet, Meeting IDs shared on LMS Platform

3. Class LMS

- Google Classroom (https://classroom.google.com/u/0/c/MzY0ODUwNzUwMjcw)

4. Evaluation Breakdown

Component	%age Weightage
End Semester Examination	60
Regular Internal Evaluation	40
TOTAL	**100**

5. Submissions

All Assignment Sets should be submitted in **electronic format** via Google Classroom. All assignments are due at 23:59 HRS on the due dates shown on the course LMS page. Any submission that spills onto 00:00 HRS or beyond to the next day contributes 1 late day each. All submissions are verified for plagiarism.

6. Plagiarism

We are committed to upholding the highest standards of academic integrity and honesty. Plagiarism in any form is unacceptable and will be treated seriously. All turned in work is passed through an automated plagiarism checker.

We trust that students are honest and will uphold their academic integrity. If, however, at any point of time any evaluation component / parameter is found to be plagiarized (from other students, internet, or any other means) more than an acceptable limit such evaluation component / parameter for that student will be cancelled/penalised without providing any further reason.

7. Late Days & Penalties

A student will have a total of **8** Free Late Days at his/her discretion throughout the semester. Each Late Day is within the next **24 Hours** of the actual deadline. A student may use one late day in lieu of a 24-hour extension of the deadline, and at most **2** late days may be used for one single assignment.

Once the free late days are exhausted, any late submissions will be penalized at **10%** per day. **Any submissions beyond 5 late days will not be graded**.

8. Consultation & Discussion

Outside and beyond the scheduled Class Meetings (Point 1), a student may request discussion of any academic matter via **e-mail**. If it is about some problem/assignment discussed or handed out in class posting and discussing it on the **LMS platform** would be preferred than personal e-mails since it would benefit the other students who might have same/similar questions or doubts. For less serious discussion students may use the class group on the instant messaging platform (WhatsApp). Phone calls should be reserved for essential/emergency situations.

9. Grading

A **composite score** will be prepared after consolidating the marks obtained in all assessment components. The composite score will be converted to **letter grades** taking in all internal components and external examination(s) as per university policy.

10. Attendance

A minimum of 75% attendance is mandatory for being eligible to sit for the University Examination. Students should target 100% attendance.

11. Suggested Readings

- The Definitive Guide to GCC, William von Hagen, 2nd Edition, 2006, Apress.
- Linux Debugging and Performance Tuning: Tips and Techniques, Steve Best, Pearson Education,1st Edition, 2006.
- The Art of Debugging with GDB, DDD, and Eclipse, Norman Matloff, Peter Jay Salzman,2008.

Links to Class Slides, Online Resources, MOOCS, and Lecture Videos etc. to be shared on LMS Platform.

12. Tentative Session Plan

Sl. No.	No. of Lectures	Topics	Resources
1	2	**Introduction** CodeLite IDE [Code::Blocks] Learn to use CodeLite IDE for wrtiing C/C++ programming languages	Class Slides Tutorial Handout
2	2	**Compiling with gcc** Learn all the command line options for compiling C programs in the unix environment using gcc. **Memory profiling with valgrind** Learn to use valgrind which is a critical tool for helping one to find memory leaks in the program: malloc without free, accessing an array outside its bounds, etc.	Class Slides Tutorial Handout
3	2	**Debugging with gdb** gdb is the standard C/C++ debugger to debug your code. Learn to interact with gdb directly via a shell, or use a graphical interface provided by CodeLite IDE.	Class Slides Tutorial Handout
4	2	**Code coverage testing with gcov** Learn about good testing using gcov to make sure the tests are exercising all the branches in the code. **Runtime profiling with gprof** Learn about using gprof which is a very useful profiling tool for speeding up execution speed of a program: it will show where your program is spending most of its time, so one can know about the most important code to optimize	Class Slides Tutorial Handout
5#	*2#*	***Git for sharing files and version control#*** *Learn to setup a repository so that it can sync your local with that on the server. Learn to use cvs for version controlling.*	*Class Slides* *Tutorial Handout*

Detailed syllabus is provided in a separate document. Sequence of lectures subject to change.
Subject to length of course duration/available weeks.

12. Tentative Session Plan

Sl. No.	No. of Lectures	Topics	Resources
1	2	**Introduction** CodeLite IDE [Code::Blocks] Learn to use CodeLite IDE for wrtiing C/C++ programming languages	Class Slides Tutorial Handout
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3	2	**Debugging with gdb** gdb is the standard C/C++ debugger to debug your code. Learn to interact with gdb directly via a shell, or use a graphical interface provided by CodeLite IDE.	Class Slides Tutorial Handout
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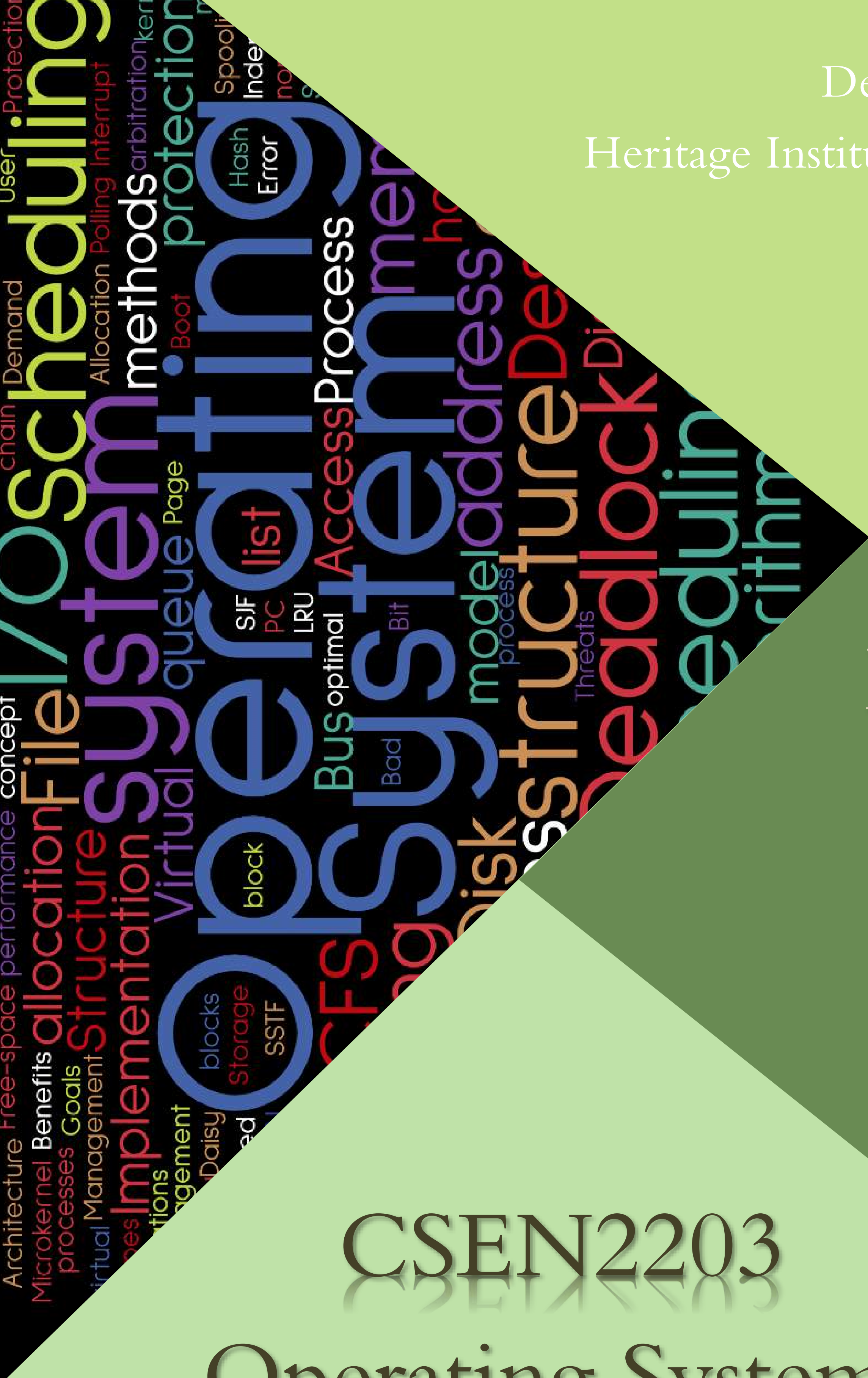
Detailed syllabus is provided in a separate document. Sequence of lectures subject to change.
Subject to length of course duration/available weeks.

Department of CSE
Heritage Institute of Technology



Course Handout

Spring 2021

CSEN2203 Operating Systems

COURSE HANDOUT

CSEN2203: Operating Systems					
B. Tech CSE, Semester IV, January 2021					
Contact Hours per Week	Lecture	Tutorial	Practical	Total	Credit Points
	3	0	0	3	3

1. Class Meetings

- Thursdays 10:00
- Fridays 12:00

(Completely Online until further notice)

2. Class Platform

- Google Meet, Meeting IDs shared on LMS Platform

3. Class LMS

- Google Classroom (https://classroom.google.com/u/0/c/Mjk5ODM0MTMyMjky)

4. Evaluation Breakdown

Component	%age Weightage
End Semester Examination	70
Regular Internal Evaluation	30
TOTAL	**100**

5. Submissions

All Assignment Sets should be submitted in **electronic format** via Google Classroom. Submissions should be in **Google Docs (unless permitted otherwise, doc/pdf and such not to be used)**. All assignments are due at 23:59 HRS on the due dates shown on the course LMS page. Any submission that spills onto 00:00 HRS or beyond to the next day contributes 1 late day each. All submissions are verified for plagiarism.

6. Plagiarism

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I trust that my students are honest and will uphold their academic integrity. If, however, at any point of time any evaluation component / parameter is found to be plagiarized (from other students, internet, or any other means) more than **30%**, such evaluation component / parameter for that student will be cancelled/penalised without providing any further reason.

7. Late Days & Penalties

A student will have a total of **8** Free Late Days at his/her discretion throughout the semester. Each Late Day is within the next **24 Hours** of the actual deadline. A student may use one late day in lieu of a 24-hour extension of the deadline, and at most **2** late days may be used for one single assignment.

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9. Grading

A **composite score** will be prepared after consolidating the marks obtained in all assessment components. The composite score will be converted to **letter grades** taking in all internal components and external examination(s) as per university policy.

10. Attendance

A minimum of 75% attendance is mandatory for being eligible to sit for the University Examination. Students should target 100% attendance.

11. Suggested Readings

- Required Textbook:

Operating System Concepts, by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (John Wiley & Sons). **[OS 8e, 9e, 10e]**

- Useful References:

Operating Systems: Internals and Design Principles, by William Stallings (Pearson Education). **[OSws]**
Modern Operating Systems, by Andrew S. Tanenbaum, Herbert Bos (Pearson Education). **[MOS]**
Operating Systems - A Concept-Based Approach, by Dhananjay M. Dhamdhere (McGraw-Hill). **[OSdd]**

Links to Online Resources, MOOCS, and Lecture Videos to be shared on LMS Platform.

12. Tentative Session Plan

Sl. No.	No. of Lectures	Topics	Resources
1	2	**Introduction** OS Architecture (Monolithic, Microkernel, Layered, Hybrid), Operating system functions, Different types of O.S. (batch, multi-programmed, time-sharing, real-time, distributed, parallel)	Class Slides OS 8e, 9e, 10e
2	2	**Security & Protection** Goals of protection, Domain of protection, Access matrix and its representation, Threats and system security (Reading Material + Assignment)	Class Slides OS 8e, 9e, 10e
3	2	**Process & Threads** 7 state process model, Threads overview, Benefits of threads	Class Slides OS 8e, 9e, 10e OSws
4	2	**CPU Scheduling** Scheduling criteria, Preemptive & non-preemptive scheduling, Scheduling algorithms FCFS, SJF	Class Slides OS 8e, 9e, 10e
5	2	**CPU Scheduling** Scheduling algorithms SRTF, RR, Priority Numericals, Comparison Assignment	Class Slides OS 8e, 9e, 10e
6	2	**Process Synchronization - I** Critical section problem, Software solution – Peterson Semaphores	Class Slides OS 8e, 9e, 10e
7	2	**Process Synchronization - II** Semaphores, Classical problems of synchronization, BB/PC, RW, DP	Class Slides OS 8e, 9e, 10e
8	2	**Process Synchronization - III** Classical problems of synchronization, BB/PC, RW, DP Assignment	Class Slides OS 8e, 9e, 10e
9	2	**Deadlocks - I** Deadlock characterization, RAG, Deadlock Prevention,	Class Slides OS 8e, 9e, 10e
10	2	**Deadlocks - II** Deadlock Avoidance & Detection Banker's - I	Class Slides OS 8e, 9e, 10e

Sl. No.	No. of Lectures	Topics	Resources
11	2	**Deadlocks - III** Banker's - II Recovery Assignment	Class Slides OS 8e, 9e, 10e
12	2	**Memory Management - I** Physical v/s Logical address, Virtual address, Contiguous memory allocation (Fixed and Variable partition)	Class Slides OS 8e, 9e, 10e
13	2	**Memory Management - II** Non-contiguous memory allocation techniques Paging, Segmentation Aassignment	Class Slides OS 8e, 9e, 10e
14	2	**Virtual Memory - I** Virtual Address, Demand Paging, Numericals	Class Slides OS 8e, 9e, 10e
15	2	**Virtual Memory - II** Page replacement algorithms (FCFS, LRU, optimal),Thrashing Assignment	Class Slides OS 8e, 9e, 10e
16	2	**Disk Management** Disk scheduling (FCFS, SSTF, SCAN, C-SCAN) Assignment	Class Slides OS 8e, 9e, 10e
17	2	**I/O Management - I** PC Bus Structure, I/O connections, Data transfer techniques (Programmed, Interrupt driven , DMA)	Class Slides OSws
18	2	**I/O Management - II** Bus arbitration (Daisy chain, Polling, Independent request), Blocking and non-blocking I/O	Class Slides OSws
19	2	**Kernel Subsystem** Kernel I/O subsystem (Scheduling, Buffering, Caching, Spooling and device reservation, Error handling) Assignment	Class Slides OSws

Detailed syllabus is provided in a separate document. Sequence of lectures subject to change.

LESSON PLAN

Subject Name: DATA MINING & KNOWLEDGE DISCOVERY					
Paper Code: CSEN4144					
Contact Hours per week	L	T	P	Total	Credit Points
3	0	0	0	3	3

Day	Topics to be Covered	Proposed Date	Actual Date	Remarks
Day-1	**Module I. Introduction and Rule-based Classification** What is Data Mining? Why do we need data mining?	07/08/2020		
Day-2	**Module I. Introduction and Rule-based Classification** Differences between Data Mining and Machine Learning.	10/08/2020		
Day-3	**Module I. Introduction and Rule-based Classification** Motivating challenges in Data Mining.	11/08/2020		
Day-4	**Module I. Introduction and Rule-based Classification** Motivating challenges in Data Mining and discussion of Decision Trees	14/08/2020		
Day-5	**Decision Tree:** General approach for solving a classification problem.	18/08/2020		
Day-6	**Decision Tree:** What is a classification problem?	21/08/2020		
Day-7	**Decision Tree:** Decision Tree Induction	24/08/2020		
Day-8	**Decision Tree:** How a decision tree works, how to build a decision tree	25/08/2020		
Day-9	**Decision Tree:** Expressing attribute test conditions, measures for selecting best split, algorithm for decision tree induction. Model overfitting – Pre-pruning, post-pruning.	28/08/2020		
Day-10	**Rule-based Classification:** How a rule-based classifier works	31/08/2020		

Day-11	**Rule-based Classification:** rule-ordering schemes	01/09/2020		
Day-12	**Rule-based Classification:** how to build a rule-based classifier.	04/09/2020		
Day-13	**Rule-based Classification:** direct and indirect methods for rule extraction.	07/09/2020		
Day-14	**Module II. Advanced Classification Techniques** **Bayesian Classifier:** Bayes theorem – using it for classification	08/09/2020		
Day-15	**Module II. Advanced Classification Techniques** **Bayesian Classifier:** Naïve Bayes classifier, Bayes error rate.	21/09/2020		
Day-16	**Support Vector Machines (SVM):** Maximum margin hyperplanes.	22/09/2020		
Day-17	**Support Vector Machines (SVM):** Linear SVM: separable case	25/09/2020		
Day-18	**Support Vector Machines (SVM):** non-separable case, Non-linear SVM.	28/09/2020		
Day-19	**Module III. Ensemble Methods, Association Rule Mining** **Ensemble Methods:** Bagging, Boosting, Random Forests.	29/09/2020		
Day-20	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Problem definition, Frequent itemset generation (Apriori principle, candidate generation and pruning.	05/10/2020		
Day-21	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Rule generation	05/10/2020		
Day-22	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Compact representation of frequent itemsets	06/10/2020		
Day-23	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** FP-growth algorithm	09/10/2020		

Day-24	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Sub-graph mining.	10/10/2020		
Day-25	**Module IV. Cluster Analysis** What is clustering analysis? Motivations, objectives and applications of clustering. Different types of clustering.	13/10/2020		
Day-26	**Module IV. Cluster Analysis** **Partitional Clustering**: **K-means**	16/10/2020		
Day-27	**Module IV. Cluster Analysis** **Partitional Clustering**: Bisecting K-means, PAM.	19/10/2020		
Day-28	**Module IV. Cluster Analysis** **Hierarchical Clustering**: **Agglomerative**	2/11/2020		
Day-29	**Module IV. Cluster Analysis** **Hierarchical Clustering**: Divisive, MIN, MAX	3/11/2020		
Day-30	**Module IV. Cluster Analysis** **Hierarchical Clustering**: dendrogram representation.	6/11/2020		
Day-31	**Module IV. Cluster Analysis** **Density-based Clustering**: **DBSCAN**.	9/11/2020		
Day-32	**Module IV. Cluster Analysis** **Density-based Clustering**: **DBSCAN**. Cluster evaluation.	10/11/2020		
Day-33	**Module IV. Cluster Analysis** Cluster evaluation– OPTICS, DENCLUE, CHAMELEON, BIRCH, CURE, ROCK	13/11/2020		

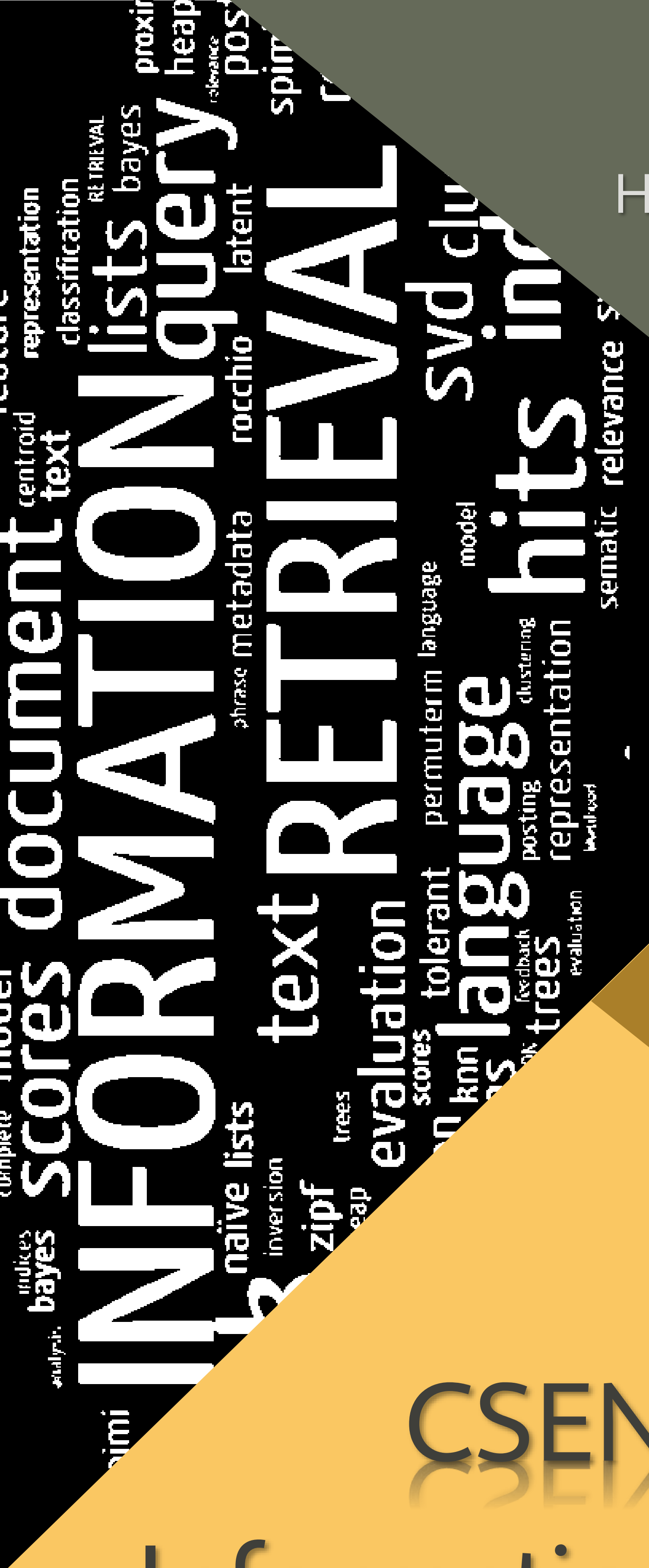
LESSON PLAN

Subject Name: DATA MINING & KNOWLEDGE DISCOVERY					
Paper Code: CSEN4144					
Contact Hours per week	L	T	P	Total	Credit Points
3	0	0	0	3	3

Day	Topics to be Covered	Proposed Date	Actual Date	Remarks
Day-1	**Module I. Introduction and Rule-based Classification** What is Data Mining? Why do we need data mining?	07/08/2020	07/08/2020	
Day-2	**Module I. Introduction and Rule-based Classification** Differences between Data Mining and Machine Learning.	10/08/2020	10/08/2020	
Day-3	**Module I. Introduction and Rule-based Classification** Motivating challenges in Data Mining.	11/08/2020	11/08/2020	
Day-4	**Module I. Introduction and Rule-based Classification** Motivating challenges in Data Mining and discussion of Decision Trees	14/08/2020	14/08/2020	
Day-5	**Decision Tree:** General approach for solving a classification problem.	18/08/2020	18/08/2020	*Good Performance*
Day-6	**Decision Tree:** What is a classification problem?	21/08/2020	21/08/2020	
Day-7	**Decision Tree:** Decision Tree Induction	24/08/2020	24/08/2020	
Day-8	**Decision Tree:** How a decision tree works, how to build a decision tree	25/08/2020	25/08/2020	
Day-9	**Decision Tree:** Expressing attribute test conditions, measures for selecting best split, algorithm for decision tree induction. Model overfitting – Pre-pruning, post-pruning.	28/08/2020	28/08/2020	
Day-10	**Rule-based Classification:** How a rule-based classifier works	31/08/2020	31/08/2020	*Good Performance*

Day-11	**Rule-based Classification:** rule-ordering schemes	01/09/2020	01/09/2020	
Day-12	**Rule-based Classification:** how to build a rule-based classifier.	04/09/2020	04/09/2020	
Day-13	**Rule-based Classification:** direct and indirect methods for rule extraction.	07/09/2020	07/09/2020	
Day-14	**Module II. Advanced Classification Techniques** **Bayesian Classifier:** Bayes theorem – using it for classification	08/09/2020	08/09/2020	*Good Performance*
Day-15	**Module II. Advanced Classification Techniques** **Bayesian Classifier:** Naïve Bayes classifier, Bayes error rate.	21/09/2020	21/09/2020	
Day-16	**Support Vector Machines (SVM):** Maximum margin hyperplanes.	22/09/2020	22/09/2020	
Day-17	**Support Vector Machines (SVM):** Linear SVM: separable case	25/09/2020	25/09/2020	
Day-18	**Support Vector Machines (SVM):** non-separable case, Non-linear SVM.	28/09/2020	28/09/2020	
Day-19	**Module III. Ensemble Methods, Association Rule Mining** **Ensemble Methods:** Bagging, Boosting, Random Forests.	29/09/2020	29/09/2020	*Good Performance*
Day-20	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Problem definition, Frequent itemset generation (Apriori principle, candidate generation and pruning.	05/10/2020	05/10/2020	*Good Performance*
Day-21	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Rule generation	05/10/2020	05/10/2020	
Day-22	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Compact representation of frequent itemsets	06/10/2020	06/10/2020	
Day-23	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** FP-growth algorithm	09/10/2020	09/10/2020	*Good Performance*

Day-24	**Module III. Ensemble Methods, Association Rule Mining** **Association Rule Mining:** Sub-graph mining.	10/10/2020	10/10/2020	*Good Performance*
Day-25	**Module IV. Cluster Analysis** What is clustering analysis? Motivations, objectives and applications of clustering. Different types of clustering.	13/10/2020	13/10/2020	
Day-26	**Module IV. Cluster Analysis** **Partitional Clustering**: **K-means**	16/10/2020	16/10/2020	
Day-27	**Module IV. Cluster Analysis** **Partitional Clustering**: Bisecting K-means, PAM.	19/10/2020	19/10/2020	
Day-28	**Module IV. Cluster Analysis** **Hierarchical Clustering**: **Agglomerative**	2/11/2020	2/11/2020	
Day-29	**Module IV. Cluster Analysis** **Hierarchical Clustering**: Divisive, MIN, MAX	3/11/2020	3/11/2020	
Day-30	**Module IV. Cluster Analysis** **Hierarchical Clustering**: dendrogram representation.	6/11/2020	6/11/2020	*Good Performance*
Day-31	**Module IV. Cluster Analysis** **Density-based Clustering**: **DBSCAN**.	9/11/2020	9/11/2020	
Day-32	**Module IV. Cluster Analysis** **Density-based Clustering**: **DBSCAN**. Cluster evaluation.	10/11/2020	10/11/2020	
Day-33	**Module IV. Cluster Analysis** Cluster evaluation– OPTICS, DENCLUE, CHAMELEON, BIRCH, CURE, ROCK	13/11/2020	13/11/2020	



Department of CSE

Heritage Institute of Technology

Course Handout

Summer 2020

CSEN6137 Information Retrieval

CSEN6137
Information Retrieval

COURSE HANDOUT

CSEN6137: Information Retrieval					
M.Tech CSE, Semester III, June 2020					
Contact Hours per Week	Lecture	Tutorial	Practical	Total	Credit Points
	3	0	0	3	3

1. Class Meetings
- Mondays 11AM
- Thursdays 11AM
- Fridays 11AM

(Completely Online until further notice)

2. Class Platform
- Google Meet, Meeting IDs shared on LMS Platform

3. Class LMS
- Google Classroom

4. Evaluation Breakdown

Component	%age Weightage
Regular Attendance and Class Performance	10
Take Home Assignments (7-8)	70
Group Project Work	20
TOTAL	**100**

5. Submissions
All Assignment Sets should be submitted in **electronic format** via Google Classroom. All assignments are due at 11:59 PM on the due dates shown on the course LMS page. Any submission that spills onto 00:00 HRS or beyond to the next day contributes 1 late day each. All submissions are verified for plagiarism.

6. Plagiarism
We are committed to upholding the highest standards of academic integrity and honesty. Plagiarism in any form is unacceptable and will be treated seriously. All turned in work is passed through an automated plagiarism checker.

I trust that my students are honest and will uphold their academic integrity. If, however, at any point of time any evaluation component / parameter is found to be plagiarized (from other students, internet, or any other means) more than **40%**, such evaluation component / parameter for that student will be cancelled/penalised without providing any further reason.

7. Late Days & Penalties

A student will have a total of **7** Free Late Days at his/her discretion throughout the semester. Each Late Day is within the next **24 Hours** of the actual deadline. A student may use one late day in lieu of a 24-hour extension of the deadline, and at most **3** late days may be used for one single assignment.

Once the free late days are exhausted, any late submissions will be penalized at **10%** per day. Any submissions beyond 3 late days will not be graded.

8. Consultation & Discussion

Outside and beyond the scheduled Class Meetings (Point 1), a student may request discussion of any academic matter via **e-mail**. If it is about some problem/assignment discussed or handed out in class posting and discussing it on the **LMS platform** would be preferred than personal e-mails since it would benefit the other students who might have same/similar questions or doubts. For less serious discussion students may use the class group on the instant messaging platform. Phone calls should be reserved for essential/emergency situations.

9. Grading

A **composite score** will be prepared after consolidating the marks obtained in all assessment components. The composite score will be converted to **letter grades** taking in all internal components and external examination(s) as per university policy.

10. Attendance

A minimum of 75% attendance is mandatory for being eligible to sit for the University Examination. Students should target 100% attendance.

11. Tentative Session Plan

Sl. #	Topic	Number of Lectures	Pre-Readings
1	• **Introduction** o What is Information Retrieval	1	IIR Text, + Material
2	• **Boolean IR and Document indexing** o Building Indices and Processing Boolean Queries	3	IIR Text, + Material
3	• **Term Vocabulary and Posting List** o Tokenization, Normalization, Stemming o Indexing	3	IIR Text, + Material
4	• **Dictionaries and Tolerant Retrieval** o Search Structures, Wildcards, Spellings, Phonetics	3	IIR Text, + Material
5	• **Index Construction & Index Compression** o Statistical Properties of Terms in IR o Heap's Law, Zipf's Law, Variable Byte Codes	2	IIR Text, + Material
6	• **Scoring, Term Weighting** o Cosine Similarity o Idf, tf-idf, Dot Products	3	IIR Text, + Material
7	• **Evaluation in IR** o Recall, Precision, ROC Curve	2	IIR Text, + Material
8	• **Relevance Feedback and Query Expansion** o Rocchio Algorithm o Pseudo Feedback, Indirect Feedback	3	IIR Text, + Material
9	• **Language Models for Information Retrieval** o Language Models, Query Likelihood Models	3	IIR Text, + Material
10	• **Text Classification** o Naïve Bayes, Bernoulli Model, Feature Selection	3	IIR Text, + Material
11	• **Vector Space Classification** o Rocchio, kNN	3	IIR Text, + Material
12	• **Flat and Hierarchical Clustering** o K-means, HAC, Centroid, Group Average	4	IIR Text, + Material
13	• **Matrix Decomposition and LSA** o Term-Document Matrix and SVD o Low-Rank approximation, LSA	4	IIR Text, + Material
14	• **Link Based Ranking Models in detail** o Link Analysis, PageRank	3	IIR Text, + Material

Detailed syllabus is provided in a separate document. Sequence of lectures subject to change.

12. Suggested Readings

- Required Textbook:

Introduction to Information Retrieval, by C. Manning, P. Raghavan, and H. Schütze (Cambridge University Press, 2008). All chapters except 10, 15. **[IIR]**

- Useful References:

Information Retrieval: Algorithms and Heuristics, by D. Grossman and O. Frieder. **[IRAH]**
Search Engines: Information Retrieval in Practice, by B. Croft, D. Metzler, and T. Strohman. **[SE]**
Mining the Web: Discovering Knowledge from hypertext data, by S. Chakrabarti (IIT-B). **[MW]**
Modern Information Retrieval, by R. Baeza-Yates and B. Ribeiro-Neto. **[MIR]**

Links to Online Resources, MOOCS, and Lecture Videos to be shared on LMS Platfrom.

LESSON PLAN

Subject: Data Preparation and Analysis **Subject Code: CSEN5231**

EVEN SEMESTER: April-July 2021 **2ND SEMESTER**

Subject Name: Data Preparation and Analysis					
Paper Code: CSEN5231					
Contact Hours per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Module I (7L): Data Gathering and Preparation
Module II (7L): Data Cleaning
Module III (15L): Exploratory Analysis
Module IV (7L): Visualization
Total classes to be taken: 36

Day	Topics to be Covered	Proposed Date	Actual Date	Remarks
Day-1	**Module-I:** Data Preparation & Analysis: What is data gathering and preparation? 1. Introduction 2. What are data, information and knowledge? Any difference among them? 3. Data formats: What are structured, semi-structured and unstructured data format? To explain with examples. 4. **Parsing and transformation-** Need of Parsing, Text markup language and parser, Extensible mark-up language and parser;	16/04/2021	16/04/2021	
Day-2	**Module-I:** 1. **Scalability-** Goals of a scalable platform, when to scale your database, vertical scaling, read scaling; 2. **Real-time issues-** Real-time event transfer, Real-time situation discovery, Real-time analytics, Real-time decision making, Real-time responses.	23/04/2021	23/04/2021	
Day-3	**Module-II: Data Cleaning** 1. Explain the importance of data cleaning, 2. Explain Data quality dimensions (Accuracy, Completeness, Currency and Consistency);	28.04.2021	28.04.2021	

Day-4	**Module-II: Data Cleaning** **Classification of Data quality problems (Single-source and Multi-source problems)-** Consistency checking, Heterogeneous and missing data;	30.04.2021	30.04.2021	
Day-5	**Module-II: Data Cleaning** **Data Cleaning Approaches:** Data Transformation and segmentation.	05.05.2021	05.05.2021	
Day-6	**Module III: Exploratory Analysis** **Descriptive statistics-** Central Tendency, variation, shape;	07.05.2021	07.05.2021	
Day-7	**Module III: Exploratory Analysis** **Comparative statistics-** Parametric (Paired t-test, Unpaired t-test)	12.05.2021	12.05.2021	
Day-8	**Module III: Exploratory Analysis** Parametric (Repeated measures ANOVA, One-way ANOVA, Pearson correlation)	28.05.2021	28.05.2021	
Day-9	**Module III: Exploratory Analysis** Parametric vs non-parametric tests (Wilcoxon-Signed Ranks test, Mann-Whitney test, Friedman test, Kruskal-Wallis test, Spearman correlation, Chi-Square test/ Fisher‟s test);	02.06.2021	02.06.2021	
Day-10	**Module III: Exploratory Analysis** **Clustering and association-** Overview of clustering, distance metrics.	04.06.2021	04.06.2021	
Day-11	**Module III: Exploratory Analysis** **Clustering and association-** k-means and hierarchical clustering;	09.06.2021	09.06.2021	
Day-12	**Module III: Exploratory Analysis** **Clustering and association- Hypothesis generation-** Introduction, Null hypothesis, alternate hypothesis, Types of errors.	11.06.2021	11.06.2021	
Day-13	**Module III: Exploratory Analysis** **Clustering and association-** Multiple testing-Methods for addressing multiple testing (Family wise error rate and False discovery rate).	16.06.2021	16.06.2021	
Day-14	**Module IV: Visualization Designing visualizations-** Steps in designing visualization	18.06.2021	18.06.2021	
Day-15	**Module IV: Visualization Designing visualizations-** Problems in Designing Effective Visualization	23.06.2021	23.06.2021	

Day-16	**Module IV: Visualization Designing** **Time series-** Line Graph, Stacked Area Chart, Bar Chart, Gantt Chart, Stream Graph, Heat Map, Polar Area Diagram;	25.06.2021	25.06.2021	
Day-17	**Module IV: Visualization Designing** **Geolocated data-** Introduction spatial data, Point phenomena, line phenomena, area phenomena, Cartograms;	30.06.2021	30.06.2021	
Day-18	**Module IV: Visualization Designing** **Correlations and connections-** Marimekko chart, Parallel Coordinates plot, Radar chart	02.07.2021	02.07.2021	
Day-19	**Module IV: Visualization Designing** **Correlations and connections-** Venn diagram, bubble chart, heatmap, scatter plot, arc diagram	07.07.2021	07.07.2021	
Day-20	**Module IV: Visualization Designing** **Correlations and connections-** brainstorm, chord diagram, connection map	09.07.2021	09.07.2021	
Day-21	**Module IV: Visualization Designing** **Correlations and connections-** network diagram, non-ribbon chord diagram, tree diagram;	14.07.2021	14.07.2021	
Day-22	**Module IV: Visualization Designing** **Hierarchies and networks-** Space and Non-space filling methods, Node-link graphs, Matrix representation of graphs; **Interactivity-** Interaction operators, Interaction operands and spaces.	16.07.2021	16.07.2021	
Day-23	**Module IV: Visualization Designing** **Hierarchies and networks-** Space and Non-space filling methods	23.07.2021	Guideline preparation and shared with Students.	
Day-24	**Module IV: Visualization Designing** **Hierarchies and networks-** Node-link graphs, Matrix representation of graphs;			
Day-25	**Module IV: Visualization Designing** **Interactivity-** Interaction operators			
Day-26	**Module IV: Visualization Designing** **Interactivity-** Interaction operands and spaces.			

HERITAGE INSTITUTE OF TECHNOLOGY

Name of Document	:	Lecture Plan
Faculty	:	EMILY DATTA (ED) & ANIRBAN KOLAY (AK)
Department	:	EE
Subject	:	**ELECTRIC DRIVES AND POWER UTILIZATION**
Subject Code	:	ELEC 4101
Nature of the subject	:	Theory
Target students	:	EE 7th Semester
Contact hours	:	3L + 1T
Credits	:	4
Session	:	2020-2021

Lecture No.	Module no	Teacher Name	Topics
1-2	1	AK	Concept and classification of electric drives, discussion on various types of load, fundamental torque equation, various components of load torque.
3-4	1		Four quadrant operation, determination of equivalent value of drive parameters for load with rotational and translational motion.
5-6	1		Concept of steady state stability and transient stability, Tutorial
7-8	1		Different classes of motor duty, thermal model of motor heating and cooling, Equivalent current, power and torque for intermittent load
9-10	1		Overloading factor for short time duty cycle, load equalization, Tutorial.
11-12	2		Various braking procedure of DC motor, Single phase full and half controlled fed DC drive
13-14	2		Three phase fully controlled DC drives, Dual converter fed drives, Armature current control with constant flux and field weakening, Ward-Leonard method
15-16	2		Chopper controlled DC motor drives, Tutorial
17-18	2		Various braking procedure of three phase induction motor, Speed control using stator voltage variation, discussion on Volts/Hertz Control
19-20	2		Speed control using static rotor resistance control, slip power recovery schemes. Brief idea on PWM inverter fed, current source inverter fed induction motor drive and field-oriented control
1	3	ED	Requirement of an ideal traction system, Supply system for electric traction
2	3		Train movement speed time curve, simplified speed time curve, average speed and schedule speed.

3	3		Mechanism of train movement (energy consumption, tractive effort during acceleration, tractive effort on a gradient, tractive effort for resistance,
4	3		power & energy output for the driving axles, factors affecting specific energy consumption, coefficient of adhesion).
5	3		Problems from Train movement
6	3		Use of various motors in traction
7	3		Speed control of various type traction motor
8	3		Braking of electric motors: braking for dc series motor, why regenerative braking is not applied in dc series motor, braking for dc series motor.
9	3		current collection in traction system: conductor rail system Trolley wire overhead system, Bow and Pantograph collectors
10	3		Review the chapter and Problem discussion
11	4	ED	The nature of radiation, Polar curve, Law of illumination
12	4		Problem discussion
13	4		Photometry (distribution photometry, integrating sphere, brightness measurement),
14	4		Types of Lamps: Conventional and energy efficient
15	4		Different lighting scheme and design of indoor lighting
16	4		Advantage of Electric heating, types of heating, Resistance heating: direct and indirect heating, Arc heating
17	4		Induction heating, Dielectric heating
18	4		Introduction and types of welding, various types of Resistance welding
19	4		Arc welding, Ultrasonic welding, LASER welding
20	4		Working of welding transformer

Date: Signature of faculty

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture Schedule

Heat Transfer (MECH 3102)

Module	Lec No.	Topics to be covered
1	**1**	Introduction to Heat Transfer--Importance from engineering point of view. Mechanisms of heat transfer--- different modes.
----do---	**2**	Brief overview of conduction, convection and radiation.
2	**3**	Conduction, Fouriers's law. Thermal conductivity, isotropic/anisotropic, homogeneous/heterogeneous medium. Conductivity of different materials
----do---	**4**	Derivation of general heat diffusion equation in 3-D with source term. Boundary conditions. Solution of steady conduction equation in 1-D without heat generation. Plane wall, Cylindrical body, spherical shell.
----do---	**5**	Analogy with electrical circuits. Thermal resistance. Critical thickness of insulation. Numerical problems.
----do---	**6**	Numerical problems
----do---	**7**	Solution of steady conduction equation in 1-D with heat generation. Plane wall, Cylindrical body, spherical shell. Numerical problems
3	**8**	Heat transfer through extended surfaces. Fins--- rectangular and pin fins.
----do---	**9**	Analysis of heat transfer through rectangular fins with different boundary conditions. Fin effectiveness, fin efficiency.
----do---	**10**	Numerical problems
4	**11**	Introduction to transient heat conduction.
----do---	**12**	Lumped parameter approach. Time constant, Biot number
----do---	**13**	Solution of 1-D transient heat conduction equation.
----do---	**14**	Numerical problems
5	**15**	Radiation heat transfer. Physical mechanism of thermal radiation.

----do---	**16**	Laws of radiation. Definition of black body. Emissive power, intensity of radiation, emissivity, transmitivity, irradiation
----do---	**17**	Kirchhoff's identity; Numerical problems.
6	**18**	Radiation exchange between black bodies. Concept of grey –Diffuse Isotropic surface (GDI)
----do---	**19**	Radiation exchange between GDI surfaces by radiation network and radiosity matrix method.
----do---	**20**	Radiation exchange between GDI surfaces by radiation network and radiosity matrix method (continued).
----do---	**21**	Radiation shielding. Numerical problems

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture Schedule

Heat Transfer (MECH 3102)

Module	Lec No.	Topics to be covered
1	**1**	Introduction to Heat Transfer--Importance from engineering point of view. Mechanisms of heat transfer--- different modes.
----do---	**2**	Brief overview of conduction, convection and radiation.
2	**3**	Conduction, Fouriers's law. Thermal conductivity, isotropic/anisotropic, homogeneous/heterogeneous medium. Conductivity of different materials
----do---	**4**	Derivation of general heat diffusion equation in 3-D with source term. Boundary conditions. Solution of steady conduction equation in 1-D without heat generation. Plane wall, Cylindrical body, spherical shell.
----do---	**5**	Analogy with electrical circuits. Thermal resistance. Critical thickness of insulation. Numerical problems.
----do---	**6**	Numerical problems
----do---	**7**	Solution of steady conduction equation in 1-D with heat generation. Plane wall, Cylindrical body, spherical shell. Numerical problems
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----do---	**9**	Analysis of heat transfer through rectangular fins with different boundary conditions. Fin effectiveness, fin efficiency.
----do---	**10**	Numerical problems
4	**11**	Introduction to transient heat conduction.
----do---	**12**	Lumped parameter approach. Time constant, Biot number
----do---	**13**	Solution of 1-D transient heat conduction equation.
----do---	**14**	Numerical problems
5	**15**	Radiation heat transfer. Physical mechanism of thermal radiation.

----do---	**16**	Laws of radiation. Definition of black body. Emissive power, intensity of radiation, emissivity, transmitivity, irradiation
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----do---	**21**	Radiation shielding. Numerical problems

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture Schedule

Heat Transfer (MECH 3102)

Module	Lec No.	Topics to be covered
1	1	Introduction to Heat Transfer--Importance from engineering point of view. Mechanisms of heat transfer--- different modes.
----do---	2	Brief overview of conduction, convection and radiation.
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----do---	5	Analogy with electrical circuits. Thermal resistance. Critical thickness of insulation. Numerical problems.
----do---	6	Numerical problems
----do---	7	Solution of steady conduction equation in 1-D with heat generation. Plane wall, Cylindrical body, spherical shell. Numerical problems
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----do---	9	Analysis of heat transfer through rectangular fins with different boundary conditions. Fin effectiveness, fin efficiency.
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4	11	Introduction to transient heat conduction.
----do---	12	Lumped parameter approach. Time constant, Biot number
----do---	13	Solution of 1-D transient heat conduction equation.
----do---	14	Numerical problems
5	15	Radiation heat transfer. Physical mechanism of thermal radiation.

----do---	**16**	Laws of radiation. Definition of black body. Emissive power, intensity of radiation, emissivity, transmitivity, irradiation
----do---	**17**	Kirchhoff's identity; Numerical problems.
6	**18**	Radiation exchange between black bodies. Concept of grey –Diffuse Isotropic surface (GDI)
----do---	**19**	Radiation exchange between GDI surfaces by radiation network and radiosity matrix method.
----do---	**20**	Radiation exchange between GDI surfaces by radiation network and radiosity matrix method (continued).
----do---	**21**	Radiation shielding. Numerical problems

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture Schedule

Heat Transfer (MECH 3102)

Module	Lec No.	Topics to be covered
1	**1**	Introduction to Heat Transfer--Importance from engineering point of view. Mechanisms of heat transfer--- different modes.
----do---	**2**	Brief overview of conduction, convection and radiation.
2	**3**	Conduction, Fouriers's law. Thermal conductivity, isotropic/anisotropic, homogeneous/heterogeneous medium. Conductivity of different materials
----do---	**4**	Derivation of general heat diffusion equation in 3-D with source term. Boundary conditions. Solution of steady conduction equation in 1-D without heat generation. Plane wall, Cylindrical body, spherical shell.
----do---	**5**	Analogy with electrical circuits. Thermal resistance. Critical thickness of insulation. Numerical problems.
----do---	**6**	Numerical problems
----do---	**7**	Solution of steady conduction equation in 1-D with heat generation. Plane wall, Cylindrical body, spherical shell. Numerical problems
3	**8**	Heat transfer through extended surfaces. Fins--- rectangular and pin fins.
----do---	**9**	Analysis of heat transfer through rectangular fins with different boundary conditions. Fin effectiveness, fin efficiency.
----do---	**10**	Numerical problems
4	**11**	Introduction to transient heat conduction.
----do---	**12**	Lumped parameter approach. Time constant, Biot number
----do---	**13**	Solution of 1-D transient heat conduction equation.
----do---	**14**	Numerical problems
5	**15**	Radiation heat transfer. Physical mechanism of thermal radiation.

----do---	**16**	Laws of radiation. Definition of black body. Emissive power, intensity of radiation, emissivity, transmitivity, irradiation
----do---	**17**	Kirchhoff's identity; Numerical problems.
6	**18**	Radiation exchange between black bodies. Concept of grey –Diffuse Isotropic surface (GDI)
----do---	**19**	Radiation exchange between GDI surfaces by radiation network and radiosity matrix method.
----do---	**20**	Radiation exchange between GDI surfaces by radiation network and radiosity matrix method (continued).
----do---	**21**	Radiation shielding. Numerical problems

Heritage Institute of Technology

Department of Mechanical Engineering

Lecture Schedule

I C Engine (MECH 3211)

Module	Lec No.	Topics to be covered
1	**1**	Introduction to I C Engines; working principles of 4-stroke and 2-stroke SI and CI engines
----do---	**2**	Contd
----do---	**3**	Classification of I C Engines; Nomenclature of different terms
----do---	**4**	Different Air standard Cycles and their efficiencies (Carnot, Sterling, Ericsson, Otto, Diesel, Lenoir, Atkinson, Brayton)
----do---	**5**	Different cycles and comparisons
----do---	**6**	Numerical problems
----do---	**7**	Fuel Air cycles
----do---	**8**	Fuel Air cycles (contd) ; numerical problems
----do---	**9**	Actual Cycls
2	**10**	I C Engine fuels
----do---	**11**	I C Engine fuels (contd), Octane number, Cetane number
----do---	**12**	Carburetor in S I engine, simple carburetor
----do---	**13**	Simple carburetor (contd); Air fuel ratio expression
----do---	**14**	Numerical problems on carburetor
----do---	**15**	Mechanical fuel injection in C I engines
----do---	**16**	Different components of fuel injection system
----do---	**17**	Numerical problems
----do---	**18**	Ignition in S I engine; Battery ignition system

----do---	**19**	Battery ignition system (contd); reference to other ignition system
3	**20**	Combustion in I C engine; Stages of combustion in S I engines
----do---	**21**	Stages of combustion in C I engines; abnormal combustions; Detonation and knocking

HERITAGE INSTITUTE OF TECHNOLOGY

Name of Document : Lecture Plan
Faculty : JAYITA SARKAR
Department : EE
Subject : **ILLUMINATION ENGINEERING**
Subject Code : ELEC3241
Nature of the subject : Theory
Target students : EE 6th Semester
Contact hours : 3L
Credits : 3
Session : 2020-2021

Lecture No.	Topics
1	Light and Electromagnetic Radiation, Visible spectrum of radiation
2-3	Radiometric and photometric quantities, visual response curve of standard observer, relation between Lumen and Watt.
4-5	Laws of Illumination, perfect diffuser, Lambert's law.
6-9	Bench photometer, luxmeter, distribution photometer, integrating sphere.
10-11	Incandescent lamps, tungsten halogen lamps
12-13	Fluorescent tubes, compact fluorescent lamps (CFL)
14	Low and high pressure sodium vapour lamps
15	High pressure mercury vapour lamps, metal halide lamps
16	Light Emitting Diode (LED) lamps
17-18	Ballast- function, electromagnetic and electronic types, principles of operation.
19-20	Objectives, quantity and quality of light, selection of lamps and luminaires.
21-22	Design considerations for lighting of offices, conference rooms, hospitals.
23-27	Design calculations by lumen method in accordance with lighting code.
28-29	Basic concepts of outdoor lighting design
30-33	Objectives, design parameters, qualitative & quantitative evaluation of road lighting systems.
34-35	Objectives, design parameters, qualitative & quantitative evaluation of landscape lighting systems.
36	Objectives, design parameters, qualitative evaluation of sports lighting systems.

Date: Signature of faculty

HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107
Department of Applied Electronics and Instrumentation Engineering
Lesson Plan

Course Name: Introduction To Mechatronics **Course Code:** AEIE3111

Program: B. Tech **Semester:** 5^{th} **Session:** 2019-20

Total number of Lectures available in the session: 40

Faculty Name: Debjyoti Chowdhury

Course Outcomes (COs):

After the completion of the course students will be able to:

1. Understand a real time mechatronics system.
2. Identify the key elements of mechatronics systems and its representation in terms of block diagram.
3. Gain knowledge of different types of Sensors required for developing mechatronics systems.
4. Learn the functions of different types of actuators and identify their application areas.
5. Understand concept of signal conditioning and use of interfacing systems such as comparator, filters, amplifiers, etc.
6. Learn the hardware and software interfacing for embedded systems.

Module No.	Topic	Materials/ Equipment/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	Overview of Mechatronics: Definition of Mechatronics; Mechatronics system design	Lecturer PPT	Understand the need for studying Mechatronic systems	Understand	CO1	1	Quiz, Class test

I	Introduction, integrated design issues in mechatronics, key elements, the mechatronics design process	Lecturer PPT, E-books, NPTEL video lectures	Learn how to integrate mechatronics systems	Remember. understand, apply, analyze	CO1	1	Assignment, Class test, Semester Exam
I	Advanced approaches in mechatronics, Mechatronics-based Product Realization	Lecturer PPT, E-books	Learn classification of various mechatronic systems and products	Define, apply, analyze and evaluate	CO1	2	Assignment, Class test, Semester Exam
I	Review of fundamentals of electronics: Different types of Amplifiers, Instrumentation Amplifiers, Comparators, Filters	Lecturer PPT, E-books	Learn classification of various OpAmp based amplifiers with Filters	Define, apply, analyze and evaluate	CO1	2	Assignment, Class test, Semester Exam
I	Modelling and simulation of physical systems: simulation and block diagrams	Lecturer PPT, E-books, video lectures	Understand how to model physical systems using block diagrams	apply, analyze and evaluate	CO2	2	Assignment, Class test, Semester Exam
I	Analogies and impedance diagrams, electrical systems	Lecturer PPT, E-books, NPTEL video lectures	Understand how to model electrical systems using block diagrams	Understand, apply and evaluate	CO2	1	Assignment, Class test, Semester Exam
I	Mechanical translational systems, mechanical	Lecturer PPT, E-books, NPTEL video lectures	Understand how to model mechanical systems using block diagrams	Understand, learn and apply	CO2	2	Assignment, Class test, Semester Exam

	rotational systems, electro mechanical coupling, fluid systems						
II	Review of working principle of sensors and actuators; Sensors for motion and position measurement, force, torque and tactile sensors	Lecturer PPT, E-books, NPTEL video lectures	Learn the working of various sensors and actuators	Understand, apply and design	CO3	3	Assignment, Class test, Semester Exam
II	Flow sensors, temperature-sensing devices concept of micro sensors and signal processing devices.	Lecturer PPT, E-books, NPTEL video lectures	Learn the design of various sensors and actuators for flow sensing	Understand, apply and design	CO3	3	Assignment, Class test, Semester Exam
II	Overview of Electromechanical actuators- relays, contactors and timers, Drives: DC motor, AC motor, Servo motor, BLDC motor etc.	Lecturer PPT, E-books, NPTEL video lectures	Realize the design of various Electromechanical actuators	Understand, apply and design	CO4	2	Assignment, Class test, Semester Exam
III	Mechanisms of actuations: Introduction to Actuator types and Application Areas Fluid Power Actuators - Hydraulic systems	Lecturer PPT, E-books, NPTEL video lectures	Understand the working various actuations Mechanisms and actuator types	Define, understand, apply	CO5	2	Assignment, Class test, Semester Exam

III	Flow, pressure and direction control valves, actuators, and supporting elements	Lecturer PPT, E-books, NPTEL video lectures	Understand the working various Flow actuator types	Understand, apply, analyze	CO5	2	Assignment, Class test, Semester Exam
III	Hydraulic power packs; Pneumatic systems: production	Lecturer PPT, E-books, NPTEL video lectures	Understand the working various Flow actuator types	Understand, apply, design	CO5	2	Assignment, Class test, Semester Exam
III	Distribution and conditioning of compressed air, system components	Lecturer PPT, E-books, NPTEL video lectures	Understand the working compressed air systems	Understand, apply, create	CO5	2	Assignment, Class test, Semester Exam
III	Micro-Actuators: Overview of different types of micro-actuation process	Lecturer PPT, E-books, NPTEL video lectures	Learn the working principle of Micro-Actuators	Understand, apply	CO5	2	Assignment, Class test, Semester Exam
IV	Micro-Controller programming and real time interfacing: Review of microcontroller programming	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Learn how to use microcontroller for mechatronic system development	Understand, apply, analyze	CO6	3	Assignment, Class test, Semester Exam
IV	Control with Embedded Computers and Programmable Logic Controllers	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Understand working of an Embedded control system	Understand, apply, analyze	CO6	3	Assignment, Class test, Semester Exam
IV	Real time case studies with Data	Lecturer PPT, E-books, Hand-	Understand real time data acquisition systems	Understand, analyse, design	CO6	2	Assignment, Class test, Semester Exam

	acquisition techniques	outs, NPTEL video lectures					
IV	Introduction to Shape memory alloy (SMA): concept, working principle, materials, and applications	Lecturer PPT, E-books, NPTEL video lectures	Understand working of Shape memory alloy	Understand, analyse, design	CO6	3	Assignment, Class test, Semester Exam

Course Title: Programming for Problem Solving Course

Code: CSEN1001

Contact Hours per week : Lectures: 3 Remedial: 1

Course outcome:

CO 1: Understand and remember functions of the different parts of a computer.

CO 2: Understand and remember how a high-level language (C programming language, in this course) works, different stages a program goes through.

CO 3: Understand and remember syntax and semantics of a high-level language (C programming language, in this course).

CO 4: Understand how code can be optimized in high-level languages.

CO 5: Apply high-level language to automate the solution to a problem.

CO 6: Apply high-level language to implement different solutions for the same problem and analyze why one solution is better than the other.

Learning Objectives:

Introduction to the concept of computer and computation and solving of problems using C as a programming language. Coverage of C will include basic concepts, arithmetic and logic, flow control, and data handling using arrays, structures, pointers and files.

Total load – 40 hours

Module I: [10L]

Fundamentals of Computer History of Computers, Generations of Computers, Classification of Computers. Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices. Basic Concepts of Assembly language, High level language, Compiler and Assembler.

Binary & Allied number systems (decimal, octal and hexadecimal) with signed and unsigned numbers (using 1's and 2's complement) - their representation, conversion and arithmetic operations.

Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation (half- 16 bit, full- 32 bit, double- 64 bit). Basic concepts of operating systems like MS WINDOWS, LINUX How to write algorithms & draw flow charts.

Module II: [10L]

Basic Concepts of C.

C Fundamentals: The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements.

Operators & Expressions: Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Standard input and output, formatted output -- printf, formatted input scanf.

Flow of Control: Statement and blocks, if-else, switch-case, loops (while, for, do-while), break and continue, go to and labels.

Module III: [10L]

Program Structures in C Basic of functions, function prototypes, functions returning values, functions not returning values. Storage classes - auto, external, static and register variables – comparison between them. Scope, longevity and visibility of variables. C preprocessor (macro, header files), command line arguments. 40

Arrays and Pointers: One dimensional arrays, pointers and functions – call by value and call by reference, array of arrays. Dynamic memory usage– using malloc(), calloc(), free(), realloc(). Array pointer duality. String and character arrays; C library string functions and their use.

Module IV: [10L]

Data Handling in C User defined data types and files:

Basic of structures; structures and functions; arrays of structures. Files – text files only, modes of operation. File related functions – fopen(), fclose(), fscanf(), fprintf(), fgets(), fputs(), fseek(), ftell();

Text Books

1. Schaum's outline of Programming with C – Byron Gottfried

2. Teach Yourself C- Herbert Schildt

3. Programming in ANSI C – E Balagurusamy

Reference Books

1. C: The Complete Reference – Herbert Schildt

2. The C Programming Language- D.M.Ritchie, B.W. Kernighan

LESSON PLAN

PAPER : PROGRAMMING FOR PROBLEM SOLVING YEAR/SEM: 1st YEAR 2nd SEM

CODE : CSEN 1001 DEPT/SEC: ECE, SEC – C

Name of Faculty: Rudranath Mitra

Serial	Topics	Teaching Methodology	Tentative Dates	References
Lecture - 1	History of Computers, Generations of Computers, Classification of Computers	Chalk and Talk, Case Studies	14-1-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 2	Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices.	Chalk and Talk Case Studies	16-1-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 3	C Fundamentals: The C character set, identifiers and keywords.	Chalk and Talk	20-1-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 4	C Fundamentals: Data Types and Sizes, variable names, declaration, statements	Chalk and Talk, Demonstrations	21-1-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 5	Basic Concepts of Assembly language, High level language, Compiler and Assembler	Chalk and Talk, Demonstrations	22-1-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 6	C : Operators & Expressions	Chalk and Talk Assignments	27-1-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" –

				Balagurusamy “ Let us C” – Kanitkar
Lecture - 7	Arithmetic Operators, Logical Operators	Chalk & Talk Demonstrations	28-1-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 8	Relational Operators, type conversion, increment and decrement operators	Chalk and Talk Demonstrations	3-2-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 9	Bitwise operators, Assignment Operators & expressions, Conditional Operators, Precedence and order of evaluation	Chalk and Talk, Case Studies	4-2-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 10	Binary & Allied Number Systems (Decimal, Octal and Hexadecimal)	Chalk and Talk, Assignments	6-2-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy - “ Let us C” – Kanitkar
Lecture - 11	Signed and Unsigned numbers (Using 1’s and 2’s complement) – their representation.	Chalk and Talk, Assignments	10-2-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 12	Conversion and arithmetic operations	Chalk and Talk	11-2-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 13	Packed and unpacked BCD System, ASCII	Chalk and Talk, Presentations	13-2-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 14	Standard Input and output, formatted	Chalk and Talk	17-2-2020	“Programming with C” – Byron Gottfried

	output – printf, formatted input scanf			- *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 15	Basic concepts of Operating systems like MS WINDOWS, LINUX. Algorithms & Flow Charts	Chalk and Talk	18-2-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 16	Flow of control: Statement and blocks, if-else, nested if-else, else-if, switch-case	Chalk and Talk	20-2-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 17	Loops(while, for, do-while), BREAK AND CONTINUE, goto and labels	Chalk and Talk, Role Play	24-2-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 18	Basics of functions, function prototypes	Chalk and Talk, Case Studies	25-2-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 19	Functions returning values, functions not returning values	Chalk and Talk, Demonstrations	27-2-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 20	Arrays One Dimensional Two Dimensional	Chalk and Talk	27-2-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 21	Storage Classes – auto, external, static and register variables – comparison between them – scope, longevity and visibility of variables.	Chalk and Talk , Role Play	02-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar

Lecture - 22	Packed and unpacked BCD System, ASCII	Chalk and Talk, Demonstrations	09-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 23	C Preprocessor (macro, header files)	Chalk and Talk, Demonstrations	10-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 24	Pointers	Chalk and Talk, Case Studies	12-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 25	Pointers and functions	Chalk and Talk	16-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 26	IEEE – 754 floating point representation [half 16 bit, full 32 bit, double 64 bit]	Chalk and Talk, Role Play	17-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 27	Call-by-value, Call-by-reference, array of arrays	Chalk and Talk, Role Play	19-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 28	Dynamic memory usage – using malloc(), calloc(), free(), realloc().	Chalk and Talk , Case Studies	23-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 29	Array pointer duality, String and Character arrays	Chalk and Talk	26-03-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy

				“ Let us C” – Kanitkar
Lecture - 30	C Library String functions and their use	Chalk and Talk	26-03-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 31	Basics of Structures – Template, Initialization, declaration, Operators & Operations	Chalk and Talk	30-03-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 32	Structure and Functions	Chalk and Talk, Demonstrations	31-03-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 33	Arrays of Structures	Chalk and Talk	02-04-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 34	Unions	Chalk and Talk, Role Play	06-04-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 35	Files – text files only, modes of operation.	Chalk and Talk, Demonstrations	07-04-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture - 36	File related functions – fopen(), fclose(), fscanf(), fprintf()	Chalk and Talk, Case Studies	09-04-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” – Balagurusamy “ Let us C” – Kanitkar
Lecture -37	File related functions – fgets(), fputs(),fseek(), ftell()	Chalk and Talk,	09-04-2020	“Programming with C” – Byron Gottfried - *Lecture Notes* “Programming in C” –

				Balagurusamy " Let us C" – Kanitkar
Lecture - 38	Revision		16-04-2020	"Programming with C" – Byron Gottfried - *Lecture Notes* "Programming in C" – Balagurusamy " Let us C" – Kanitkar
Lecture - 39	Revision/Recapitulation		16-04-2019	
Lecture - 40	Recapitulation		21-04-2019	

First Class Test: 4^{th} – 6^{th} MARCH 2020

Second Class Test: 20^{th} – 22^{nd} APRIL 2020

	HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107 **Department of Applied Electronics and Instrumentation Engineering** **Lesson Plan**
	Course Name: Introduction To Internet of Things **Course Code:** AEIE 3201 **Program:** B. Tech **Semester:** 6th **Session:** 2019-20 **Total number of Lectures available in the session:** 36 **Faculty Name:** Debjyoti Chowdhury
	Course Outcomes (COs):

After the completion of the course students will be able to:

1. Learn and familiarize the design challenges related to IoT systems.
2. Develop Python applications for IoT systems.
3. Demonstrate working knowledge of MicroPython on an ESP 8266 board.
4. Design of an IoT system with an Arduino and ESP 8266 for sensor data acquisition.
5. Understand functional components in an IoT Edge device.
6. Develop machine learning applications for microcontrollers.

Module No.	**Topic**	**Materials/ Equipment/ References**	**Learning Outcomes**	**Blooms level(s)**	**COs**	**Number of Lectures**	**Evaluation Pattern**
I	Architectural overview on an IoT systems- Edge/Fog computing,	Lecturer PPT	Understand the need of Internet of Things	Understand	CO1	1	Quiz, Class test

I	Machine to Machine (M2M) communication	Lecturer PPT, E-books	Learn the basics of machine-to-machine communication	Remember. understand, apply, analyze	CO1	2	Assignment, Class test, Semester Exam
I	Wireless Sensor Network, IoT and M2M value chains	Lecturer PPT, E-books	Learn classification of Wireless Sensor networks	Define, apply, analyze and evaluate	CO1	2	Assignment, Class test, Semester Exam
I	IoT protocol suite- MQTT, LoRa,	Lecturer PPT, E-books	Understand the basics of various IoT protocols	Define, apply, analyze and evaluate	CO1	2	Assignment, Class test, Semester Exam
I	CoAP and HTTP-REST	Lecturer PPT, E-books	Understand the basics of various HTTP based IoT protocols	apply, analyze and evaluate	CO2	1	Assignment, Class test, Semester Exam
I	IoT server architecture-Infrastructure as a Service (IaaS)	Lecturer PPT, E-books	Understand the architecture of cloud service infrastructures	Understand, apply and evaluate	CO2	1	Assignment, Class test, Semester Exam
I	Everything as a Service (XaaS).	Lecturer PPT, E-books	Learn Everything as a Service cloud service structure	Understand, learn and apply	CO2	1	Assignment, Class test, Semester Exam
II	Introduction to Python 3- I/O statements, condition	Lecturer PPT, E-books	Learn basic Python syntax	Understand, apply and design	CO3	3	Assignment, Class test, Semester Exam

	statements, loops, functions, classes						
II	Python packages (i.e. Flask, urllib, httplib, JSON), Eclipse Paho-MQTT and MQTT-SN	Lecturer PPT, E-books	Learn advanced Python modules for IoT	Understand, apply and design	CO3	3	Assignment, Class test, Semester Exam
II	Introduction to NoSQL database-Basics of MongoDB, PyMongo API	Lecturer PPT, E-books	Understand the need for NoSQL database	Understand, apply and design	CO4	2	Assignment, Class test, Semester Exam
II	Introduction to MicroPython (on ESP 8266)	Lecturer PPT, E-books	Learn how to program a microcontroller with MicroPython	Define, understand, apply	CO5	1	Assignment, Class test, Semester Exam
II	General board control, Networking, Pins and GPIO control, ADC (analog to digital conversion) modules	Lecturer PPT, E-books	Learn MicroPython modules for Networking and GPIO control	Understand, apply, analyze	CO5	1	Assignment, Class test, Semester Exam
II	Building a REST API server with MongoDB backend using Python Flask module	Lecturer PPT, E-books	Understand the working of a REST api sever	Understand, apply, design	CO5	2	Assignment, Class test, Semester Exam

III	Introduction to ESP 8266/ESP 32 WiFi modules- AT command set, TCP/IP stack, Lua firmware	Lecturer PPT, E-books	Learn the basics of AT commands in an ESP 8266	Understand, apply, create	CO5	1	Assignment, Class test, Semester Exam
III	UART interface; Introduction to Arduino boards family- Basic code structure, I/O applications, UART applications	Lecturer PPT, E-books	Learn how to use the UART interface in Arduino microcontroller dev. board	Understand, apply	CO5	2	Assignment, Class test, Semester Exam
III	ADC interface with sensors (i.e. LM35 and DHT11)	Lecturer PPT, E-books	Learn how to interface analog sensors with the Arduino microcontroller	Understand, apply, analyze	CO5	2	Assignment, Class test, Semester Exam
III	Communication with ESP 8266 modules	Lecturer PPT, E-books, Hand-outs	Understand the basics of ESP 8266 communication over UART	Understand, apply, analyze	CO6	1	Assignment, Class test, Semester Exam
III	Connecting ESP 8266 with an Arduino to send POST (REST API) requests	Lecturer PPT, E-books	Learn to model a ESP 8266 as a REST api server	Understand, apply, analyze	CO6	1	Assignment, Class test, Semester Exam

IV	Machine learning on the Edge: Introduction to TensorFlow lite on Raspberry Pi Zero W	Lecturer PPT, E-books, Hand-outs	Understand the basics of Machine learning on the Edge	Understand, analyse, design	CO6	2	Assignment, Class test, Semester Exam
IV	Transferring TensorFlow model parameters,	Lecturer PPT, E-books	Understand the prerequisites of Transferring TensorFlow model	Understand, analyse, design	CO6	1	Assignment, Class test, Semester Exam
IV	Classification of sensor data using TinyML framework	Lecturer PPT, E-books, Hand-outs	Perform classification of sensor data using TinyML	Understand, analyse, evaluate	CO6	2	Assignment, Class test, Semester Exam
IV	Edge interfaces-Communication between an Arduino UNO rev.3 with Raspberry Pi Zero W over UART serial.	Lecturer PPT, E-books, Hand-outs	Learn about the UART communication	Understand, analyse, evaluate	CO6	2	Assignment, Class test, Semester Exam

	HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107 **Department of Applied Electronics and Instrumentation Engineering** **Lesson Plan**						
	Course Name: Programming Language For Embedded IoT Systems **Course Code:** AEIE5102 **Program:** M.Tech **Semester:** 1st **Session:** 2019-20 **Total number of Lectures available in the session:** 36 **Faculty Name:** Debjyoti Chowdhury						
	Course Outcomes (COs):	After the completion of the course students will be able to: 1. Interpret the vision of IoT from a global context. 2. Understand the key features, design challenges and related to IoT systems. 3. Learn the architecture of NodeMCU and develop IoT systems using it. 4. Demonstrate working knowledge of Micro Python. 5. Design an IoT system with functional requirements for hardware components including processor, networking components and sensors. 6. Develop an IoT system with along with applications of cloud.					
Module No.	**Topic**	**Materials/ Equipment/ References**	**Learning Outcomes**	**Blooms level(s)**	**COs**	**Number of Lectures**	**Evaluation Pattern**
I	IoT-An Architectural Overview, Main design principles and needed capabilities	Lecturer PPT	Understand the need of Internet of Things	Understand	CO1	1	Assignment, Class test

I	An IoT architecture outline, standards considerations	Lecturer PPT, E-books	Learn the basics of IoT architecture	Remember. understand, apply, analyze	CO1	1	Assignment, Class test, Semester Exam
I	M2M and IoT Technology	Lecturer PPT, E-books	Learn classification of M2M	Define, apply, analyze and evaluate	CO1	1	Assignment, Class test, Semester Exam
I	Fundamentals-Devices and gateways	Lecturer PPT, E-books	Understand the Fundamentals of IoT Devices	Define, apply, analyze and evaluate	CO1	1	Assignment, Class test, Semester Exam
I	Data management, Local and wide area networking	Lecturer PPT, E-books	Understand the basics of Data management	apply, analyze and evaluate	CO2	1	Assignment, Class test, Semester Exam
I	Everything as a Service (XaaS)	Lecturer PPT, E-books	Understand the architecture of cloud service infrastructures	Understand, apply and evaluate	CO2	1	Assignment, Class test, Semester Exam
I	M2M and IoT analytics	Lecturer PPT, E-books	Learn M2M and IoT data analytics	Understand, learn and apply	CO2	2	Assignment, Class test, Semester Exam

II	Introduction to Python 2.7 - I/O statements, condition statements	Lecturer PPT, E-books	Learn basic Python syntax	Understand, apply and design	CO3	3	Assignment, Class test, Semester Exam
II	Python loops, functions, classes,	Lecturer PPT, E-books	Learn advanced Python syntax	Understand, apply and design	CO3	3	Assignment, Class test, Semester Exam
II	Python packages (i.e. serial, OS, JSON, urllib, httplib)	Lecturer PPT, E-books	Learn advanced Python modules for IoT	Understand, apply and design	CO4	2	Assignment, Class test, Semester Exam
II	Publishing messages to the cloud using PubNub	Lecturer PPT, E-books	Learn how to Publish sensor data	Define, understand, apply	CO5	2	Assignment, Class test, Semester Exam
II	MQTT broker with python client	Lecturer PPT, E-books	Learn basics of MQTT broker	Understand, apply, analyze	CO5	2	Assignment, Class test, Semester Exam
II	Introduction Android Things on Raspberry Pi 3 using Java/Kotlin	Lecturer PPT, E-books	Understand the working Android Things	Understand, apply, design	CO5	2	Assignment, Class test, Semester Exam

III	Introduction to Cloud Computing	Lecturer PPT, E-books, Hand-outs,	Learn the basics of Cloud compution	Understand, apply, analyze	CO6	2	Assignment, Class test, Semester Exam
III	Introduction to platform for Internet of Things and Analytics using ThingSpeak and PubNub	Lecturer PPT, E-books, Hand-outs,	Learn how to use various IoT platforms	Understand, apply, analyze	CO6	2	Assignment, Class test, Semester Exam
III	Real time sensor (i.e. LM35, DHT 11, MQx gas sensors) data acquisition using NodeMCU	Lecturer PPT, E-books, Hand-outs,	Learn how to interface analog sensors with the Arduino microcontroller	Understand, analyse, design	CO6	2	Assignment, Class test, Semester Exam
III	Data acquisition using ESP8266 for Arduino	Lecturer PPT, E-books,	Understand the basics of ESP 8266 communication over UART	Understand, analyse, design	CO6	2	Assignment, Class test, Semester Exam
III	Introduction to Python for microcontrollers	Lecturer PPT, E-books, Hand-outs,	Learn to use Python for microcontrollers	Understand, analyse, evaluate	CO6	2	Assignment, Class test, Semester Exam

IV	Development environments for cloud services; AWS IoT	Lecturer PPT, E-books, Hand-outs,	Understand the basics of AWS IoT	Understand, analyse, evaluate	CO6	1	Assignment, Class test, Semester Exam
IV	Google App-cloud platform in for industrial IoT	Lecturer PPT, E-books, Hand-outs,	Understand the basics of Google App-cloud	Understand, analyse, evaluate	CO6	1	Assignment, Class test, Semester Exam
	Introduction to Android Studio for Android Things App development	Lecturer PPT, E-books, Hand-outs,	Perform IoT application development with Android Studio		CO6	1	Assignment, Class test, Semester Exam
	Understanding the relationship between IoT and BigData, IoT data analytics on cloud	Lecturer PPT, E-books, Hand-outs,	Learn about the relationship between IoT and BigData		CO6	1	Assignment, Class test, Semester Exam

Lecture/Lab Plan
Paper Name: Engineering Graphics and Design
Paper code: MECH1052
Odd Semester (2021-2022)

Lec-ture No.	Chap-ter	Topics to be covered	Remark
01.	Introduction	Importance of Engineering Drawing; With examples; with a few diagrams/drawings on green board Drawing Board, T-square, Set-squares (without beveled edges): demonstration of making multiples of 15^0 (15^0, 30^0,45^0,60^0,75^0,90^0)with 30^0-60^0 and 45^0-set-squares ; Compass, Divider, Scale, Protractor(half/full); French curves: no. 5 and no. 6; Drawing paper: size of drawing paper, length and breadth relationship, relation of drawing paper size or standard; Drawing pencil.	Online
02.	Projection	Description of HP/VP/PP 1st /2nd/3rd/4th angle projection Projection of points in 4 different quadrants	Online
03.	Projection of points	Making border on the drawing sheet, title block. Drawing projection of points on drawing sheet	Off-line
04.	Projection of straight line	Projection of straight line parallel to HP and VP Projection of straight line parallel to HP and inclined to VP Projection of straight line parallel to VP and inclined to HP	Off-line
05.	Projection of straight line	Projection of straight line inclined to both HP and VP	Off-line
06.	Projection of lamina	Projection of geometrical lamina (surface) like rectangle, hexagon, pentagon etc.	Online
07.	Projection of solids	Introductions of Solids. Projection of cylinder, cone, prism, pyramid with axis parallel to VP Projection of cylinder, cone, prism, pyramid with axis parallel to HP	Online
08.	Projection of solids	Projection of cylinder, cone, prism, pyramid with axis parallel to HP and inclined to VP Projection of cylinder, cone, prism, pyramid with axis parallel to VP and inclined to HP	Online

Recommended books:

1. “Elementary Engineering Drawing” by N. D. Bhatt ; Charotar Book stall, Anand.
2. “Engineering Graphics” by K. L. Narayana, P. Kannaiah, K. Venkata Reddy. TMH
3. “Engineering Graphics” by V. Lakshminarayanan, R.S. vaish Wanar; Jain Brothers.

PAPER NAME: Wireless and Cellular Communication

PAPER CODE: ECEN 3211

NAME OF THE FACULTY: Dr. Sabyasachi Chatterjee

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

SESSION: 2020-21

LECTURE PLAN

SERIAL NO.	TOPICS	REFERENCES	MODE OF TEACHING
Lecture 1	➢ Brief introduction to mobile wireless communication and systems, Description of cellular system	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter1) *And Lecture Notes*	Group Discussion and Online Mode
Lecture 2	➢ Detailed Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering,	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Online Mode
Lecture 3	➢ Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring,.	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Group Discussion and Online Mode
Lecture 4	➢ Co-channel and Adjacent channel interferences, ➢ handoff management (hard handoff and soft handoff)assignment schemes,	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Online Mode
Lecture 5	➢ Overview of wireless channel and its parameters. a) Multipath fading and its different effect ➢ ISI ➢ log distance path loss model, ➢ log normal shadowing model,	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Online Mode
Lecture 6	➢ free space propagation model, ➢ two ray ground reflection model	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter4 and 5) *And Lecture Notes*	Online Mode
Lecture 7	➢ Flat and frequency selective fading ➢ Fast and slow fading. Doppler effect due to velocity of mobiles.	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter4) *And Lecture Notes*	Online Mode
Lecture 8	➢ Practical fading models for large scale fading. ➢ Rayleigh fading model ➢ Rician fading model.	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter4)	Online Mode

		And Lecture Notes	
Lecture 9	➢ Evolution strategies – First Generation (1G) and second Generation (2G) and different technology used and their evolution.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter2) *And Lecture Notes*	Online Mode
Lecture10	Evolution strategies – Third Generation (3G) to Fourth Generation (4G) and different technology used and their evolution.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter7) *And Lecture Notes*	Group Discussion and Online Mode
Lecture11	➢ Multiple Access Technologies in cellular communication a) Time division multiple access (TDMA), variants like narrowband and wideband TDMA	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter7) *And Lecture Notes*	Group Discussion and Online Mode
Lecture12	➢ b) Frequency division multiple access (FDMA),	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter7) *And Lecture Notes*	Online Mode
Lecture13	Code Division Multiple Access (CDMA), Direct sequence CDMA, spread spectrum technique. ➢	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Group Discussion and Online Mode
Lecture14	➢ Spectral efficiency of different wireless access technologies. a) FDMA b) TDMA C) CDMA	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Group Discussion and Online Mode
Lecture15	➢ Introduction to SDR, ➢ Introduction to CR.	*Lecture Notes*	Online Mode
Lecture16	➢ Second generation (2G) Network: ➢ Global system for mobile communication (GSM): ➢ Architecture and Protocols,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode
Lecture17	GSM Air Interface, GSM spectrum, GSM Multiple Access Scheme, GSM Channel Organization,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode
Lecture18	➢ Traffic Channel multi-frame, ➢ Control (Signalling) Channel Multi-frame, ➢ Frames, Multi-frames, Super-frames and Hyper-frames, ➢	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode
Lecture19	➢ GSM Call Set up Procedure, ➢ Location Update Procedure, ➢ Routing of a call.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode

Lecture20	➢ The concept of Packet data Services : 2.5G General Packet Radio Services ➢ GPRS network architecture,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter9) *And Lecture Notes*	Online Mode
Lecture21	➢ GPRS interfaces and reference points,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter9) *And Lecture Notes*	Online Mode
Lecture22	➢ GPRS Mobility management procedure, ➢ GPRS attachment and detachment procedures	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter9) *And Lecture Notes*	Online Mode
Lecture23	➢ Overview of CDMA systems: IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS) CDMA based IS-95 Systems,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter10 and 11) *And Lecture Notes*	Online Mode
Lecture24	➢ forward link and reverse link for IS-95, ➢ handoff process in CDMA based IS-95 network. ➢	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter10) *And Lecture Notes*	Online Mode
Lecture25	➢ UMTS Network ➢ Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution, UMTS FDD and TDD, ➢ UMTS Channels, Logical Channels, UMTS Time Slots	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter11) *And Lecture Notes*	Online Mode
Lecture26	➢ IEEE 802.11 standards, ➢ WLAN family, ➢ WLAN transmission technology, ➢ WLAN system architecture,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter15) *And Lecture Notes*	Online Mode
Lecture27	➢ Collision Sense Multiple Access with Collision Detection (CSMA/CD) ➢ CSMA collision avoidance (CSMA/CA),	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter14) *And Lecture Notes*	Online Mode
Lecture28	➢ Frequency Hopping Spread Spectra, ➢ 802.11 PHY and MAC layers	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter14) *And Lecture Notes*	Online Mode
Lecture29	➢ IEEE 802.11 Distributed Coordination function (DCF) ➢ Point coordination function (PCF), ➢ Back off algorithm.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter14) *And Lecture Notes*	Online Mode
Lecture30	➢ Evolution of broadband wireless, ➢ IEEE 802.16 standards : WiMAX , Spectrum Allocation,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter16)	Online Mode

		And Lecture Notes	
Lecture31	➢ IEEE 802.16 Standard Architecture, ➢ Overview of WiMAX PHY,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter16) *And Lecture Notes*	Online Mode
Lecture32	➢ IEEE 802.16 MAC Layer, ➢ Orthogonal Frequency Division Multiple Access (OFDMA)	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter16) *And Lecture Notes*	Online Mode
Lecture33	➢ Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture34	➢ Four basic entities for MIPv4, ➢ Mobile IPv4 Operations, Registration, Tunneling, ➢ MIPv4 Reverse Tunneling, ➢ MIPv4 Triangular Routing,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture35	➢ Configuring PDP Addresses on Mobile Station, ➢ Mobility Classification, ➢ Seamless Terminal Mobility Management	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture36	➢ Limitations of current TCP/IP networks for mobility support, Mobility solution.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture37	➢ Question and answer session		Online Mode

PAPER NAME: ADVANCED COMMUNICATION SYSTEMS

PAPER CODE: ECEN4103

NAME OF THE FACULTY: Dr. Sabyasachi Chatterjee

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

SESSION: 2020-21

Course Name : Advanced Communication Systems

Course Code : ECEN 4103

Contact Hours per week

L	T	P	Total	Credit points
3	0	0	3	3

Course Outcome:
1. The students will learn about the evolution of radio communication.
2. They will be able to appreciate the challenges of RF communication.
3. Different wireless networks and their operations will be clear to them.
4. The students will learn about the new technologies like SDR and Cognitive radios.
5. They will be able to understand the functioning of WI-FI networks.
6. Our students will be able to take up research work in communication domain.

MODULE – I:

Cellular Mobile Wireless Networks: Systems and Design Fundamentals:

Brief introduction to mobile wireless communication and systems, Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering, Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes, mobility management, location management and handoff management. (6L)

Characteristics of wireless channel and propagation path loss models:

Fading, different types of fading, Inter symbol interference, fast fading model, Doppler effect due to velocity of mobiles, Rayleigh envelop, free space propagation model, two ray ground reflection model, log distance path loss model, log normal shadowing model, types of base stations and mobile station antennas.
(4L)

MODULE – II:

Modern Mobile Wireless Communication Systems:

Evolution strategies – First Generation (1G) to Fourth Generation (4G), Introduction to SDR, Introduction to CR. (3L)

Multiple Access Technologies in cellular communication

Time division multiple access (TDMA), variants like narrowband and wideband TDMA, Frequency division multiple access (FDMA), Code Division Multiple Access (CDMA), Direct sequence CDMA, spread spectrum technique, spectral efficiency of different wireless access technologies. (3L)

Cellular Communication Networks and Systems

Second generation (2G) Network: Global system for mobile communication (GSM):

Architecture and Protocols, Air Interface, GSM spectrum, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multi-frame, Control (Signalling) Channel Multi-frame, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, Location Update Procedure, Routing of a call.
(3L)

The concept of Packet data Services : 2.5G General Packet Radio Services GPRS network architecture, GPRS interfaces and reference points, GPRS Mobility management procedures, GPRS attachment and detachment procedures (3L)

Overview of CDMA systems: IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS) CDMA based IS-95 Systems, forward link and reverse link for IS-95, handoff process in CDMA based IS-95 network. UMTS Network Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution, UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS Time Slots (3L)

Module III:

Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA), Frequency Hopping Spread Spectra, 802.11 PHY and MAC layers, IEEE 802.11 Distributed Coordination function (DCF) and Point coordination function (PCF), Back off algorithm.
(4L)

Wireless Broadband Networks and Access:
Evolution of broadband wireless, IEEE 802.16 standards : WiMAX , Spectrum Allocation, IEEE 802.16 Standard Architecture, Overview of WiMAX PHY, IEEE 802.16 MAC Layer, IEEE 802.16, Orthogonal Frequency Division Multiple Access (OFDMA)
(3L)

MODULE – IV:

Mobile Internet Protocol

Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Configuring PDP Addresses on Mobile Station, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support, Mobility solution. (4L)

TEXT BOOKS:

1. Wireless Networks: Applications and Protocols, T.S. Rappaport, Pearson Education
2. Wireless Communication and Networks : 3G and Beyond, I. Saha Misra, TMH Education.
3. Wireless Communications : Principles and Practice, T.S.Rappaport, PHI Learning.
4. Wireless Communications, A. Goldsmith, Cambridge University Press.
5. Mobile Communication Engineering W.C.R Lee (TMH)

REFERENCE BOOKS:

1. Wireless Digital Communications: Modulations and Spread Spectrum Applications, K. Feher, Prentice Hall.
2. Wireless Communications and Networking, J.W.Mark and W. Zhuang, PHI.

LECTURE PLAN

SERIAL NO.	TOPICS	REFERENCES	MODE OF TEACHING
Lecture 1	➢ Brief introduction to mobile wireless communication and systems, Description of cellular system	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter1) *And Lecture Notes*	Group Discussion and Online Mode
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Lecture 3	➢ Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring,.	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Group Discussion and Online Mode
Lecture 4	➢ Co-channel and Adjacent channel interferences, ➢ handoff management (hard handoff and soft handoff)assignment schemes,	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Online Mode
Lecture 5	➢ Overview of wireless channel and its parameters. a) Multipath fading and its different effect ➢ ISI ➢ log distance path loss model, ➢ log normal shadowing model,	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter3) *And Lecture Notes*	Online Mode
Lecture 6	➢ free space propagation model, ➢ two ray ground reflection model	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter4 and 5) *And Lecture Notes*	Online Mode
Lecture 7	➢ Flat and frequency selective fading ➢ Fast and slow fading. Doppler effect due to velocity of mobiles.	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter4) *And Lecture Notes*	Online Mode
Lecture 8	➢ Practical fading models for large scale fading. ➢ Rayleigh fading model ➢ Rician fading model.	*Book:* Wireless Networks: Applications and Protocols, T.S.Rappaport, (chapter4)	Online Mode

		And Lecture Notes	
Lecture 9	➢ Evolution strategies – First Generation (1G) and second Generation (2G) and different technology used and their evolution.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter2) *And Lecture Notes*	Online Mode
Lecture10	Evolution strategies – Third Generation (3G) to Fourth Generation (4G) and different technology used and their evolution.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter7) *And Lecture Notes*	Group Discussion and Online Mode
Lecture11	➢ Multiple Access Technologies in cellular communication a) Time division multiple access (TDMA), variants like narrowband and wideband TDMA	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter7) *And Lecture Notes*	Group Discussion and Online Mode
Lecture12	➢ b) Frequency division multiple access (FDMA),	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter7) *And Lecture Notes*	Online Mode
Lecture13	Code Division Multiple Access (CDMA), Direct sequence CDMA, spread spectrum technique. ➢	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Group Discussion and Online Mode
Lecture14	➢ Spectral efficiency of different wireless access technologies. a) FDMA b) TDMA C) CDMA	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Group Discussion and Online Mode
Lecture15	➢ Introduction to SDR, ➢ Introduction to CR.	*Lecture Notes*	Online Mode
Lecture16	➢ Second generation (2G) Network: ➢ Global system for mobile communication (GSM): ➢ Architecture and Protocols,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode
Lecture17	GSM Air Interface, GSM spectrum, GSM Multiple Access Scheme, GSM Channel Organization,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode
Lecture18	➢ Traffic Channel multi-frame, ➢ Control (Signalling) Channel Multi-frame, ➢ Frames, Multi-frames, Super-frames and Hyper-frames, ➢	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode
Lecture19	➢ GSM Call Set up Procedure, ➢ Location Update Procedure, ➢ Routing of a call.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter8) *And Lecture Notes*	Online Mode

Lecture20	➢ The concept of Packet data Services : 2.5G General Packet Radio Services ➢ GPRS network architecture,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter9) *And Lecture Notes*	Online Mode
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Lecture23	➢ Overview of CDMA systems: IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS) CDMA based IS-95 Systems,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter10 and 11) *And Lecture Notes*	Online Mode
Lecture24	➢ forward link and reverse link for IS-95, ➢ handoff process in CDMA based IS-95 network. ➢	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter10) *And Lecture Notes*	Online Mode
Lecture25	➢ UMTS Network ➢ Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution, UMTS FDD and TDD, ➢ UMTS Channels, Logical Channels, UMTS Time Slots	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter11) *And Lecture Notes*	Online Mode
Lecture26	➢ IEEE 802.11 standards, ➢ WLAN family, ➢ WLAN transmission technology, ➢ WLAN system architecture,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter15) *And Lecture Notes*	Online Mode
Lecture27	➢ Collision Sense Multiple Access with Collision Detection (CSMA/CD) ➢ CSMA collision avoidance (CSMA/CA),	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter14) *And Lecture Notes*	Online Mode
Lecture28	➢ Frequency Hopping Spread Spectra, ➢ 802.11 PHY and MAC layers	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter14) *And Lecture Notes*	Online Mode
Lecture29	➢ IEEE 802.11 Distributed Coordination function (DCF) ➢ Point coordination function (PCF), ➢ Back off algorithm.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter14) *And Lecture Notes*	Online Mode
Lecture30	➢ Evolution of broadband wireless, ➢ IEEE 802.16 standards : WiMAX , Spectrum Allocation,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter16)	Online Mode

		And Lecture Notes	
Lecture31	➢ IEEE 802.16 Standard Architecture, ➢ Overview of WiMAX PHY,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter16) *And Lecture Notes*	Online Mode
Lecture32	➢ IEEE 802.16 MAC Layer, ➢ Orthogonal Frequency Division Multiple Access (OFDMA)	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter16) *And Lecture Notes*	Online Mode
Lecture33	➢ Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture34	➢ Four basic entities for MIPv4, ➢ Mobile IPv4 Operations, Registration, Tunneling, ➢ MIPv4 Reverse Tunneling, ➢ MIPv4 Triangular Routing,	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture35	➢ Configuring PDP Addresses on Mobile Station, ➢ Mobility Classification, ➢ Seamless Terminal Mobility Management	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture36	➢ Limitations of current TCP/IP networks for mobility support, Mobility solution.	Wireless Communication and Networks : 3G and Beyond, I Saha Misra (chapter12) *And Lecture Notes*	Online Mode
Lecture37	➢ Question and answer session		Online Mode

Module 1

Lecture series	Topic
Lecture 1	World energy resources - Indian energy scenario - Environmental aspects of energy utilization
Lecture 2	Review of conventional energy resources - coal, gas, oil reserves and resources; Different form of nonconventional energy;
Lecture 3	Renewable energy resources and their importance – solar, wind, hydro, biomass, geothermal, and ocean energy, role of energy in economic development and social transformation;
Lecture 4	Solar spectrum; electromagnetic spectrum, basic laws of radiation. A brief history of energy consumption;
Lecture 5	Energy flow in ecosystem;
Lecture 6	Fuel cells - types of fuel cells;
Lecture 7	Thermodynamic efficiency of PEM fuel cell;
Lecture 8	Environmental impact of the PEM fuel cell in the transportation sector as compared to internal combustion engine.

Module 2

Lecture series	Topic
Lecture 1	Solar radiation: Measurements and prediction; Solar energy conversion techniques to heat and electricity;
Lecture 2	Spectrum of electromagnetic radiation, sun structure and characteristics,
Lecture 3	Heat transfer processes applicable to solar energy,
Lecture 4	solar radiation, and its analysis
Lecture 5	**solar ra**diation characteristics of opaque materials and transmission through glazing.
Lecture 6	Natural convection case studies
Lecture 7	Heat transfer in packed beds and perforated plates.
Lecture 8	Instruments for measurement of solar energy (Pyranometer / pyrheliometer / sunshine recorder),
Lecture 9	solar radiation on the collector
Lecture 10	Introduction to solar cells; Relation between solar radiation spectrum and UV-vis & IR component.

Module 3

Lecture series	Topic
Lecture 1	current status and future prospects; wind energy in India; power available in the wind;
Lecture 2	Anemometers and wind directions; environmental benefits and problems of wind energy; factors influencing the cost of energy generation - site specific parameters,
Lecture 3	World Meteorological Organization (WMO) specification, and machine parameters; wind energy conversion system (WECS):
Lecture 4	classification, characteristics, and applications; characteristics of wind rotor; wind turbine power and torque characteristics;
Lecture 5	types of rotors - horizontal and vertical axis wind turbine; Betz limit;
Lecture 6	Wind pumps - wind driven piston pumps, limitations, and performance analysis; atmospheric circulations,
Lecture 7	classification, factors influencing wind, wind shear, turbulence, wind speed monitoring,
Lecture 8	Wind pump basics: Its application and tip speed ratio calculation in withdrawing water; Dynamic wind pumps; Pulsating torque calculation.
Lecture 9	classification of hydropower plants, small hydropower systems: overview of micro, mini, and small hydro systems;
Lecture 10	status of hydropower worldwide; advantages and disadvantages of Hydropower; Methods for determining head and flow.

Module 4

Lecture series	Topic
Lecture 1	Origin of biomass - plant derived, residues, aquatic, marine biomass, various wastes, photosynthesis; Biomass resource assessment - Estimation of woody biomass, non woody biomass and wastes, ASTM standards.
Lecture 2	Bulk chemical properties - Moisture content, proximate and ultimate analyses, calorific value, and waste water analysis for solids;
Lecture 3	Chemical composition of biomass-Cellulose, hemicelluloses and lignin content in common agricultural residues and their estimation,
Lecture 4	protein content in biomass; Structural properties - Physical structure, particle size and size distribution, permeability
Lecture 5	Physical properties - Bulk density, angle of repose, thermal analysis (TGA, DTA, and DSC).
Lecture 6	Ocean energy resources, ocean energy routes; principles of ocean thermal energy conversion systems; principles of ocean wave energy conversion
Lecture 7	tidal energy conversion;
Lecture 8	Availability of geothermal energy-size and distribution; recovery of geothermal energy,
Lecture 9	various types of systems to use geothermal energy; Power generation using geothermal heat,
Lecture 10	Sustainability of geothermal source, Geothermal heat pump and geothermal energy scenario in India.

LECTURE PLAN (ODD Semester 2021_22)

First Year First Semester

Basic Electronics (ECEN 1011)

Faculty Name: Dr. Sabyasachi Chatterjee (ECE Department)

Lecture No.	Date		Module	Topic	Book Reference
	Planned	Executed			
1			Module 1	Crystalline material, Energy band theory	Millman & Halkias: Integrated Electronics
2			Module 1	Fermi levels; Conductors, Semiconductors and Insulators : electrical properties, band diagrams.	Millman & Halkias: Integrated Electronics
3			Module 1	Semiconductors: intrinsic and extrinsic, energy band diagram	Millman & Halkias: Integrated Electronics
4			Module 1	Electrical conduction phenomenon, P-type and N- type semiconductors	Millman & Halkias: Integrated Electronics
5			Module 1	Drift and diffusion carriers. Diodes and Diode Circuits	Millman & Halkias: Integrated Electronics
6			Module 1	Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
7			Module 1	Formation of depletion zone, V-I characteristics,	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
8			Module 1	Zener Diode and its Application, Zener and Avalanche breakdown	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications

9			Module 1	Simple diode circuits, load line, piecewise linear model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
10			Module 1	Ripple factor, efficiency, idea of regulation.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
11			Module 2	Formation of PNP / NPN junctions	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
12			Module 2	Energy band diagram; transistor mechanism and principle of transistors	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
13			Module 2	Energy band diagram; transistor mechanism and principle of transistors	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
14			Module 2	CE, CB, CC configuration, transistor characteristics: cut-off, Active modes of operation,	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
15			Module 2	CE, CB, CC configuration, transistor characteristics: cut-off, Active modes of operation, Saturation modes of operation	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
16			Module 2	CE, CB, CC configuration, transistor characteristics: cut-off, Active modes of operation, Transistor action	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
.17			Module 2	Input & output characteristics	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications

18			Module 2	Load line & amplifier operation, Current amplification factors for CB and CE modes.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
19			Module 2	Biasing and Bias stability: calculation of stability factor	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
20			Module 2	Biasing and Bias stability: calculation of stability factor	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
21			Module 3	Junction field effect transistor (JEET): Principle of operation	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
22			Module 3	JFET parameters, eqv. Circuit	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
23			Module 3	Design of bias circuits,	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
24			Module 3	Load line, amplifier characteristics.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
25			Module 3	MOSFETs: Construction & principle of operation of p- & n-channel enhancement MOSFET	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
26			Module 3	Depletion mode MOSFETs, Drain characteristics, Transfer characteristics, Threshold voltage & its control.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
27			Module 3	Construction and working principle of CRO, Lissajous pattern	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications

28			Module 3	Concept-block diagram, properties, positive and negative feedback	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
29			Module 3	Loop gain, open loop gain	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
30			Module 3	Feedback factors; topologies of feedback amplifier	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
31			Module 4	Effect of feedback on gain, condition of oscillation, Barkhausen criteria.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
32			Module 4	Introduction to integrated circuits, operational amplifier and its terminal properties	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
33			Module 4	Introduction to integrated circuits, operational amplifier and its terminal properties;	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
34			Module 4	Application of operational amplifier; Concept of op-amp saturation,	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
35			Module 4	Application of operational amplifier; Concept of op-amp saturation,	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
36			Module 4	Application of operational amplifier; Concept of op-amp saturation,	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
37			Module 4	Inverting and non-inverting mode of operation	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications

38			Module 4	Adders, Subtractors, Voltage follower, Integrator, Differentiator	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
39			Module 4	Adders, Subtractors, Voltage follower, Integrator, Differentiator Basic Comparator Circuit.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications
40			Module 4	Adders, Subtractors, Voltage follower, Integrator, Differentiator Basic Comparator Circuit.	D. Chattopadhyay, P. C Rakshit : Electronics Fundamentals and Applications

<u>LECTURE PLAN</u>
Programming for Problem Solving
Electrical Engg.
Code: CSEN1001 (First Semester)

Lecture No.	Topics to be Taught	Reference	Name of Lecturer
1	History Of Computers, Generations of Computers.	Introduction to computing—P.K.Sinha	SBP
2	Classification of Computers. Basic Anatomy of Computer System.	Introduction to computing—P.K.Sinha	SBP
3	Primary & Secondary memory, Processing Unit, Input and Output devices.	Introduction to computing—P.K.Sinha	SBP
4	Basic Concepts of Assembly language, High level language, Compiler and Assembler.	Introduction to computing—P.K.Sinha	SBP
5	Binary & Allied number systems representing signed and unsigned numbers.	Introduction to computing—P.N. Sinha	SBP
6	Conversion of one number system to another number system and arithmetic operations.	Introduction to computing—P.N. Sinha	SBP
7	Packed and unpacked BCD system, ASCII. IEEE-754 floating point representation.	Introduction to computing—P.N. Sinha	SBP
8	Basic Concepts of Operating Systems like MS WINDOWS, LINUX.	Introduction to computing—P.N. Sinha	SBP
9	**Algorithm:** ✓ What is Algorithm? ✓ Characteristics of algorithm ✓ Example: Representation of Algorithm	Introduction to computing—P.K.Sinha	SBP
10	**Flowchart:** ✓ Define Flowchart. ✓ Components of Flowchart ✓ Example: Representation of Flowchart	Introduction to computing—P.K.Sinha	SBP
11	**Basic Concepts:** ✓ Translator ✓ Assembler ✓ Linker ✓ Loader ✓ Compiler ✓ Interpreter	Notes Introduction to computing- E. Balagurusamy	SBP

12	**Concepts of Programming:** ✓ What is Programming language? ✓ Type of Programming language. ✓ About C-programming	Introduction to computing- E. Balagurusamy	SBP
13	**C Fundamentals:** ✓ C character set ✓ Identifier and Key word ✓ Data Types and size: Basic data type and Qualifiers ✓ Variable: declaration, initialization ✓ Statement	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
14	**Operators and Expressions:** ✓ Arithmetic operators ✓ Relational operators ✓ Logical operators ✓ Increment and Decrement operators ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
15	**Operators and Expressions:** ✓ Conditional operators ✓ Short hand operators ✓ Assignment operator and expressions ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
16	**Operators and Expressions:** ✓ Bit wise operators ✓ Type conversion ✓ Precedence of operators and order of evaluation ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
17	**Operators and Expressions:** ✓ Input and Output: Standard input and output ✓ Formatted input- scanf and output – printf ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
19	**Flow of Control:** ✓ Statement and blocks ✓ Condition and branching: • if statement • if – else • nested if-else • if-else-if ladder • switch ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP

20	**Flow of Control:** ✓ Loops: • entry control- while, for • exit control- do while ✓ Break and Continue ✓ Go To and labels ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
21	**Arrays:** ✓ Define array ✓ One dimensional array ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
22	**Arrays:** ✓ Multidimensional array ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
23	**Pointer:** ✓ What is pointer? ✓ Pointer arithmetic. ✓ Pointer and array: ✓ array of pointer ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
24	**Pointer:** ✓ Pointer to an array ✓ Array of arrays ✓ Array pointer duality ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
25	**String Handling** ✓ Introduction to string ✓ Compare between character array and string ✓ Multidimensional String ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
26	**String Handling** ✓ Different string functions: strrev(), strcpy(), strlen(), strcmp(), strncmp(), strcmpi() ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
27	**Function:** ✓ Basic of function ✓ Type of function ✓ Function prototype ✓ Actual and Formal argument ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
28	**Function:** ✓ Function returning value ✓ Function not returning value	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. &	SBP

	✓ Parameter passing: Call by value, Call by reference ✓ Examples	Ritchie D.M.	
29	**Function and Preprocessor** ✓ Recursive function ✓ Command line argument ✓ Macro: definition, expansion ✓ Different between function and macro. ✓ Header files ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
30	**Storage Structure:** ✓ Storage Structure : auto, external, static, register and there scope ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
31	**Structure:** ✓ Basic concepts of structure ✓ Structure variable and pointer to structure and structure as a parameter ✓ Nested structure ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
32	**Structure and Union:** ✓ Basic concepts of union ✓ Union Variable and pointer to union ✓ Nesting of structure and union ✓ Comparison between structure and union ✓ Examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
33	**Structures and functions.**	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
34	**Arrays of structures.**	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
35	**Some Examples of structures.**	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
36	**Files:** ✓ Text files ✓ Modes of operation	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP

37	**File related functions:** fopen(), fclose, fscanf() with examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
38	**File related functions:** fprintf(), fgets, fputs() with examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
39	**File related functions:** fseek(), ftell() with examples	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP
40	**Examples of Data File Handling in C.**	Programming with C-Gottfried The C Programming Language- Kerninghan B.W. & Ritchie D.M.	SBP

PAPER NAME: ANALOG CIRCUITS

PAPER CODE: ECEN 2101

NAME OF THE FACULTY: SABYASACHI CHATTERJEE

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

Course Outcomes:
After going through this course, the students will be able to
1. Apply the previous knowledge gathered from Basic Electrical and Basic Electronics papers.
2. Understand the concepts of BJT, MOSFET and biasing techniques of BJT and MOSFET based amplifier circuits.
3. Analyze frequency response of amplifier circuits.
4. Design different types sinusoidal oscillators and multivibrator circuits.
5. Construct algebraic equations based amplifier and analog computers using OP-AMP
6. Design stable high-gain amplifier circuits.

MODULE 1: Analog Signals and Devices [9L]

Basic concepts and device biasing [5L]:
Analog, discrete and digital signals. Diode: piecewise-linear model, clipping and clamping operation. BJT biasing
circuits, Q-point and stability.

Small Signal analysis of Amplifiers [4L]:

Small signal (h-parameter and re model) analysis of BJT CE mode amplifier circuit (derive input impedance, output
impedance, voltage gain, current gain for the amplifiers).

MODULE 2: Oscillators and Frequency Responses of Amplifiers [9L]

Frequency Responses of Amplifiers [2L]:
Frequency response of CE mode RC-coupled amplifier; effect of external and parasitic capacitors on cut-off frequencies.
Feedback & Oscillator Circuits [7L]:
Concept of feedback, Effects of negative feedback in amplifiers, Oscillators circuits: Phase-shift, Wien-Bridge, Hartley, Colpitt and crystal Oscillators.

MODULE 3: Operational Amplifiers (OPAMPs) [7L]

Fundamentals of OPAMP [4L]:
Basic building blocks of OPAMP: Differential Amplifiers, Current source and current mirror circuits. Types of differential amplifiers, AC and DC analysis of differential amplifiers; Characteristics of an ideal OPAMP.

Applications of OPAMP [3L]:

Inverting and non-inverting OPAMP amplifiers, Log-antilog amplifiers, Instrumentation amplifier, Precision rectifiers, basic comparator, Schmitt Trigger.

MODULE 4: Analog Circuit Applications [7L]

Power Amplifiers [4L]:
Concepts and operations of Class A, B and AB amplifiers; Calculation of DC power, AC power and efficiency of
these amplifiers.

Applications Analog IC [3L]:

Description of 555 Timer IC, astable and mono-stable operations using 555. Study of 78XX and 79XX voltage regulator ICs.

Books:

1. Microelectronic Circuits by Adel S. Sedra, Kenneth C. Smith
2. Electronics Devices and Circuits by Robert L. Boylestad, Louis Nashelskey
3. Fundamentals of Microelectronics by Behzad Razavi
4. Integrated electronics by Jacob Millman, Christos C. Halkias

Lecture No.	Topic
Lecture 1	Concepts of Analog, discrete and digital signals. Diode: piecewise-linear model
Lecture 2	Diode series & parallel clipper circuits with and without bias
Lecture 3	Diode clamper circuits with and without bias
Lecture 4	Concept of biasing, DC load line & Q-point of BJT amplifiers, Concepts of stability factors of BJT biasing circuits
Lecture 5	Study of BJT fixed bias, Collector to base bias & voltage divider biasing circuits
Lecture 6	Concepts of ac load line & small signal analysis, introduction to small signal models
Lecture 7	h-parameter model of BJT CE mode amplifier circuit, derivation of input impedance, output impedance, voltage gain, current gain
Lecture 8	r_e model of BJT CE mode amplifier circuit with voltage divider bias, derivation of input impedance, output impedance, voltage gain, current gain
Lecture 9	Numericals on BJT amplifier circuits
Lecture 10	Frequency response of CE mode RC-coupled amplifier
Lecture 11	Effect of external and parasitic capacitors on cut-off
Lecture 12	Concept of feedback, feedback topologies
Lecture 13	Effects of negative feedback in amplifiers
Lecture 14	Concept of Oscillators circuits, Wein bridge oscillator
Lecture 15	Phase-shift oscillator
Lecture 16	General LC oscillators
Lecture 17	Hartley & Colpitt oscillators
Lecture 18	crystal Oscillator & oscillator related problems
Lecture 19	Concept of differential amplifiers, types of differential amplifiers, DC analysis of differential amplifiers
Lecture 20	AC analysis of differential amplifiers
Lecture 21	Current source and current mirror circuits
Lecture 22	Block diagram of a basic OPAMP, Characteristics of an ideal OPAMP
Lecture 23	Inverting and non-inverting OPAMP amplifiers, Log-antilog amplifiers
Lecture 24	Instrumentation amplifier, Precision rectifiers
Lecture 25	Basic comparator, Schmitt Trigger
Lecture 26	Concepts and operations of Class A, B and AB amplifiers
Lecture 27	Class A series fed power amplifier, calculation of DC power, AC power and efficiency
Lecture 28	Class A transformer coupled power amplifier, calculation of DC power, AC power and efficiency

Lecture 29	Class B & AB power amplifiers
Lecture 30	Description of 555 Timer IC, mono-stable operation using 555
Lecture 31	Astable multivibrator operation using 555
Lecture 32	Study of 78XX and 79XX voltage regulator ICs

Lesson Plan Subject Code: MATH4181(Free Elective)
Instructor Name: Moulipriya Sarkar
Odd Semester 2020-21
(16L)

Lecture	Topics to be covered
1, 2	Formulation of an LPP; Graphical Method of solution of an LPP.
3,4	Transportation Problems (TP); Representation of Transportation Problems as LPP; Methods of finding initial basic feasible solution of TP: North-West Corner Rule, Matrix Minima Method.
5,6	Vogel's Approximation Method; Optimality test of the basic feasible solution.
7	Assignment Problems; Hungarian Method; Travelling Salesman Problem.
8	Canonical and Standard form of an LPP; Basic Solution of a system of linear equations; Simplex Method.
9, 10	Big-M Method.
11	Concept of Duality; Mathematical formulation of duals; Dual Simplex Method.
12, 13	Unimodal Function; Elimination Methods: Interval Halving Method.
14	Dichotomous Search.
15	Fibonacci Method.
16	Golden Section Method.

Lecure Plan
Paper Name: Engineering Graphics & Design
Paper code: MECH1052
Odd Semester (2021-2022)
(Theory)

Lecture No.	Chapter	Topics to be covered
01.	Introduction	A. Importance of Engineering Drawing; With examples; with a few diagrams/drawings on green board B. Mention of following Equipment and Accessories required for engineering drawing. Drawing Board, T-square, Set-squares (without beveled edges): demonstration of making multiples of 15^0 (15^0, 30^0,45^0,60^0,75^0,90^0)with 30^0-60^0 and 45^0-set-squares ; Compass, Divider, Scale, Protractor(half/full); French curves: no. 5 and no. 6; Drawing paper: size of drawing paper, length and breadth relationship, relation of drawing paper size or standard; Drawing pencil.
02.	Lines and Lettering	1. Importance of Lines 2. To show how to make border line and Title Block on drawing sheet. 3. Different Types and thickness of lines and their applications. 4. Practising these lines.
03.	Lines and Lettering (Continued)	1. Basic concepts in lettering : ratio of letter height and width; 2. Formation of grids 3. Practising vertical & inclined letters. 4. Practice of a few letters
04.	Repeat of (2,3)	More practices of 2 and 3 combined
05.	Practice of geometrical drawing	A. Practice of drawing angles of 15^0, 30^0,45^0,60^0,75^0,90^0 with 30^0-60^0 and 45^0-set-squares B. C. Practice of some plane geometrical drawings like squares, rectangles, triangles, hexagon etc. ….. then Pentagon
06.	Dimensioning & Scales	**1. Different system of dimensioning with practice:** **i) aligned system & ii) unidirectional system:** **A. Dimensioning Terminology and execution:** **a. Dimension Lines.** **b. Projection Lines.** **c. Leader or Pointer Lines.** **d. Arrowheads (size).**

<table>
<tr><td></td><td></td><td>B. Placing of Dimensions:

a. Aligned System for Linear & Angular Dimensioning.
b. Unidirectional System for Linear & Angular Dimensioning.

C. Practice of arrowheads.</td></tr>
<tr><td>07.</td><td>Dimensioning & Scales

(Continued)</td><td>A General Rules of Dimensioning

B Method of Dimensioning some Common Features:
a. Circles.
b. Radii.
c. Chords and Arcs.
d. Angles.
e. Spheres.
f. Squares and Hexagons.
g. Chamfers.
h. Countersink.

C Arrangement of Dimensions:

a. Continuous or chain Dimensions.

b. Dimensioning from a common Feature:
• Progressive or Parallel Dimensioning.
• Superimposed Running Dimensioning.

c. Combined Dimensioning.

d. Dimensioning by Coordinates.</td></tr>
<tr><td>08.</td><td>Dimensioning & Scales
(Continued)</td><td>Continuation of (7 and 8) as required
Introduction to scale

Representative fraction

Reducing scale, Enlarging scale

Practice a few geometric drawings with dimensions and scales given.</td></tr>
<tr><td>09.</td><td>Solids</td><td>1. Introductions of Solids.
2. Classification of Solid:
A. Polyhedra:
• Tetrahedron.
• Cube.
• Octahedron.
• Dodecahedron.
• Prism
• Pyramid

B. Solids of Revolution:
• Cylinder.
• Sphere.</td></tr>
</table>

		• **Cone.** **Oblique Solid/ Right solid. (Note: We shall work with right solid only).** **3. Orientation of Solids:** **a. Axis perpendicular to the H.P.** **b. Axis perpendicular to the V.P.** **c. Axis parallel to both the H.P. and the V.P.** **d. Axis inclined to the H.P. and parallel to the V.P.** **e. Axis inclined to the V.P. and parallel to the H.P.** **f. Axis inclined to both H.P. and V.P.**
10.	--do— (Contd..)	**-- --------------------Written Examination-------------------------**
11.	Viva-Voce	**------------------Viva Voce from entire syllabus---------------------**

Recommended books:

1. "Elementary Engineering Drawing" by N. D. Bhatt ; Charotar Book stall, Anand.
2. "Engineering Graphics" by K. L. Narayana, P. Kannaiah, K. Venkata Reddy. TMH
3. "Engineering Graphics" by V. Lakshminarayanan, R.S. vaish Wanar; Jain Brothers.

		POWER PLANT ENGINEERING
		MECH 4101
	LEC NU	Details
Module 1	1	Review of fundamentals;
	2	Power plant cycles - Rankine
	3	Reheat
	4	regenerative cycles;
	5	Binary vapour
	6	Binary Vapour Continue
	7	Co-Generation
	8	Introduction to Boilers: Fire tube and water tube boilers
	9	mountings and accessories, Super-critical boilers
Module 3	1	Steam turbines- parts and classification, nozzle types,
	2	flow through nozzles,
	3	condition for maximum flow rate, nozzle efficiency.
	4	Impulse turbine- velocity diagram, work done
	5	blade efficiency and condition for maximum blading efficiency
	6	Pressure compounding or Rateau Turbine
	7	velocity compounding or Curtis Turbine of steam turbine
	8	reaction turbine- velocity diagram, degree of reaction
	9	Parsons turbine: condition for maximum blading efficiency
	10	Governing in steam turbines.
Module 4	1	Condensing systems- basic ideas & Classification of steam condensers
	2	Leakage in condensers, condensing efficiency
	3	Cooling Tower –Dry cooling tower and Wet cooling tower
	4	Cooling tower calculations.
	5	Power plant economics: load curve & Various Factor
	6	Continue Last Topic
	7	cost of power generation.
	8	Introduction to nuclear
	9	hydel power plants.

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: -
Stream:-
Semester:-
Contact: 3L+1T
Credit: 4

TEXT BOOK:

REFERENCE BOOK:

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
I	CO1	Basic terminology related to dc network, KCL, KVL.	1				
		Nodal analysis and Mesh analysis, related problems.	1				
		Superposition Theorem and related problems.	1				
		Thevenin's and Norton's Theorem, related problems.	1				
		Maximum Power transfer theorem, star delta conversion.	1				
		Miscellaneous problem on network analysis and star delta conversion	1				
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1				
		Biot Savart law, Ampere's circuital law and their application.	1				
		Magnetic circuit analysis, related problems.	1				
		Self and mutual inductance, coefficient of coupling.	1				
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1				
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1				
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1				
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1				
		General expression of power in an AC circuit, active, reactive, apparent power.	1				
		Resonance in RLC series circuit, problems related to ac series circuit.	1				
		Problems related to ac series circuit.	1				
		Introduction to ac parallel circuit, parallel resonance.	1				
		Problems related to ac parallel circuit.	1				
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1				
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1				
		Measurement of three phase power by two wattmeter method, problems.	1				
		Problems on three phase system.	1				
	CO2	Construction of dc machines and working principle of dc generator.	1				
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1				
		Characteristics of dc generator.	1				
		Working principle of dc motor, concept of back E.M.F, torque equation.	1				
		Characteristics of dc motor.	1				
		Starting and speed control of dc motor.	1				
		Miscellaneous problem on dc machine (generator and motor).	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1				
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	2				
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	2				
		Impedance transformation, equivalent cuircuit of a practical transformer.	1				
		Losses and Efficiency of transformer.	1				
		Condition of maximum efficiency of transformer, regulation, problems.	1				
		Open and short circuit test of transformer.	1				
		Problems on single phase transformer.	1				
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1				
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1				
		Equivalent circuit and phasor diagram.	1				
		Torque equation and torque-slip characteristics, problems.	1				

FACULTY 1

FACULTY 2

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: -
Stream:-
Semester:-
Contact: 3L+1T
Credit: 4

TEXT BOOK:

REFERENCE BOOK:

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
I	CO1	Basic terminology related to dc network, KCL, KVL.	1				
		Nodal analysis and Mesh analysis, related problems.	1				
		Superposition Theorem and related problems.	1				
		Thevenin's and Norton's Theorem, related problems.	1				
		Maximum Power transfer theorem, star delta conversion.	1				
		Miscellaneous problem on network analysis and star delta conversion	1				
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1				
		Biot Savart law, Ampere's circuital law and their application.	1				
		Magnetic circuit analysis, related problems.	1				
		Self and mutual inductance, coefficient of coupling.	1				
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1				
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1				
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1				
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1				
		General expression of power in an AC circuit, active, reactive, apparent power.	1				
		Resonance in RLC series circuit, problems related to ac series circuit.	1				
		Problems related to ac series circuit.	1				
		Introduction to ac parallel circuit, parallel resonance.	1				
		Problems related to ac parallel circuit.	1				
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1				
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1				
		Measurement of three phase power by two wattmeter method, problems.	1				
		Problems on three phase system.	1				
	CO2	Construction of dc machines and working principle of dc generator.	1				
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1				
		Characteristics of dc generator.	1				
		Working principle of dc motor, concept of back E.M.F, torque equation.	1				
		Characteristics of dc motor.	1				
		Starting and speed control of dc motor.	1				
		Miscellaneous problem on dc machine (generator and motor).	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1				
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	2				
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	2				
		Impedance transformation, equivalent cuircuit of a practical transformer.	1				
		Losses and Efficiency of transformer.	1				
		Condition of maximum efficiency of transformer, regulation, problems.	1				
		Open and short circuit test of transformer.	1				
		Problems on single phase transformer.	1				
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1				
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1				
		Equivalent circuit and phasor diagram.	1				
		Torque equation and torque-slip characteristics, problems.	1				

FACULTY 1

FACULTY 2

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: -
Stream:-
Semester:-
Contact: 3L+1T
Credit: 4

TEXT BOOK:

REFERENCE BOOK:

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
I	CO1	Basic terminology related to dc network, KCL, KVL.	1				
		Nodal analysis and Mesh analysis, related problems.	1				
		Superposition Theorem and related problems.	1				
		Thevenin's and Norton's Theorem, related problems.	1				
		Maximum Power transfer theorem, star delta conversion.	1				
		Miscellaneous problem on network analysis and star delta conversion	1				
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1				
		Biot Savart law, Ampere's circuital law and their application.	1				
		Magnetic circuit analysis, related problems.	1				
		Self and mutual inductance, coefficient of coupling.	1				
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1				
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1				
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1				
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1				
		General expression of power in an AC circuit, active, reactive, apparent power.	1				
		Resonance in RLC series circuit, problems related to ac series circuit.	1				
		Problems related to ac series circuit.	1				
		Introduction to ac parallel circuit, parallel resonance.	1				
		Problems related to ac parallel circuit.	1				
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1				
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1				
		Measurement of three phase power by two wattmeter method, problems.	1				
		Problems on three phase system.	1				
	CO2	Construction of dc machines and working principle of dc generator.	1				
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1				
		Characteristics of dc generator.	1				
		Working principle of dc motor, concept of back E.M.F, torque equation.	1				
		Characteristics of dc motor.	1				
		Starting and speed control of dc motor.	1				
		Miscellaneous problem on dc machine (generator and motor).	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1				
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	2				
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	2				
		Impedance transformation, equivalent cuircuit of a practical transformer.	1				
		Losses and Efficiency of transformer.	1				
		Condition of maximum efficiency of transformer, regulation, problems.	1				
		Open and short circuit test of transformer.	1				
		Problems on single phase transformer.	1				
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1				
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1				
		Equivalent circuit and phasor diagram.	1				
		Torque equation and torque-slip characteristics, problems.	1				

FACULTY 1

FACULTY 2

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: -
Stream:-
Semester:-
Contact: 3L+1T
Credit: 4

TEXT BOOK:

REFERENCE BOOK:

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
I	CO1	Basic terminology related to dc network, KCL, KVL.	1				
		Nodal analysis and Mesh analysis, related problems.	1				
		Superposition Theorem and related problems.	1				
		Thevenin's and Norton's Theorem, related problems.	1				
		Maximum Power transfer theorem, star delta conversion.	1				
		Miscellaneous problem on network analysis and star delta conversion	1				
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1				
		Biot Savart law, Ampere's circuital law and their application.	1				
		Magnetic circuit analysis, related problems.	1				
		Self and mutual inductance, coefficient of coupling.	1				
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1				
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1				
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1				
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1				
		General expression of power in an AC circuit, active, reactive, apparent power.	1				
		Resonance in RLC series circuit, problems related to ac series circuit.	1				
		Problems related to ac series circuit.	1				
		Introduction to ac parallel circuit, parallel resonance.	1				
		Problems related to ac parallel circuit.	1				
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1				
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1				
		Measurement of three phase power by two wattmeter method, problems.	1				
		Problems on three phase system.	1				
	CO2	Construction of dc machines and working principle of dc generator.	1				
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1				
		Characteristics of dc generator.	1				
		Working principle of dc motor, concept of back E.M.F, torque equation.	1				
		Characteristics of dc motor.	1				
		Starting and speed control of dc motor.	1				
		Miscellaneous problem on dc machine (generator and motor).	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1				
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	2				
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	2				
		Impedance transformation, equivalent cuircuit of a practical transformer.	1				
		Losses and Efficiency of transformer.	1				
		Condition of maximum efficiency of transformer, regulation, problems.	1				
		Open and short circuit test of transformer.	1				
		Problems on single phase transformer.	1				
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1				
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1				
		Equivalent circuit and phasor diagram.	1				
		Torque equation and torque-slip characteristics, problems.	1				

FACULTY 1

FACULTY 2

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: -
Stream:-
Semester:-
Contact: 3L+1T
Credit: 4

TEXT BOOK:

REFERENCE BOOK:

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
I	CO1	Basic terminology related to dc network, KCL, KVL.	1				
		Nodal analysis and Mesh analysis, related problems.	1				
		Superposition Theorem and related problems.	1				
		Thevenin's and Norton's Theorem, related problems.	1				
		Maximum Power transfer theorem, star delta conversion.	1				
		Miscellaneous problem on network analysis and star delta conversion	1				
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1				
		Biot Savart law, Ampere's circuital law and their application.	1				
		Magnetic circuit analysis, related problems.	1				
		Self and mutual inductance, coefficient of coupling.	1				
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1				
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1				
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1				
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1				
		General expression of power in an AC circuit, active, reactive, apparent power.	1				
		Resonance in RLC series circuit, problems related to ac series circuit.	1				
		Problems related to ac series circuit.	1				
		Introduction to ac parallel circuit, parallel resonance.	1				
		Problems related to ac parallel circuit.	1				
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1				
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1				
		Measurement of three phase power by two wattmeter method, problems.	1				
		Problems on three phase system.	1				
	CO2	Construction of dc machines and working principle of dc generator.	1				
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1				
		Characteristics of dc generator.	1				
		Working principle of dc motor, concept of back E.M.F, torque equation.	1				
		Characteristics of dc motor.	1				
		Starting and speed control of dc motor.	1				
		Miscellaneous problem on dc machine (generator and motor).	1				

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty	Proposed Date	Actual Date	Remarks
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1				
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	2				
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	2				
		Impedance transformation, equivalent cuircuit of a practical transformer.	1				
		Losses and Efficiency of transformer.	1				
		Condition of maximum efficiency of transformer, regulation, problems.	1				
		Open and short circuit test of transformer.	1				
		Problems on single phase transformer.	1				
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1				
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1				
		Equivalent circuit and phasor diagram.	1				
		Torque equation and torque-slip characteristics, problems.	1				

FACULTY 1

FACULTY 2

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - BIDISHA ROY (BR), NABANITA CHATTERJEE (NC)
Stream:- CHE
Semester:- 2^{ND}
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
		Basic terminology related to dc network, KCL, KVL.	1	
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
	CO1	Thevenin's and Norton's Theorem, related problems.	1	BR
		Maximum Power transfer theorem, star delta conversion.	1	
I		Miscellaneous problem on network analysis and star delta conversion	1	
		Review on basic terminologies related to magnetism, concept of magnetic flux.	1	
		Biot Savart law, Ampere's circuital law and their application.	1	
	CO3	Magnetic circuit analysis, related problems.	1	BR
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	NC
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	BR
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	BR
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	**NC**
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	NC
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - Bidisha Roy (BR) , Reetwik Bhadra(RB), Anirban Koley(AK)
Stream:- CSBS
Semester:- 1st
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	AK
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	BR
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	AK
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	RB
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	BR
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	AK
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	RB
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - Sudipta Mitra (SM), Bidisha Roy (BR)
Stream:- CSE A
Semester:- 1st
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	SM
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	SM
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	**BR**
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	**BR**
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	SM
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	**BR**
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	SM
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - Jayita Sarkar(JS), Bidisha Roy (BR) , Anirban Koley(AK)
Stream:- ECE A
Semester:- 1st
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	JS
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	JS
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	BR
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	JS
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	JS
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	**AK**
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	AK
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - Jayita Sarkar(JS), Bidisha Roy (BR)
Stream:- EE
Semester:- 1st
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	JS
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	JS
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	BR
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	BR
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	JS
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	BR
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	JS
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - Prof. (Dr.) Goshaidas Ray (GDR), Sudipta Mitra (SM), Bidisha Roy (BR)
Stream:- EE
Semester:- 2ND
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	SM
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	SM
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	**BR**
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	**SM**
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	SM
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	GDR
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	GDR
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: - Jayita Sarkar(JS), Bidisha Roy (BR)
Stream:- IT
Semester:- 1st
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	JS
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	JS
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	**BR**
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	**BR**
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	JS
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Even Semester 2019

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	**BR**
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	JS
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Odd & Even Semester (New Syllabus)

Paper Name:- Basic Electrical Engineering
Paper Code: ELEC 1001
Name of the faculty: -Emily Datta (ED), Bidisha Roy(BR), Reetwik Bhadra (RB)
Stream:- Mechanical Engineering(Section-A)
Semester:- 2nd
Contact: 3L+1T
Credit: 4

TEXT BOOK:
T1: A Text Book of Electrical Technology, Vol. I & II, B.L. Theraja, A.K. Theraja, S.Chand & Company
T2: Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition

REFERENCE BOOK:
R1: Basic Electrical Engineering, Nath & Chakraborti
R2: Basic Electrical Engineering, Hughes

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
I	CO1	Basic terminology related to dc network, KCL, KVL.	1	ED
		Nodal analysis and Mesh analysis, related problems.	1	
		Superposition Theorem and related problems.	1	
		Thevenin's and Norton's Theorem, related problems.	1	
		Maximum Power transfer theorem, star delta conversion.	1	
		Miscellaneous problem on network analysis and star delta conversion	1	
	CO3	Review on basic terminologies related to magnetism, concept of magnetic flux.	1	ED
		Biot Savart law, Ampere's circuital law and their application.	1	
		Magnetic circuit analysis, related problems.	1	
		Self and mutual inductance, coefficient of coupling.	1	
		B-H curve, losses in magnetic material, lifting power of electromagnet.	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Odd & Even Semester (New Syllabus)

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
II	CO4	Generation of Alternating EMF, equation, waveform, phase, phase difference, time period, frequency.	1	**BR**
		RMS value, Average value, form factor, peak factor of alternating quantity-examples.	1	
		AC through pure resistance, inductance and capacitance. waveform and phasor diagram.	1	
		AC through series RL, RC and RLC circuit, phasor diagram, voltage and impedance triangle.	1	
		General expression of power in an AC circuit, active, reactive, apparent power.	1	
		Resonance in RLC series circuit, problems related to ac series circuit.	1	
		Problems related to ac series circuit.	1	
		Introduction to ac parallel circuit, parallel resonance.	1	
		Problems related to ac parallel circuit.	1	
III	CO4	Generation of Three Phase AC power, balanced 3-phase system.	1	**RB**
		Star and Delta Connection, relationship between line and phase quantities, phasor diagram.	1	
		Measurement of three phase power by two wattmeter method, problems.	1	
		Problems on three phase system.	1	
	CO2	Construction of dc machines and working principle of dc generator.	1	ED
		Classification of dc machine with circuit diagram, E.M.F equation of dc generator.	1	
		Characteristics of dc generator.	1	
		Working principle of dc motor, concept of back E.M.F, torque equation.	1	
		Characteristics of dc motor.	1	
		Starting and speed control of dc motor.	1	
		Miscellaneous problem on dc machine (generator and motor).	1	

Department of Electrical Engineering
Heritage Institute of Technology
Lecturer Plan for Odd & Even Semester (New Syllabus)

Module	CO	Topic of the Lecture	No. of lectures	Name of the Faculty
IV	CO5	Introduction to Transformer, operating principle, EMF equation.	1	RB
		Properties of ideal transformer, ideal transformer on no load and loaded condition. Phasor diagram.	1	
		Properties of practical transformer, phasor diagram of practical transformer under loaded condition.	1	
		Impedance transformation, equivalent cuircuit of a practical transformer.	1	
		Losses and Efficiency of transformer.	1	
		Condition of maximum efficiency of transformer, regulation, problems.	1	
		Open and short circuit test of transformer.	1	
		Problems on single phase transformer.	1	
	CO6	Introduction to 3 phase induction motor, construction, production of rotating magnetic field.	1	ED
		Operating principle, concept of slip, expression for frequency of rotor induced emf, related problems	1	
		Equivalent circuit and phasor diagram.	1	
		Torque equation and torque-slip characteristics, problems.	1	

Paper Name: Engineering Drawing Laboratory

Paper Code: CHEN 2253

Contact hours per week	**L**	**T**	**P**	**Total**	**Credit Points**
	0	0	2	2	1

Course Outcome:
After completion of the course the:

1. Student will be able to understand basics of engineering drawing.
2. Student will be able to draw different angular projection view of engineering equipment.
3. Students will be able to draw isometric projection view of engineering equipment.
4. Students will be able to draw cut-section view of engineering equipment.
5. Students will be able to use AutoCAD software for developing engineering drawing layouts.
6. Students will be able to prepare a virtual 3-D representation of an engineering equipment.

Faculty Name	Dr. Dwaipayan Sen		
Session	2020-2021	**Number of students**	31

Experiment No.	**Topics Covered**	**CO Attained**
01	Introduction to AutoCAD software for drawing in 2D: Drawing and editing commands. Knowledge of setting up layers, dimensioning, hatching, making block, plotting and printing, working with external reference file.	1,4,5
02	Flange coupling for shaft and vessel or pipe.	2,5
03	Pipe joints and fittings, single line and double line pipe line assembly.	2,5
04	Stuffing box.	2,5
05	Detailed cut section drawing of Globe valve and Stop valve.	4
06	Piping and instrumentation diagram of any given chemical process. Assembly drawing of a single stirred jacketed pressure vessel with all its accessories using AutoCAD software. Introduction to AutoCAD software for drawing in 3D: Working in 3-dimensions, Drawing and editing commands, viewing 3D objects, basic solid and wireframe models, extruding, simple revolved objects. Generation of orthographic projections from 3D drawing.	2,3,4,5,6

Lecture Plan_Module1_MATH1101

Lecture1: Matrix properties: singularity, symmetric, skew-symmetric, orthogonal and corresponding exercises.

Lecture2: Determinants, Laplace's expansion with problems.

Lecture3, 4: Linear combination, spanning, linear dependence and independence, elementary row operation, canonical form and echelon form of matrices with problems.

Lecture5: Rank of a matrix with problems.

Lecture 6, 7: Solving system of linear equations: Matrix inversion method, Cramer's rule, checking consistency and inconsistency by rank concept.

Lecture 8 : Eigenvalues and eigenvectors.

Lecture9: Cayley-Hamilton theorem, Diagonalization of matrices.

Lecture 10: Orthogonal transformation.

Lecture Plan_Module1_MATH1101

Lecture1: Matrix properties: singularity, symmetric, skew-symmetric, orthogonal and corresponding exercises.

Lecture2: Determinants, Laplace's expansion with problems.

Lecture3, 4: Linear combination, spanning, linear dependence and independence, elementary row operation, canonical form and echelon form of matrices with problems.

Lecture5: Rank of a matrix with problems.

Lecture 6, 7: Solving system of linear equations: Matrix inversion method, Cramer's rule, checking consistency and inconsistency by rank concept.

Lecture 8 : Eigenvalues and eigenvectors.

Lecture9: Cayley-Hamilton theorem, Diagonalization of matrices.

Lecture 10: Orthogonal transformation.

Lecture Plan_Module1_MATH1101

Lecture1: Matrix properties: singularity, symmetric, skew-symmetric, orthogonal and corresponding exercises.

Lecture2: Determinants, Laplace's expansion with problems.

Lecture3, 4: Linear combination, spanning, linear dependence and independence, elementary row operation, canonical form and echelon form of matrices with problems.

Lecture5: Rank of a matrix with problems.

Lecture 6, 7: Solving system of linear equations: Matrix inversion method, Cramer's rule, checking consistency and inconsistency by rank concept.

Lecture 8 : Eigenvalues and eigenvectors.

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<u>Lecture Plan_Module1_MATH1101</u>

Lecture1: Matrix properties: singularity, symmetric, skew-symmetric, orthogonal and corresponding exercises.

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Lecture 10: Orthogonal transformation.

PAPER NAME: MICROWAVE ENGINEERING

PAPER CODE: ECEN3103

NAME OF THE FACULTY: SOUMYO CHATTERJEE

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

SESSION: 2020-21

LECTURE PLAN

SERIAL NO.	TOPICS	DATE (TENTATIVE)	DATE (EXECUTED)	REFERENCES	MODE OF TEACHING ADOPTED
Lecture 1	➢ RF & Microwave Spectrum ➢ Typical applications of RF and Microwave Engineering ➢ Safety considerations	05/08/2020	05/08/2020	a) *Book:* Microwave Engineering *(Author: Subal Kar)* [Chapter-1&2]	Group Discussion and PPT
Lecture 2	➢ Rectangular waveguides ➢ TE & TM modes	07/08/2020	07/08/2020	*a)* *Book:* Microwave Engineering *(Author: Subal Kar)* [Chapter-2] *b)* Lecture Notes	PPT
Lecture 3	➢ TE_{10} mode analysis ➢ Cut-off frequency ➢ Propagation constant ➢ Intrinsic wave impedance ➢ Phase and group velocity	10/08/2020	10/08/2020	*a)* *Book:* Microwave Engineering *(Author: Subal Kar)* [Chapter-2] *b) Lecture Notes*	PPT
Lecture 4	➢ Power transmission ➢ Attenuation ➢ Waveguide excitation ➢ Wall current	11/08/2020	11/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-2] b) Lecture Notes	PPT
Lecture 5	➢ Introduction of circular waveguide ➢ Circular waveguides ➢ TE_{11} mode analysis	12/08/2020	12/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-2] b) Lecture Notes	PPT
Lecture 6	➢ Rectangular waveguide resonator a) Design Considerations b) Resonant Frequency	14/08/2020	14/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-2] b) Lecture Notes	PPT
Lecture 7	➢ Rectangular waveguide resonator a) Q factor b) Methods of Excitation ➢ Numerical Problems on Resonators	17/08/2020	17/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-2] b) Lecture Notes	Quiz and PPT
Lecture 8	➢ Problem Session a) Revision of previous topics b) Practice problems on lectures 2 to 6	18/08/2020	18/08/2020	a) Book: Microwave Engineering *(Author: Sushrut Das)* [Chapter-5 & 6] b) Lecture Notes	Group Discussion/ Quiz PPT
Lecture 9	➢ Introduction to planar transmission lines a) Micro-strip lines b) Coplanar waveguide c) Slot line-design consideration d) field patterns	19/08/2020	19/08/2020	a) Book: Microwave Engineering *(Author: Sushrut Das)* [Chapter-3] *b)* Lecture Notes	Group Discussion and PPT
Lecture10	➢ Propagation characteristics	21/08/2020	24/08/2020	a) Book: Microwave Engineering	PPT

	➢ Comparison for different characteristics of the above mentioned lines			*(Author: Sushrut Das)* [Chapter-3] b) Lecture Notes	
Lecture11	➢ N-port networks ➢ Properties of S matrix	24/08/2020	25/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* *b)* Lecture Notes	PPT
Lecture12	➢ Transmission matrix & their relationships ➢ Problems on S matrix ➢ S parameters for two port networks with mismatched load	25/08/2020	26/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-5] b) Lecture Notes	PPT
Lecture13	➢ Microwave passive components and their S matrix representation: a) Attenuators b) Phase shifter	28/08/2020	28/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-6] *b)* Lecture Notes	PPT
Lecture14	➢ Microwave passive components and their S matrix representation: a) Directional coupler, b) Bethe-hole coupler	31/08/2020	31/08/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-6] b) Lecture Notes	PPT
Lecture15	➢ Microwave passive components and their S matrix representation: a)Two hole coupler b) Magic tee	01/09/2020	01/09/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-6] b) Lecture Notes	Group Discussion and PPT
Lecture16	➢ Microwave passive components and their S matrix representation: a) Hybrid ring b) Circulators	02/09/2020	02/09/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-3] b) Lecture Notes	PPT
Lecture17	➢ Microwave passive components and their S matrix representation: a) Isolators b) Problems on different passive components ➢ Methods of coupling of microwave signal	04/09/2020	04/09/2020	a) Book: Microwave Engineering *(Author: Sushrut Das)* [Chapter-7&8] *b)* Lecture Notes	Group Discussion and PPT
Lecture18	➢ Operating Principle of: a) Two cavity Klystron b) Reflex Klystron	07/09/2020	07/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-9] a) Lecture Notes	PPT
Lecture19	➢ Introduction to cross field devices ➢ Operating Principle of: a) Magnetron	08/09/2020	08/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-9] *a)* Lecture Notes	PPT
Lecture20	➢ Operating Principle of : a) TWT ➢ Comparative study and applications of different tubes	09/09/2020	09/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-9] a) Lecture Notes	PPT
Lecture21	➢ Revision of topics covered in Lecture 22 to 24 ➢ Practice Problems	11/09/2020	21/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-9] a) Lecture Notes	PPT
Lecture22	➢ TED-Gunn diode	14/09/2020	22/09/2020	a) Book: Microwave Devices and Circuits	PPT

	c) Avalanche Transit Time device- IMPATT			*(Author: Samuel Y. Liao)* [Chapter-7 & 8] b) Lecture Notes	
Lecture23	➢ Schottky diode PIN diode	15/09/2020	23/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-7 & 8] a) Lecture Notes	PPT
Lecture24	➢ Microwave bipolar transistor	16/09/2020	28/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-6] a) Lecture Notes	PPT
Lecture25	➢ Microwave field effect transistor (MESFET)	18/09/2020	29/09/2020	a) Book: Microwave Devices and Circuits *(Author: Samuel Y. Liao)* [Chapter-6] a) Lecture Notes	Group Discussion and PPT
Lecture26	➢ Introduction to filter design ➢ Design procedure of filter design using insertion loss method- Maximally flat response	21/09/2020	30/09/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-8] *a)* Lecture Notes	PPT
Lecture27	➢ Design procedure of filter design using insertion loss method- Equi-ripple response	22/09/2020	05/10/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-8] *a)* Lecture Notes	PPT
Lecture28	➢ Low pass prototype design	23/09/2020	06/10/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-8] *a)* Lecture Notes	PPT
Lecture29	➢ Low pass prototype design (Continued)	25/09/2020	07/10/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-8] *a)* Lecture Notes	PPT
Lecture30	➢ Conversion to other filter prototypes	28/09/2020	12/10/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-8] *b)* Lecture Notes	Group Discussion and PPT
Lecture31	➢ Basic consideration in the design of RF amplifier- Transistor S-parameter	29/09/2020	13/10/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-9] *b)* Lecture Notes	PPT
Lecture32	➢ Stability Criteria ➢ Matching network ➢ Noise Figure	30/09/2020	14/10/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-9] *b)* Lecture Notes	PPT
Lecture33	➢ Matching network design using lumped elements and L- Section	05/10/2020	02/11/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-9] *b)* Lecture Notes	PPT

Lecture34	➢ Matching network design using lumped elements and L- Section (Continued) ➢ Practice Problems	06/10/2020	03/11/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-9] *b)* Lecture Notes	PPT
Lecture35	➢ Brief introduction to NBA	07/10/2020	04/11/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-9] *b)* Lecture Notes	PPT
Lecture36	➢ Brief introduction to LNA	09/10/2020	09/11/2020	a) Book: Microwave Engineering *(Author: Subal Kar)* [Chapter-9] *b)* Lecture Notes	PPT

Serial No.	Date of Plan	Date of Execution	Lecture Plan	Reference Book	Mode of Teaching
Lecture 1 Module 1	2021-03-15	2021-03-18	*Digital Image Acquisition: Sampling and quantization ; spatial, grey level and temporal resolution*	R.C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson	PPT
Lecture 2 Module1	2021-03-18	2021-03-19	*Spatial domain Processing: Pixel point processing: linear and piecewise linear transformations, log and power law transformations.*	Same as above	PPT
Lecture 3 Module 1	2021-03-19	2021-03-23	*Image Histogram and histogram equalization, Pixel Group Processing.*	Same as above	PPT
Lecture 4 Module 1	2021-03-23	2021-03-25	*Convolution in spatial domain.*	Same as above	PPT
Lecture 5, Module I	2021-03-25	2021-03-26	*low frequency and high frequency filtering.*	Same as above	PPT
Lecture 6 Module I	2021-03-26	2021-03-30	*mean and median filters*	Same as above	PPT
Lecture 7 Module II	2021-03-30	2021-04-01	*Frequency Domain Processing: Relation with spatial*	Same as above	PPT

			domain convolution.		
Lecture 8. Module I	2021-04-01	2021-04-03	*Standard low pass and high pass spatial domain filters.*	Same as above	PPT
Lecture 9. Module II	2021-04-03	2021-04-06	*Morphological operations: Dilation, Erosion.*	Same as above	PPT
Lecture 10. Module II	2021-04-06	2021-04-08	*Morphological operations: Opening and Closing*	Same as above	PPT
Lecture 11. Module II	2021-04-08	2021-04-09	*Morphological operations: Boundary extraction.*	Same as above	PPT
Lecture 12. Module II	2021-04-09	2021-04-13	*Morphological operations: Region filling.*	Same as above	PPT
Lecture 13. Module II	2021-04-13	2021-04-15	*Color Image Processing: RGB and HIS color models and interrelation.*	Same as above	PPT
Lecture 14. Module II	2021-04-15	2021-04-16	*Image Compression Standards: Lossy and lossless compressions.*	Same as above	PPT
Lecture 15 Module II	2021-04-16	2021-04-20	*BMP, TIFF & JPG image formats*	Intel 8086 family Datasheet	PPT
Lecture 17 Module III	2021-04-20	2021-04-22	8086 Pin Layout and description.	Same as above	PPT
Lecture 18	2021-04-22	2021-04-23	*Introduction*	Same as	PPT

Module III			*to the Pattern Recognition System: Components of Pattern Recognition System*	above + S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press.	
Lecture 19 Module III	2021-04-23	2021-04-27	*Learning and adaptation.*	Same as above	PPT
Lecture 20 Module III	2021-04-27	2021-04-29	*Supervised Learning (Classification).*	Same as above	PPT
Lecture 21 Module III	2021-04-29	2021-04-30	*Unsupervised Learning (Clustering).*	Same as above	PPT
Lecture 22 Module III	2021-04-30	2021-05-04	*Bayesian Decision Theory: classifiers, discriminant functions, decision surfaces.*	Same as above	PPT
Lecture 23 Module III	2021-05-04	2021-05-06	*Discriminant functions for Normal density.*	Same as above	PPT
Lecture 24 Module III	2021-05-06	2021-05-07	*Error bounds for Normal density.*	Same as above	PPT
Lecture 25 Module III	2021-05-07	2021-05-11	*Maximum Likelihood and Bayesian Parameter Estimation.*	Same as above	PPT
Lecture 26 Module III	2021-05-11	2021-05-13	*Principal Component Analysis.*	Same as above	PPT
Lecture 27 Module III	2021-05-13	2021-05-15	*Fisher Linear Discriminant.*	Same as above	PPT

Lecture 28 Module III	2021-05-15	2021-05-18	*Hidden Markov Models.*	Same as above	PPT
Lecture 29 Module IV	2021-05-18	2021-05-20	*Non-parametric Techniques & Feature Extraction.*	Same as above	PPT
Lecture 30 Module IV	2021-05-20	2021-05-21	*Parzen window estimation.*	Same as above	PPT
Lecture 31 Module IV	2021-05-21	2021-05-22	*k-nearest neighbour classification.*	Same as above	PPT
Lecture 32 Module IV	2021-05-22	2021-05-25	*Perceptron classifier.*	Same as above	PPT
Lecture 33 Module IV	2021-05-25	2021-05-27	*Support Vector Machines.*	Same as above	PPT
Lecture 34. Module IV	2021-05-27	2021-05-28	*Decision Tree based classifiers. Feature extraction – discrete cosine and sine transform*	Same as above	PPT
Lecture 35. Module IV	2021-05-28	2021-05-29	*Principal Component analysis, Kernel Principal Component Analysis*	Same as above	PPT

Serial No.	**Date of Plan**	**Date of Execution**	**Lecture Plan**	**Reference Book**	**Mode of Teaching**
Lecture 1 Module 1	2020-09-30	2020-10-01	*MPU {Introduction to Microprocessors and Microcontrollers and their history}*	Microprocessor Programmed Logic by Short Kenneth L. & Microprocessor Architecture by Gaonkar	PPT
Lecture 2 Module1	2020-10-01	2020-10-04	*Peripheral IO, and IO devices, and Memory interface*	Same as above	PPT
Lecture 3 Module 1	2020-10-04	2020-10-05	*Bussed Architecture, Address Bus, Data Bus, & Control Bus, Timing and Control Signals.*	Same as above	PPT
Lecture 4 Module 1	2020-10-05	2020-10-08	*Tristate Logic, and Latch*	Same as above	PPT
Lecture 5, Module I	2020-10-08	2020-10-11	*Intel 8085 Microprocessor Architecture,* Signals	Same as above + Intel 8085 Datasheet	PPT
Lecture 6 Module I	2020-10-11	2020-10-16	8085 *Addressing modes, – Instruction classification*, and *Instruction set*	Same as above	PPT
Lecture 7 Module II	2020-10-16	2020-10-18	8085 *Timing diagram.* T *states, Machine Cycles, Cycle time, Loop time*	Same as above	PPT

			determinatio n		
Lecture 8. Module II	2020-10-18	2020-10-22	8085 *Memory Mapped and Peripheral I/O*	Same as above	PPT
Lecture 9. Module II	2020-10-22	2020-10-23	8085 *ALP format program*	Same as above	PPT
Lecture 10. Module II	2020-10-23	2020-10-25	8085 *8-bit and 16-bit Operation including stack-subroutine*	Same as above	PPT
Lecture 11. Module II	2020-10-25	2020-10-26	*Interrupt Structure* of 8085 *microprocessor*	Same as above	PPT
Lecture 12. Module II	2020-10-26	2020-10-29	8085 *Processing of vectored and Non-vectored interrupts,*	Same as above	PPT
Lecture 13. Module II	2020-10-29	2020-11-01	8085 *Latency time and Response time*	Same as above	PPT
Lecture 14. Module II	2020-11-01	2020-11-02	*Handling multiple interrupts*	Same as above	PPT
Lecture 15 Module II	2020-11-02	2020-11-05	*8086 Architecture - Signals-*	Intel 8086 family Datasheet	PPT
Lecture 17 Module II	2020-11-05	2020-11-08	*8086 Pin Layout and description.*	Same as above	PPT
Lecture 18 Module II	2020-11-08	2020-11-09	*8086 Segmented Memory – EU and BIU*	Same as above	PPT
Lecture 19 Module II	2020-11-09	2020-11-12	*8086 Memory Map and Addresses,*	Same as above	PPT

			Memory Word Size		
Lecture 20 Module II	2020-11-12	2020-11-15	*8086, Instruction Set*	Same as above	PPT
Lecture 21 Module II	2020-11-15	2020-11-16	*8086 Addressing Modes with examples*	Same as above	PPT
Lecture 22 Module II	2020-11-16	2020-11-20	*Minimum and Maximum Modes of Operation-Even and Odd Memory Bank*	Same as above	PPT
Lecture 23 Module II	2020-11-20	2020-11-22	*Basic 8086 Assembly Language Programmin g*	Same as above	PPT
Lecture 24 Module III	2020-11-22	2020-11-23	*Absolute Decoding and Partial Decoding, Foldback Memory with examples used 8155 interface to 8085*	Microproces sor Architecture by Gaonkar	PPT
Lecture 25 Module III	2020-11-23	2020-11-26	*8085 interface with (PPI) Programmab le Peripheral Interface 8255*	Microproces sor Architecture by Gaonkar + Intel 8255 datasheet	PPT
Lecture 26 Module III	2020-11-26	2020-11-29	*8085 interface with (PIC) Programmab le Interrupt Controller 8259*	Microproces sor Architecture by Gaonkar + Intel 8259 datasheet	PPT
Lecture 27 Module III	2020-11-29	2020-11-30	*8085 interface with (PIT)*	Microproces sor Architecture	PPT

			Programmable interval timer 8253/4.	by Gaonkar + Intel 8253 datasheet	
Lecture 28 Module III	2020-11-30	2020-12-03	*8085 interface with Programmable DMA controller 8257*	Microprocessor Architecture by Gaonkar + Intel 8257 datasheet	PPT
Lecture 29 Module III	2020-12-03	2020-12-06	*USART 8251 and 8085 interface*	Microprocessor Architecture by Gaonkar + Intel 8251 datasheet	PPT
Lecture 30 Module III	2020-12-06	2020-12-07	*Programmable keyboard display – Interface 8279 with 8085*	Microprocessor Architecture by Gaonkar + Intel 8279 datasheet	PPT
Lecture 31 Module III	2020-12-07	2020-12-10	*ADC & DAC Interfacing*	Microprocessor Architecture by Gaonkar	PPT
Lecture 32 Module IV	2020-12-10	2020-12-13	*Architecture of 8051 Microcontroller*	Microprocessor Architecture by Gaonkar	PPT
Lecture 33 Module IV	2020-12-13	2020-12-17	*8051Signals – I/O ports Memory*	Microprocessor Architecture by Gaonkar	PPT
Lecture 34. Module IV	2020-12-17	2020-12-20	*8051 Counter Timers*	8051 Microcontroller by Mazidi & Mazidi	PPT
Lecture 35. Module IV	2020-12-20	2020-12-21	*8051 – Serial Data I/O – Interrupts*	8051 Microcontroller by Mazidi & Mazidi	PPT
Lecture 36 Module IV	2020-12-21	2020-12-24	*8051 Interfacing - Keyboard, LCD,*	8051 Microcontroller by Mazidi &	PPT

			Stepper Motor Control.	Mazidi	

PAPER NAME: INFORMATION THEORY AND CODING

PAPER CODE: ECEN 3105

NAME OF THE FACULTY: Shounak Dasgupta

DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

SESSION: 20-21

Course Outcome:

After completing this course, the students will be able to

1. Distinguish between different types of source codes.
2. Figure out equations for entropy, mutual information and channel capacity for all types of channels, utilizing their knowledge on the elements.
3. Explain and estimate the merit of various methods for generating and detecting different types of error correcting codes.
4. Formulate the basic equations of linear block codes, cyclic codes.
5. Outline the basics of convolution code, linear algebra and BCH code.
6. Develop overall understanding about different types of codes applied to both source and channel end during data transmission.

Academic Year: 20-21 **Sub:** Information Theory & Coding **Code:** ECEN 3105

Department: ECE **Stream: ECE Sec A**

Total Number of Classes: 37

Sl No	Main Topics	Sub Topics under main topic	Lecture No	Reference	Mode of Teaching
1	Introduction	Uncertainty and information,	1	Information theory, coding and cryptography - Ranjan Bose; TMH	Online/ ppt presentation
2	Information theory	Measure of information, Self and conditional Information	2		
		Average mutual information And entropy.	3,4		
		Fixed length code, Variable length code, Prefix code	5		
	Source Coding	Source coding theorem, Shannon -Fano code	6,7		
		Huffman codes.	8		
		Arithmetic code, Lempel-Ziv algorithm.	9		
3	Channels	Channel models : Discrete memory less channel, Channel matrix for different channel models- Lossless channel, Deterministic channel, Noise-less channel	10 , 11	Information theory, coding and cryptography - Ranjan Bose; TMH	Online/ ppt presentation
		Channel capacity	12		
		Information capacity, Information capacity theorem, The Shannon limit.	13		
4	Linear block codes	Introduction & properties of block codes, minimum distance	14,15	Introduction to Error Control Codes – Salvatore Gravano ; Oxford	Online/ ppt presentation
		Matrix description of linear block codes,	16		
		parity check matrix	17		
		Equivalent codes,	18		
		Decoding of a linear block code, perfect codes, Standard Array	19,20		
		Introduction , Polynomials, Division algorithm for polynomials	21	Introduction to	Online/ ppt presentation

Academic Year: 20-21 **Sub:** Information Theory & Coding **Code:** ECEN 3105

Department: ECE **Stream: ECE Sec A**

Total Number of Classes: 37

5	Cyclic codes	a method for generating cyclic codes & examples	22,23	Error Control Codes – Salvatore Gravano ; Oxford	
		a method for decoding cyclic codes (systematic)	24		
		matrix description of cyclic codes,	25		
		Golay codes	26		

6	Galois Field	Introduction, G- Field, Primitive elements, minimal polynomials	27,28	Introduction to Error Control Codes – Salvatore Gravano ; Oxford / Information and Coding - N Abramson; McGraw Hill.	Online/ ppt presentation
		generator polynomials in terms of minimal polynomials	29		
	BCH codes	Parity check polynomials in terms of minimal polynomials & examples	30		
		Examples of BCH codes.	31		
7	Graphical representation of convolution code	Tree codes, trellis codes,	31	Introduction to Error Control Codes – Salvatore Gravano ; Oxford	Online/ ppt presentation
	Encoding convolution code	Polynomial description of convolutional codes	32		
		Distance notions for convolutional codes, The generating function	33		
		Matrix representation of convolutional codes	34		
	Decoding of convolution codes	Viterbi decoder	35,36		
	Example of convolution code	Turbo codes, Turbo decoding	37		

LECTURE PLAN

Paper Name: Mathematics-I **Paper Code: MATH1101**
Module IV (*Functions of Several Variables and Multiple Integrals*)

Lectures	Topics
1st class	Recapitulation of basic definitions and idea about limit, continuity of functions of single variable. Introduction of multivariable functions, their domain, range. Knowledge of limit and continuity for functions of two variables. Related Problems.
2nd class	Determination of partial derivatives of higher orders with examples.
3rd class	Homogeneous functions and Euler's theorem and related problems up to three variables.
4th class	Jacobians, Chain Rule, Related problems solving.
5th class	More Problem solving practice.
6th class	Concept of line integrals, Graphical interpretation, Related problem solving.
7th class	Concept of Double integrals, Graphical interpretation, Related problem solving.
8th class	Green's Theorem: Statement with simple graphical explanation, Related Problem Solving.
9th class	Stoke's Theorem: Statement with simple graphical explanation , Related Problem Solving.
10th class	Gauss Divergence Theorem: Statement with simple graphical explanation Related Problem Solving.

LECTURE PLAN

Paper Name: Mathematics-I **Paper Code: MATH1101**
Module IV (*Functions of Several Variables and Multiple Integrals***)**

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LECTURE PLAN

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LECTURE PLAN

Paper Name: Mathematics-I **Paper Code: MATH1101**

Module IV (*Functions of Several Variables and Multiple Integrals***)**

Lectures	**Topics**
1st class	Recapitulation of basic definitions and idea about limit, continuity of functions of single variable. Introduction of multivariable functions, their domain, range. Knowledge of limit and continuity for functions of two variables. Related Problems.
2nd class	Determination of partial derivatives of higher orders with examples.
3rd class	Homogeneous functions and Euler's theorem and related problems up to three variables.
4th class	Jacobians, Chain Rule, Related problems solving.
5th class	More Problem solving practice.
6th class	Concept of line integrals, Graphical interpretation, Related problem solving.
7th class	Concept of Double integrals, Graphical interpretation, Related problem solving.
8th class	Green's Theorem: Statement with simple graphical explanation, Related Problem Solving.
9th class	Stoke's Theorem: Statement with simple graphical explanation , Related Problem Solving.
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Lesson Plan-PHYS-1001

Module-2 (12 lectures)

Oscillatory motion (4 lectures)

Lecture-1 : Effect of damping force on free oscillation : Large, Critical and Weak damping.

Lecture-2 : Force oscillation and resonance.

Lecture-3 : Power transfer and electromechanical analogy.

Lecture-4 : Classical wave equation. Problems and Solutions.

Optics (3 lectures)

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Lecture-1 : Characteristics of Laser. Spontaneous and stimulated emission of radiation. Metastable states.

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Lecture-3 : Types of LASERS and their applications.

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Lecture-3 : Stokes theorem and Ampere's law. Applications

Lecture -4 : Magnetic moment and magnetic field due to a dipole.

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Lecture-6 : Problems and solutions.

Magnetostatics in a linear magnetic medium (3 lectures)

Lecture-1 : Magnetization and the concept of bound current.

Lecture-2 : The relation between B and H and classification of Magnetic material. The Hysteresis loop.

Lecture_3 : Curie Weiss Law. Problems and solutions.

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HERITAGE INSTITUTE OF TECHNOLOGY

Department of ChE

B.Tech 1st Year 1st Semester, Session 2021-22

Subject: Workshop/Manufacturing Practices (P)

Lesson Plan

Sl. No.	Lab to be conducted	Remarks
1. 25.10.21	Fittings	Done
2. 08.11.21	Pattern making	Done
3. 15.11.21	Foundry and Casting	Done
4. 22.11.21	Lathe	
5. 29.11.21	Shaper and Milling	
6. 06.12.21	MMA Welding	
7. 13.12.21	Sheet Metal and Brazing	
8. 20.12.21	Viva	

LESSON PLAN

SOIL MECHANICS – I (CIVL 2102)

Contacts: 3L + 1T
Credits: 4

by Dr. Subha Sankar Chowdhury

Day	Module	Lecture	Topics covered
1	III	2L	Capillary pressure, pore water pressure
2	III	1L + 1T	Total stress and effective stress under different conditions and flow through soil
3	III	2L	Critical hydraulic gradient and quick sand condition
4	III	1L + 1T	Introduction to permeability, Darcy’s law, coefficient of permeability
5	III	2L	Discharge and seepage velocity, factors affecting permeability
6	III	1L + 1T	Determination of coefficient of permeability by different methods, constant head and falling head methods.
7	III	2L	Permeability of stratified deposits
8	III	1L + 1T	Field determination of permeability – unconfined and confined aquifers
9	III	2L	Introduction to seepage flow, seepage pressure, two dimensional flow, flow net, Laplace equation, continuity equation
10	III	1L + 1T	Properties and use of flow net, flow through earthen dams, estimation of seepage quantity.
11	III	2L	Piping, heaving, uplift due to seepage, design of filters.
12	IV	1L + 1T	Introduction to stress distribution in soil, Boussinesq’s equation, Westergaard’s equation.
13	IV	2L	Determination of vertical stress due to point load, line load and strip load
14	IV	1L + 1T	Determination of vertical stress beneath corner of a rectangular area, Equivalent point load method, 2:1 distribution method
15	IV	2L	Newmark’s influence chart
16	IV	1L + 1T	Contact pressure and settlement distribution for flexible and rigid footings located at the surface

LESSON PLAN

SOIL MECHANICS – I (CIVL 2102)

Contacts: 3L + 1T
Credits: 4

by Dr. Subha Sankar Chowdhury

Day	Module	Lecture	Topics covered
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16	IV	1L + 1T	Contact pressure and settlement distribution for flexible and rigid footings located at the surface

HERITAGE INSTITUTE OF TECHNOLOGY

Department of CSE A1

B.Tech 1st Year 1st Semester, Session 2021-22

Subject: Engineering Drawing and Design (P)

Lesson Plan

Sl. No.	Theory to be covered	Remarks
1. 28.10.21	Projection of Point	Done
2. 11.11.21	Projection of Line- 1	Done
3. 18.11.21	Projection of Line- 2	
4. 25.11.21	Projection of Surface	
5. 02.12.21	Projection of Solid- 1	
6. 09.12.21	Projection of Solid- 2	
7. 16.12.21	Projection of Solid Section	
8. 23.12.21	Test	

****Lesson Plan/ HMTS 1061/ Professional Communication Lab/ Koyel Mallick Session: Odd Semester 2021**

Class No.	Topics	Important dates for Assessment	Activity Description
		Mon/ CSE-A/ Gr.2	**#Missing assessments = missing opportunity for (upgradation + scores)**
1	**Introduction to course. Introduction to Phonetic Symbols and Practice Worksheet.**	**Oct 25th 2021**	We learn about Phonemes and practice the various sounds in English language. Symbols to be memorized.
2	**Learning Transcription and Assessment (Phonetic Symbols and word Transcription) : 20m**	**Nov 1st**	Assessment on Phonetic Transcription and identifying phonetic symbols.
3	**Introduction to Stress, Intonation, Rhythm**	**Nov 8th**	We learn on intonation by looking at words and how they change meaning with the shift in emphasis on them, as you speak.
4	**Techniques for Effective Speaking: Voice Modulation and Assessment (Prepared Speech) : 10m**	**Nov 15th**	You shall prepare and deliver on the following topic in the class by applying discussed techniques of Effective Speaking. **Topic**: Why I want to be an Engineer? (2 min maximum time for speech) Individual Assessment
5	**Introduction to Communication: Encoding, Verbal and Non-Verbal. Focus: Verbal Symbols**	**Nov 22nd**	We learn on relevance of Verbal communication and practice on encoding messages.
6	**Focus: Non-Verbal Symbols Assessment (Role Play) : 10m**	**Nov 29th**	Teacher identifies teams to prepare and participate in a role play session selecting from given topics. (Group Assessment) (Topics & teams shall be posted in Classroom by Nov 15th 2021)
7	**Introduction to Group Discussion: Strategies and Mock GD**	**Dec 6th**	We discuss strategies for group discussion, and practice with sample topics in class hour.
8	**Final GD : 20m**	**Dec 13th**	***Group Discussion Teams, details shall be posted in Classroom by 6th Dec 2021. GD topics will be announced on-spot.**
9	**Introduction to Presentation Skills**	**Dec 20th**	***Topics and team details for PPT (Continuous Assessment) to be posted in Classroom shortly.**
10	**Mock Presentation**	**TBA (To be Announced)**	Every identified team presents within allocated time, gets feedback.
11	**PPT Presentation (Continuous)**	**TBA**	Corrected PPTs are again presented incorporating feedback.
12	**Final PPT Assessment End Semester :40m**	**TBA**	***Fresh topics and teams, details for PPT (Final Assessment) to be posted in Classroom shortly.** End Semester Final Practical dates will be announced by College.

Continuous Assessment (40m) + Final Assessment (60m) = 100 Total
[Continuous Assessment = 20m (Phonetic Symbols) + 10m (Prepared Speech) + 10m (Role Play) = 40m
Final Assessment = 20m (Group Discussion) + 40m (PPT Final) = 60m]

****Revisions (if any) in lesson plan shall be intimated accordingly.**

Day	Topic	Date MON	Date THU
day 1	matrix	4.10	7.10
day 2	Matrix	25.10	28.10
day 3	Poly add	1.11	28.10
day 4	Single LL	8.11	11.11
day 5	Circular and Doubly	15.11	18.11
day 6	Stack with Array and LL	22.11	25.11
day 7	Queue with array and LL	29.11	2.12
day 8	Circular Queue and deque	6.12	9.12
day 9	BST	13.12	16.12
day 10	Searching	20.12	13.01
day 11	Sorting	10.01	20.01
day 12	Graph Algo	17.01	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Engineering Mechanics   Paper Code: MECH 2101

Lecture Plan

ME 2nd year (ME A) Odd 2021-22

Lecture No.	Date	Chapter/ Module	Topics to be covered	Remarks
1	**4.10.21**	**4**	• Introduction to dynamics: Kinematics & kinetics; • Types of motion of particles & motion curves • Rectilinear motion of particles with i. uniform acceleration ii. non – uniform acceleration • Problems	**Done**
2	**5.10.21**	**4**	• Law of gravitation and acceleration due to gravity • Problems , 10.4, 10.15	**Done**
3	**25.10.21**	**4**	• Plane curvilinear motion of particles i. Rectangular components ii. Normal and Tangential components • Projectile Motion-1: Nomenclature	**Done**
4	**26.10.21**	**4**	• Projectile Motion-2 i. Time of flight ii. Height iii. Range of projectile	**Done**
5	**27.10.21**	**4**	• Problems of projectile: 2/62, 2/67, 2/72 • Problems of relative velocity: 2/190, 2/192	**Done**
6	**29.10.21**	**3**	• Centre of gravity; Centre of mass & centroid; • Centroid of circle and rectangle	**Done**
7	**1.11.21**	**3**	• Centroid of an arc, circular sector • Centroid of plane areas – triangle, circular sector, quadrilateral	**Done**
8	**2.11.21**	**3**	• Composite area consisting of above figures (with problems)	**Done**
9	**3.11.21**	**3**	• Theorem of Pappus • Problem on Pappus	**Done**
10	**8.11.21**	**3**	• Area moment of inertia • Moment of inertia of a plane figure; • Polar moment of inertia of a plane figure;	**Done**
11	**9.11.21**	**3**	• Radius of gyration • Parallel axes theorem. • Problems	**Done**
12	**10.11.21**		• Moment of Inertia of composite figures (with problems)	**Done**
13	**15.11.21**		• Free body diagram i. Reactions from different types of supports ii. Steps for Drawing a FBD	**Done**

			iii. Sample of free body diagram	
14	**16.11.21**		• Equilibrium of Rigid Bodies i. Types of problems under equilibrium ii. Basic equation of equilibrium iii. Concept and equilibrium of forces in two dimensions • Problems on 2D force equilibrium	**Done**
			• Online quiz on 2D force equilibrium	
15	**17.11.21**		• Equilibrium of three concurrent forces - Lami's theorem. • Statically determinant or indeterminate problem.	**Done**
			• Online quiz on equilibrium	
16	**22.11.21**		• Friction (Jana) i. Concept of friction ii. Types of friction iii. Mechanics of friction iv. Laws of Coulomb's friction	**Done**
			• Coefficient of friction i. Static and kinetic • Angle of repose • Friction cone • Problem on friction	**Done**
17	**23.11.21** **24.11.21**		• Friction on Wages • Problems on wages	**Done**
18	**29.11.21**		• Kinetics on particles i. Newtons 2^{nd} Laws of motion ii. D'Alembert principle • Problems of FBD with D'Alembert principle	
19	**30.11.21**		• Work done and Energy: Principle of conservation of energy	
20	**1.12.21**		• Impulse momentum theory: Conservation of momentum theory •	
21	**6.12.21**		• Problems on equilibrium	
22	**7.12.21**		• Problems on frictional force	
23	**8.12.21**		• Problems on D'Alembert principle	
24	**13.12.21**		• Problems on FBD	
25	**14.12.21**		• MCQ practice	
27	**15.12.21**		• General Discussion	
	20.12.21		•	

28	**21.12.21**		•	
29	**22.12.21**		•	
30	**27.12.21**		•	
31	**28.12.21**		•	
			•	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Fluid Mechanics & Hydraulics   Paper Code: MECH 2102

Lecture Plan

ME 2nd year (ME B) Odd 2021-22

Sl. No.	Lecture No./Date	Chapter/ Module	Topics to be covered	Remarks
1	**7.10.21**	**1**	• Definition of fluid and importance of fluid mechanics; • Concept of Continuum;	**Done**
2	**27.10.21**	**1**	• Fluid properties- density, specific weight, specific volume, specific gravity. • No-slip condition • Viscosity: definition, causes of viscosity, Newton's law of viscosity	**Done**
3	**28.10.21**	**1**	• Variation of viscosity with temperature. • Dimensional formula and units of viscosity. • Kinematic viscosity; • Problems on viscosity. 1.3, 1.4, 1.10	**Done**
4	**3.11.21**	**1**	• Newtonian and Non-Newtonian fluids with Rheology diagram. • Compressibility and Bulk modulus of elasticity. • Difference between compressible and incompressible fluids. • Problem on viscosity. 1.13, 1.18	**Done**
		1	• MCQ on Fluid Properties	**Done**
5	**10.11.21**	**1**	• Fluid statics: Pascal's Law-statement and proof; • Basic Hydrostatic Law and its proof. • Problem 2.3 2.4	**Done**
6	**11.11.21**	**1**	• Variation of pressure with depth in incompressible fluid. • Unit and scales of pressure measurement. • Problems 2.7 2.10	**Done**
7	**17.11.21**	**1**	• Measurement of fluid pressure: i. Piezometer ii. Simple U-tube manometer iii. Differential U-tube manometer • Characteristics and choice of manometric fluid. • Problems 2.12, 2.21	**Done**
8	**17.11.21**	**1**	• Measurement of fluid pressure: iv. Inverted tube manometer, v. Inclined tube manometer. • Problems 2.22	**Done**
9		**1**	• Complex Problem on Manometer 2.29, 2.30	
10	**18.11.21**	**2**	• Hydrostatic thrust on submerged plane-1 i. Horizontally immersed ii. Vertically immersed • Problems 3.2, 3.4	**Done**
11	**24.11.21**	**2**	• Hydrostatic thrust on submerged plane-2 i. Inclined planes	**Done**

			• Problems 3.19, 3.34	
12	**25.11.21**	**2**	• Hydrostatic thrust on submerged plane-3 i. Curved surfaces • Problems 3.34 ; 3.23 • Problems 3.19	**Done**
13	**1.12.21**	**2**	• Buoyancy • Principle of floatation • Problems 4.1, 4.3 , 4.4	
14	**2.12.21**	**2**	• Stability of submerged and floating bodies • Metacentric height (GM) • Problems 4.7, 4.10	
15	**8.12.21**	**4**	• Application of linear momentum to control volume-linear momentum equation analysis of force exerted by a fluid stream on a solid boundary i. thrust on pipe bends • Problems 6.29, 6.30	
16	**9.12.21**	**4**	• Dimensional analysis i. Use & Advantage ii. Dimensions iii. Dimensional Homogeneity • Rayleigh's method • Problems 7.4, 7.5	
17	**15.12.21**	**4**	• Buckingham Pi theorem. • Problems 7.8, 7.9	
18	**16.12.21**		• General Discussion	

Lesson Plan-PHYS-2111

Module 3 (12 Lectures)

Crystal physics (12 Lectures)

Lecture 1: Review of Symmetries in solid.

Lecture 2: Two dimensional and three dimensional Bravias lattices.

Lecture 3: Millers indices.

Lecture 4: X-ray Diffraction: Brags law, Laue's equation.

Lecture 5: Problems and solutions.

Lecture 6: Reciprocal lattice.

Lecture 7: Concept of Brillion Zone, Ewald construction.

Lecture 8: Structure factor.

Lecture 9: Problems and solutions.

Lecture 10: Imperfections due to point defects, Energy of formation of vacancy.

Lecture 11: Number of vacancies at any temperature, equilibrium concentration of of Schottky and Frenkel defects in ionic crystal , Colour center, Exciton.

Lecture 12: Problem and solutions.

Module 4 (12 Lectures)

Physics of solids (6 Lectures)

Lecture 1: Bonding energy of ionic crystal.

Lecture 2: Vibrations of monoatomic linear lattice.

Lecture 3: One dimensional diatomic lattice.

Lecture 4: , Concept of phonons, Inelastic scattering of photons and phonons.

Lecture 5: Problems and solutions.

Lecture 6: Einstein and Debye theory of specific heat.

Band theory of solids (6 Lectures)

Lecture 1: Fermi Dirac distribution and its application in metal and semiconductor.

Lecture 2: Bloch theorem.

Lecture 3: Kronig-Penny model (qualitative treatment).

Lecture 4: Origin of energy band formation in solids.

Lecture 5: Classification of materials into conductors, Semi conductors & Insulators. Concept of effective mass of an electron and hole.

Lecture 6: Problems and solutions.

Lesson Plan-PHYS-2211

Module 3 (12 Lectures)

Crystal physics (12 Lectures)

Lecture 1: Review of Symmetries in solid.

Lecture 2: Two dimensional and three dimensional Bravias lattices.

Lecture 3: Millers indices.

Lecture 4: X-ray Diffraction: Brags law, Laue's equation.

Lecture 5: Problems and solutions.

Lecture 6: Reciprocal lattice.

Lecture 7: Concept of Brillion Zone, Ewald construction.

Lecture 8: Structure factor.

Lecture 9: Problems and solutions.

Lecture 10: Imperfections due to point defects, Energy of formation of vacancy.

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Lecture 12: Problem and solutions.

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Lecture 5: Classification of materials into conductors, Semi conductors & Insulators. Concept of effective mass of an electron and hole.

Lecture 6: Problems and solutions.

	Module	Topic	Estimated	Tentative	Actual
Module I	Introduction	Why do we need data structure? Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type; Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – Big Oh, Omega, Theta, notations.	2L	7/10/2021	
	Array	Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials.	2L	27/10, 28/10	
	Linked list	Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.	4L	3/11,10/11 ,11/11	
Module II					
	Stack and Queue	Stack and its implementations (using array, using linked list),Application	2L	17/11	
		Queue, circular queue, deque.Implementation of queue- both linear and circular (using array, using linked list), applications	3L	18/11,24/1 1	
		Implementation of dequewith input and output restriction	1L	1/12,	
		Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle (Concept of Backtracking)	2L	25/11	
Module III					
	Tree	Basic terminologies, forest, tree representation (using array, using linked list).	1L	2/12,	
		Binary trees - binary tree traversal(pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree	4L	8/12,9/12	
		Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only).	3L	15/12,16/1 2	
		B- Trees – operations (insertion, deletion with examples only)	1L	16/12	

	Graph	Graph definitions and Basic concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree,cut vertex/articulation point, complete graph, simple path, simple cycle).	1L	1-Dec	
		Graph representations/storage implementations –adjacency matrix, adjacency list, Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) –concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, forward-edge), applications	3L	13/01, 19/01	

LESSON PLAN WITH DATES AND CLOSURE REPORT

Paper Name: Engineering Graphics & Design

Department – CSE C1(Practical class)

Paper Code: MECH-1052

Name of Faculty: Ranojit Banerjee

Lecture No./Date	List of Experiment	Remarks
29-10-2021	Introduction	Online class
12-11-2021	Projection of points	-do-
	Projection of lines	-do-
	Projection of lines	-do-
	Projection of lines	-do-
	Projection of Surfaces	This part will not be covered for this semester
	Projection of solids	
	Projection of solids	
	Section of solids	
	Section of solids	
	Viva	

LESSON PLAN WITH DATES AND CLOSURE REPORT

Paper Name: Dynamics of Machine Lab **Paper Code: MECH-3211**

Name of Faculty: Ranojit Banerjee

Lecture No./Date	List of Experiment	Remarks
1. **29-10-2021**	To study and design of the following Mechanism • Four Bar Mechanism • Slider Crank Mechanism • Crank and Slotted Lever Mechanism • Whitworth Quick Return Mechanism	
2. **12-11-2021**	1. Measurement of time period and the use of a simple pendulum 2. Measurement of time period and the use of a compound pendulum	
	1. To determine the natural frequency of un-damped torsional vibration of a single rotor shaft system. 2. To determine the radius of gyration of given bar by using bifilar suspension	
To be covered in the practical classes.	Experiments on working of gyroscope, operation and analysis 1. To find the gyroscopic couple 2. To find the gyroscopic effect and relative direction of different gyroscopic motions	
	To perform experiment on Watt and Porter Governors to prepare performance characteristic Curves, and to find stability & sensitivity.	
	To perform experiment on Hartnell Governor to prepare performance characteristic Curves, and to find stability & sensitivity	
	Designing cam and Studying operation of cams and its analysis	
	Static and Dynamic Balancing of a shaft	
	Static and Dynamic Balancing of a shaft	
(This is not covered in the current semester)	Experiment on Free Damped Torsional oscillation Experiment on Forced Damped Vibration	**(This is not covered in the current semester)**

Lesson plan PHYS-1001

Module-I

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Lecture-2:Directional derivative of a scalar field and notion of gradient. Equipotential surfaces. Surface integral and Divergence. Gauss theorem. Sourse, sink, solenoidal field. Problems and solutions.

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Module-III

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Lecture-2: Calculation of electric fields and potential for discrete and continuous charge distribution (continued)

Lecture-3: Boundary-value problems in one dimension.-Laplace and Poisson's equation(Cartesian system).

Lecture-4: Boundary value problem (spherical polar and cylindrical system).

Lecture-5: Method of images. (point charge before a plane).

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LESSON PLAN (MECH 4281)				
Lecture No.	**Date**	**Module**	**Topics to be covered**	**Remarks**
1	19-03-2021	1	Introduction	
2	26-03-2021		Load Unitization	
3	02-04-2021		**HOLIDAY**	**GOOD FRIDAY**
4	09-04-2021		Classification of MH equipment	
5	16-04-2021	4	Introduction of Trucks and Vehicles	
6	23-04-2021		Constructional features and use of wheeled hand truck, hand pallet truck and fork lift truck	
7	30-04-2021		Specifications, capacity rating and attachments of fork lift truck	
8	07-05-2021		FLT batteries	
9	14-05-2021		Doubt clearance	
10	21-05-2021		Quiz 1	
11	28-05-2021		Quiz 2	

B. Tech. in Applied Electronics and Instrumentation Engineering (AEIE)
2nd Year – 1st Semester

Subject Name: Material Science and Technology					
Paper Code: AEIE2111					
Contact hrs per	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

Module	**Topic**	**Lecture Allotments**
I	Introduction, properties of materials, classification of materials	2
	Advanced materials, future materials and modern materials	1
	Atomic structure, atomic bonding in solids, crystal structures, crystalline and non-crystalline materials, Miller indices, anisotropic elasticity	3
	Elastic behavior of composites, structure and properties of polymers, structure and properties of ceramics	2
	Electrical conduction, semi conductivity, super conductivity, electrical conduction in ionic ceramics and in polymers, dielectric behavior, ferroelectricity, piezoelectricity	1
	Heat capacity, thermal expansion, thermal conductivity, thermal stresses	1
	Diamagnetism and paramagnetism, ferromagnetism, anti-ferromagnetism and ferrimagnetism. Influence of temperature on magnetic behavior	1
	Optical properties of metals, optical properties of nonmetals, application of optical phenomena	1
II	Point defects, theoretical yield point, line defects and dislocations, interfacial defects, bulk or volume defects.	2
	Elastic deformation, plastic deformation, Interpretation of tensile stress-strain curves yielding under multi-axial stress	2
	Yield criteria and macroscopic aspects of plastic deformation, property variability and design factors	1
	Diffusion mechanisms, steady and non-steady state diffusion, factors that influence diffusion, non-equilibrium transformation and microstructure	2
	Dislocation and plastic deformation	1
	Mechanisms of strengthening in metals, recovery, recrystallization and grain growth, strengthening by second phase particles, optimum distribution of particles, lattice resistance to dislocation motion	2
III	Equilibrium phase diagrams, particle strengthening by precipitation, precipitation reactions, kinetics of nucleation and growth	2
	The iron-carbon system, Phase transformations, transformation rate effects and TTT diagrams, microstructure and property changes in iron-carbon system	2
	Fracture, ductile and brittle fracture, fracture mechanics	2
	Impact fracture, ductile brittle transition, fatigue	1
	Crack initiation and propagation, crack propagation rate, creep, generalized creep behavior, stress and temperature effects	2
IV	Types of metals and alloys, fabrication of metals, thermal processing of metals, heat treatment, precipitation hardening.	2
	Types and applications of ceramics, fabrication and processing of ceramics.	1
	Mechanical behavior of polymers, mechanisms of deformation and strengthening of polymers, crystallization, melting & glass transition, polymer types, polymer synthesis & processing.	2
	Particle reinforced composites, fiber reinforced composites, structural composites.	1
	Corrosion of metals, corrosion of ceramics, degradation of polymers.	1
	Economic considerations, environmental and societal considerations, recycling issues, life cycle analysis and its use in design.	2
Total		40

B. Tech. in Applied Electronics and Instrumentation Engineering (AEIE)
2^{nd} Year – 2nd Semester

Subject Name: Electrical and Electronic Measurements					
Paper Code: AEIE2203					
Contact hrs per	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

Module	Topic	Lecture Allotments
I	Static and dynamic characteristics of instruments: accuracy, sensitivity, repeatability, precision, drift, hysteresis, threshold, resolution, fidelity, speed of response.	2
	Classification of analog instruments, types of torques in indicating instruments	1
	Construction and principle of operation of permanent magnet moving coil type instruments	1
	Construction and principle of operation of moving iron type instruments	1
	Construction and principle of operation of dynamometer type instruments	1
	Construction and principle of operation of electrostatic type instruments	1
	Extension of instrument ranges using shunts and multipliers	1
	Introduction to instrument transformers: current transformer and potential transformer.	2
	Measurement of energy by single phase induction type meter	1
II	Measurement of medium resistance: ammeter-voltmeter methods, substitution method, Wheatstone bridge method; measurement of low resistance by Kelvin double bridge; 4-terminal resistance.	2
	Measurement of high resistance: direct deflection method, loss of charge method, megger	2
	Measurement of self-inductance: Maxwell's inductance bridge, Maxwell's inductance-capacitance bridge, Anderson's bridge;	2
	Measurement of capacitance: DeSauty's bridge, Schering bridge; Measurement of frequency by Wien's bridge.	2
	Localization of cable faults using Murray and Varley loop methods.	1
III	Voltage controlled oscillator, phase locked loop, applications	1
	Basic emitter follower voltmeter, DC and AC voltmeters with operational amplifiers	3
	True rms voltmeter, chopper stabilized amplifiers for measurement of very low voltage.	1
	Cathode ray oscilloscope: cathode ray tube, sweep generator, oscilloscope automatic time base, waveform display, ,	3
	Dual-trace oscilloscopes	1
	Oscilloscope probes, applications	1
IV	Digital voltmeters: characteristics, types- ramp type, dual slope integrating type, successive approximation type, microprocessor-based ramp type	3
	Basic digital displays, LEDs and LCD panels, display drivers; time base generation with crystal oscillators and dividers.	2
	Design and implementation of a simple digital frequency meter, errors in frequency measurement possible remedies, pulse time period and width measurement, frequency ratio measurement.	3
	Q meter: basic circuit, series connection method, parallel connection method, sources of errors.	2
Total		40

B. Tech. in Applied Electronics and Instrumentation Engineering (AEIE)
3rd Year – 1st Semester

Subject Name: Communication Techniques					
Paper Code: AEIE3131					
Contact hrs per	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

Module	Topic	Lecture Allotments
I	Introduction to Communication Process: elements of communication systems (mention of transmitter, receiver and channel), modulation, analog vs digital; origin of noise and its effect, importance of SNR in system design	2
	amplitude modulation (AM), envelop detection, limitations of AM, DSB-SC modulation, coherent detection, SSB and VSB modulations	3
	angle modulation, phase modulation, frequency modulation, narrowband FM, generation of FM, detection of FM, Phased locked Loop	3
	frequency division multiplexing technique	1
II	Digital Modulation Techniques: Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques, Geometrical representation, generation, detection, error probability and power spectra of basic digital carrier modulation techniques: ASK, PSK and FSK	3
	Concept of QAM and M-ary Communication, M-ary phase shift keying, average probability of symbol error for coherent M-ary PSK, power spectra of MPSK, Quadrature Phase Shift Keying (QPSK), Generation, detection, error probability and power spectra of QPSK signal	3
	Offset Quadrature Phase Shift Queuing (OQPSK), Minimum Shift Keying (MSK), signal constellation of MSK waveforms, error probability of MSK signal, Gaussian Minimum Shift Keying: GMSK	2
	Basic Concept of OFDM and Spread Spectrum Modulation	2
III	Pulse Modulation: sampling process, PAM, PPM & PWM, time division multiplexing technique	2
	quantization process, quantization noise, PCM encoding and decoding, Polar/Unipolar/Bipolar NRZ and RZ, Manchester	2
	error control codes: ARQ, Hamming codes	1
	differential pulse code modulation, delta modulation, delta-sigma modulation	1
	matched filter, properties of matched filter, ISI, distortion-less baseband binary transmission, raised cosine spectrum, equalization	2
IV	Cellular Mobile Wireless Networks: Systems and Design Fundamentals: Brief introduction to mobile wireless communication and systems	1
	Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering	1
	Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes Fixed channel, Dynamic channel and Hybrid channel	2
	mobility management location management and handoff management, handoff process, different types of handoffs.	1
	Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols IEEE 802.11 standards	1
	WLAN family, WLAN transmission technology, WLAN system architecture, WLAN applications	2
	Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA)	1
Total		36

B. Tech. in Applied Electronics and Instrumentation Engineering (AEIE)
2^{nd} Year – 1st Semester

Subject Name: Material Science and Technology					
Paper Code: AEIE2111					
Contact hrs per	**L**	**T**	**P**	**Total**	**Credit points**
	4	**0**	**0**	**4**	**4**

Module	**Topic**	**Lecture Allotments**
I	Introduction, properties of materials, classification of materials	2
	Advanced materials, future materials and modern materials	1
	Atomic structure, atomic bonding in solids, crystal structures, crystalline and non-crystalline materials, Miller indices, anisotropic elasticity	3
	Elastic behavior of composites, structure and properties of polymers, structure and properties of ceramics	2
	Electrical conduction, semi conductivity, super conductivity, electrical conduction in ionic ceramics and in polymers, dielectric behavior, ferroelectricity, piezoelectricity	1
	Heat capacity, thermal expansion, thermal conductivity, thermal stresses	1
	Diamagnetism and paramagnetism, ferromagnetism, anti-ferromagnetism and ferrimagnetism. Influence of temperature on magnetic behavior	1
	Optical properties of metals, optical properties of nonmetals, application of optical phenomena	1
II	Point defects, theoretical yield point, line defects and dislocations, interfacial defects, bulk or volume defects.	2
	Elastic deformation, plastic deformation, Interpretation of tensile stress-strain curves yielding under multi-axial stress	2
	Yield criteria and macroscopic aspects of plastic deformation, property variability and design factors	1
	Diffusion mechanisms, steady and non-steady state diffusion, factors that influence diffusion, non-equilibrium transformation and microstructure	2
	Dislocation and plastic deformation	1
	Mechanisms of strengthening in metals, recovery, recrystallization and grain growth, strengthening by second phase particles, optimum distribution of particles, lattice resistance to dislocation motion	2
III	Equilibrium phase diagrams, particle strengthening by precipitation, precipitation reactions, kinetics of nucleation and growth	2
	The iron-carbon system, Phase transformations, transformation rate effects and TTT diagrams, microstructure and property changes in iron-carbon system	2
	Fracture, ductile and brittle fracture, fracture mechanics	2
	Impact fracture, ductile brittle transition, fatigue	1
	Crack initiation and propagation, crack propagation rate, creep, generalized creep behavior, stress and temperature effects	2
IV	Types of metals and alloys, fabrication of metals, thermal processing of metals, heat treatment, precipitation hardening.	2
	Types and applications of ceramics, fabrication and processing of ceramics.	1
	Mechanical behavior of polymers, mechanisms of deformation and strengthening of polymers, crystallization, melting & glass transition, polymer types, polymer synthesis & processing.	2
	Particle reinforced composites, fiber reinforced composites, structural composites.	1
	Corrosion of metals, corrosion of ceramics, degradation of polymers.	1
	Economic considerations, environmental and societal considerations, recycling issues, life cycle analysis and its use in design.	2
Total		40

B. Tech. in Applied Electronics and Instrumentation Engineering (AEIE)
3rd Year – 1st Semester

Subject Name: Communication Techniques					
Paper Code: AEIE3131					
Contact hrs per	**L**	**T**	**P**	**Total**	**Credit points**
	3	**0**	**0**	**3**	**3**

Module	**Topic**	**Lecture Allotments**
I	Introduction to Communication Process: elements of communication systems (mention of transmitter, receiver and channel), modulation, analog vs digital; origin of noise and its effect, importance of SNR in system design	2
	amplitude modulation (AM), envelop detection, limitations of AM, DSB-SC modulation, coherent detection, SSB and VSB modulations	3
	angle modulation, phase modulation, frequency modulation, narrowband FM, generation of FM, detection of FM, Phased locked Loop	3
	frequency division multiplexing technique	1
II	Digital Modulation Techniques: Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques, Geometrical representation, generation, detection, error probability and power spectra of basic digital carrier modulation techniques: ASK, PSK and FSK	3
	Concept of QAM and M-ary Communication, M-ary phase shift keying, average probability of symbol error for coherent M-ary PSK, power spectra of MPSK, Quadrature Phase Shift Keying (QPSK), Generation, detection, error probability and power spectra of QPSK signal	3
	Offset Quadrature Phase Shift Queuing (OQPSK), Minimum Shift Keying (MSK), signal constellation of MSK waveforms, error probability of MSK signal, Gaussian Minimum Shift Keying: GMSK	2
	Basic Concept of OFDM and Spread Spectrum Modulation	2
III	Pulse Modulation: sampling process, PAM, PPM & PWM, time division multiplexing technique	2
	quantization process, quantization noise, PCM encoding and decoding, Polar/Unipolar/Bipolar NRZ and RZ, Manchester	2
	error control codes: ARQ, Hamming codes	1
	differential pulse code modulation, delta modulation, delta-sigma modulation	1
	matched filter, properties of matched filter, ISI, distortion-less baseband binary transmission, raised cosine spectrum, equalization	2
IV	Cellular Mobile Wireless Networks: Systems and Design Fundamentals: Brief introduction to mobile wireless communication and systems	1
	Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering	1
	Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes Fixed channel, Dynamic channel and Hybrid channel	2
	mobility management location management and handoff management, handoff process, different types of handoffs.	1
	Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols IEEE 802.11 standards	1
	WLAN family, WLAN transmission technology, WLAN system architecture, WLAN applications	2
	Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA)	1
Total		36

HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107

Department of Applied Electronics and Instrumentation Engineering

Lesson Plan

Course Name: Analytical Instrumentation **Course Code:** AEIE4131

Program: B. Tech **Semester:** 7^{th} **Session:** 2021-22

Total number of Lectures available in the session: 36

Faculty Name: Dr. Anil Kumar Bag

Course Outcomes (COs):	After the completion of the course students will be able to: 1. Gain knowledge about gas analyzers. 2. Apply the liquid analysis techniques for analyzing liquids. 3. Acquire knowledge of UV, IR, X-ray and atomic mass spectroscopy. 4. Learn different chromatographic separation method used in industry and research purpose. 5. Select instrument for a particular analysis with some idea of its merits, demerits and limitations. 6. Learn operation of analytical tools that are used in hospitals for clinical analysis, drugs and pharmaceutical laboratories and above all for environmental pollution monitoring.

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	Introduction to analytical instrumentation: classification, types of instrumental methods.	Lecturer PPT	Learn qualitative and quantitative analysis, sampling process	Understand, remember	1	1	Quiz, Class test

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	Gas analysis: thermal conductivity method,	Lecturer PPT, E-books, NPTEL video lectures	Demonstrate TCD	Understand, apply	1	2	Assignment, Class test, Semester Exam
I	Heat of reaction method.	Lecturer PPT, E-books, NPTEL video lectures	Operation of Heat of reaction method.	Remember. understand	1	1	Assignment, Class test, Semester Exam
I	Flue gas analyzers: Oxygen analysis-magneto dynamic instrument (Pauling cell),	Lecturer PPT, E-books, NPTEL video lectures	Apply O2 analyser	Understand, apply	1,5	1	Assignment, Class test, Semester Exam
I	Thermo magnetic type or hot wire type instrument	Lecturer PPT, E-books, NPTEL video lectures	Apply pouling cell analyser	Remember. Understand	1,5	1	Assignment, Class test, Semester Exam
I	Zirconia oxygen analyzer	Lecturer PPT, E-books, NPTEL video lectures	Apply Zirconia oxygen analyzer	Understand, apply and evaluate	1,5	1	Assignment, Class test, Semester Exam
II	NOx, Cox, SOX analyzer	Lecturer PPT, E-books, NPTEL video lectures	Apply best analyser for pollutant measurement.	Understand, remember, apply, evaluate	1,6	1	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
II	Electrodes-ion Selective, Molecular-Selective Electrode Systems	Lecturer PPT, E-books, NPTEL video lectures	Analyse ISFET	Understand, analyse	2	2	Assignment, Class test, Semester Exam
II	Electrochemical Cells	Lecturer PPT, E-books, NPTEL video lectures	Operation of electrochemical cell	Understand	2	1	Assignment, Class test, Semester Exam
II	Working of pH Electrode	Lecturer PPT, E-books, NPTEL video lectures	Apply pH electrode.	Understand, Learn and apply	2	2	Assignment, Class test, Semester Exam
II	Conductivity Cells, Total Dissolved Solids (TDS)	Lecturer PPT, E-books, NPTEL video lectures	Apply conductivity analyser	Understand, Learn and apply	2	2	Assignment, Class test, Semester Exam
II	Voltametry and Polarography	Lecturer PPT, E-books, NPTEL video lectures	Analyse voltamogram in various field.	Understand, apply, analyze	2,6	2	Assignment, Class test, Semester Exam
III	Electromagnetic radiation, Beer-Lambert law, colorimeters	Lecturer PPT, E-books, NPTEL video lectures	Learn absorption spectroscopy	Understand,	3	2	Assignment, Class test, Semester Exam
III	UV-Visible spectrophotometers : single and double	Lecturer PPT, E-books, NPTEL	Apply UV-Visible spectrometer	Understand, apply, analyse	3	1	Assignment, Class test, Semester

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
	beam instruments, sources and detectors	video lectures					Exam
III	IR spectrophotometers : types	Lecturer PPT, E-books, NPTEL video lectures	Apply IR spectrometer	Understand, apply, evaluate	3,6	1	Assignment, Class test, Semester Exam
III	FTIR spectrophotometers	Lecturer PPT, E-books, NPTEL video lectures	Apply FTIR spectrometer	Understand, apply, evaluate	3,6	1	Assignment, Class test, Semester Exam
III	Flame photometer	Lecturer PPT, E-books, NPTEL video lectures	Learn flame photometry	Understand	3,6	1	Assignment, Class test, Semester Exam
III	Atomic spectrophotometers : absorption/emission type, sources, detectors applications	Lecturer PPT, E-books, NPTEL video lectures	Learn atomic spectroscopy	Understand	3,6	2	Assignment, Class test, Semester Exam
III	Fluorescence spectrophotometer	Lecturer PPT, E-books, NPTEL video lectures	Learn Fluorescence spectroscopy	Understand	3,6	1	Assignment, Class test, Semester Exam
III	X-ray diffractometer:	Lecturer PPT, E-books, NPTEL	Learn X-ray	Understand	3	1	Assignment, Class test,

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
	working principle and applications;	video lectures	spectroscopy				Semester Exam
III	NMR: working principle and applications.	Lecturer PPT, E-books, NPTEL video lectures	Learn NMR spectroscopy	Understand	3,6	1	Assignment, Class test, Semester Exam
III	Mass spectrometer: working principle and applications.	Lecturer PPT, E-books, NPTEL video lectures	Learn mass spectroscopy	Understand	3,6	1	Assignment, Class test, Semester Exam
IV	Separation methods: chromatography theory	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Theory of chromatography	Understand, remember	4	2	Assignment, Class test, Semester Exam
IV	Instrumentation, gas chromatography, GC): basic parts, columns, temperature programming,	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Operation of GC	Understand, remember	4,5,6	2	Assignment, Class test, Semester Exam
IV	GC detectors	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Operation of GC detectors	Understand, analyse	4	1	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
IV	liquid chromatography (LC): types, sources, detectors;	Lecturer PPT, E-books, NPTEL video lectures	Theory of LC	Understand, analyse.	4	1	Assignment, Class test, Semester Exam
IV	High-pressure liquid chromatography (HPLC): sample injection system, column, detectors, applications;	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Operation of LC detectors	Understand, analyse	4,5,6	1	Assignment, Class test, Semester Exam
IV	Electrophoresis : theory, principle, instrumentation of horizontal and vertical electrophoresis;	Lecturer PPT, E-books, Hand-outs, NPTEL video lectures	Theory of Electrophoresis	Understand, analyse,	4,5,6	1	Assignment, Class test, Semester Exam
IV	Ion trap mass spectrometer;	Lecturer PPT, E-books, NPTEL video lectures	Operation of Ion trap mass spectrometer	Understand, analyse	4,5,6	1	Assignment, Class test, Semester Exam
IV	Scanning electron microscope (SEM).	Lecturer PPT, E-books, NPTEL video lectures	Operation of SEM	Understand, analyse	4,5,6	1	Assignment, Class test, Semester Exam

<table>
<tr><td></td><td colspan="7">HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107
Department of Applied Electronics and Instrumentation Engineering
Lesson Plan</td></tr>
<tr><td></td><td colspan="7">Course Name: Control Systems Course Code: AEIE 2204
Program: B. Tech Semester: 4th Session: 2020-21
Total number of Lectures available in the session: 40
Faculty Name: Dr. Anil Kumar Bag</td></tr>
<tr><td></td><td>Course Outcomes (COs):</td><td colspan="6">After the completion of the course students will be able to:
1. Develop mathematical model of physical systems in forms of differential equation and transfer function.
2. Represent the systems using block diagram and signal flow graph models.
3. Investigate the time response of systems and calculate performance indices.
4. Apply the concept of stability in s-domain by using Routh stability criterion and root locus technique.
5. Analyze frequency response and stability of linear systems using different stability criterion.
6. Understand the concept of state variable analysis and compensation techniques for design.</td></tr>
<tr><td>Module No.</td><td>Topic</td><td>Materials/ Equipments/ References</td><td>Learning Outcomes</td><td>Blooms level(s)</td><td>COs</td><td>Number of Lectures</td><td>Evaluation Pattern</td></tr>
<tr><td>I</td><td>Introduction to control system, classification of control system</td><td>Lecturer PPT</td><td>Learn different types of control system</td><td>Understand, remember, analyse</td><td>1</td><td>2</td><td>Quiz, Class test</td></tr>
</table>

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	mathematical model of physical systems-importance, differential equation representation of physical systems	Lecturer PPT, E-books, NPTEL video lectures	Build mathematical model of various system	Understand, apply	1	1	Assignment, Class test, Semester Exam
I	Modelling of mechanical, electrical, fluid/hydraulic, thermal system	Lecturer PPT, E-books, NPTEL video lectures	Build mathematical model of various system	Apply, evaluate, design	1	1	Assignment, Class test, Semester Exam
I	Transfer function model of the physical systems and pole-zero representation	Lecturer PPT, E-books, NPTEL video lectures	Build transfer function model of various system	Understand, apply,Design	1	1	Assignment, Class test, Semester Exam
I	Block diagram model end block diagram reduction	Lecturer PPT, E-books, NPTEL video lectures	Build block diagram model of various system	Remember. Understand, apply	1	2	Assignment, Class test, Semester Exam
I	Signal flow graphs	Lecturer PPT, E-books, NPTEL video lectures	Solve SFG	Understand, apply and evaluate	2	2	Assignment, Class test, Semester Exam
I	Reduction of Parameter	Lecturer PPT, E-books, NPTEL	Reduction block diagram	Understand, remember,	2	1	Assignment, Class test,

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
	Variations by Use of Feedback	video lectures					Semester Exam
I	Control System Components	Lecturer PPT, E-books, NPTEL video lectures	Learn different control system component	Understand, remember	2	2	Assignment, Class test, Semester Exam
IV	Introduction to State space analysis	Lecturer PPT, E-books, NPTEL video lectures	Learn state space analysis	Understand	6	1	Assignment, Class test, Semester Exam
IV	S variables of electrical, mechanical system	Lecturer PPT, E-books, NPTEL video lectures	Can build state variable model of different system	Understand, Learn and apply	6	1	Assignment, Class test, Semester Exam
IV	State Space Representation of a System	Lecturer PPT, E-books, NPTEL video lectures	Can build state variable model of different system	Understand, apply, analyze	6	2	Assignment, Class test, Semester Exam
IV	S S representation in canonical form, diagonalisation, solution of state equation	Lecturer PPT, E-books, NPTEL video lectures	Can build state variable model of different system	Understand, Design, apply	6	2	Assignment, Class test, Semester Exam
IV	Controllability and observability	Lecturer PPT, E-books, NPTEL video lectures	Learn controllability and observability.	Understand, apply, analyse	6	3	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern

	HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107 **Department of Applied Electronics and Instrumentation Engineering** **Lesson Plan**
	Course Name: Control Systems **Course Code:** AEIE 2204 **Program:** B. Tech **Semester:** 4th **Session:** 2020-21 **Total number of Lectures available in the session:** 40 **Faculty Name:** Dr. Anil Kumar Bag
	Course Outcomes (COs):

After the completion of the course students will be able to:

1. Develop mathematical model of physical systems in forms of differential equation and transfer function.
2. Represent the systems using block diagram and signal flow graph models.
3. Investigate the time response of systems and calculate performance indices.
4. Apply the concept of stability in s-domain by using Routh stability criterion and root locus technique.
5. Analyze frequency response and stability of linear systems using different stability criterion.
6. Understand the concept of state variable analysis and compensation techniques for design.

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	Introduction to control system, classification of control system	Lecturer PPT	Learn different types of control system	Understand, remember, analyse	1	2	Quiz, Class test

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	mathematical model of physical systems- importance, differential equation representation of physical systems	Lecturer PPT, E-books, NPTEL video lectures	Build mathematical model of various system	Understand, apply	1	1	Assignment, Class test, Semester Exam
I	Modelling of mechanical, electrical, fluid/hydraulic, thermal system	Lecturer PPT, E-books, NPTEL video lectures	Build mathematical model of various system	Apply, evaluate, design	1	1	Assignment, Class test, Semester Exam
I	Transfer function model of the physical systems and pole-zero representation	Lecturer PPT, E-books, NPTEL video lectures	Build transfer function model of various system	Understand, apply,Design	1	1	Assignment, Class test, Semester Exam
I	Block diagram model end block diagram reduction	Lecturer PPT, E-books, NPTEL video lectures	Build block diagram model of various system	Remember. Understand, apply	1	2	Assignment, Class test, Semester Exam
I	Signal flow graphs	Lecturer PPT, E-books, NPTEL video lectures	Solve SFG	Understand, apply and evaluate	2	2	Assignment, Class test, Semester Exam
I	Reduction of Parameter	Lecturer PPT, E-books, NPTEL	Reduction block diagram	Understand, remember,	2	1	Assignment, Class test,

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
	Variations by Use of Feedback	video lectures					Semester Exam
I	Control System Components	Lecturer PPT, E-books, NPTEL video lectures	Learn different control system component	Understand, remember	2	2	Assignment, Class test, Semester Exam
IV	Introduction to State space analysis	Lecturer PPT, E-books, NPTEL video lectures	Learn state space analysis	Understand	6	1	Assignment, Class test, Semester Exam
IV	S variables of electrical, mechanical system	Lecturer PPT, E-books, NPTEL video lectures	Can build state variable model of different system	Understand, Learn and apply	6	1	Assignment, Class test, Semester Exam
IV	State Space Representation of a System	Lecturer PPT, E-books, NPTEL video lectures	Can build state variable model of different system	Understand, apply, analyze	6	2	Assignment, Class test, Semester Exam
IV	S S representation in canonical form, diagonalisation, solution of state equation	Lecturer PPT, E-books, NPTEL video lectures	Can build state variable model of different system	Understand, Design, apply	6	2	Assignment, Class test, Semester Exam
IV	Controllability and observability	Lecturer PPT, E-books, NPTEL video lectures	Learn controllability and observability.	Understand, apply, analyse	6	3	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern

	LESSON PLAN
	Sub Code & Name: CSEN 3133 **Web Technologies** **Course:B.tech** **Branch : CSE** **Semester: 5th**

Module 1:

Session No.	Topics to be covered	Ref	Teaching Method	No. of Required Classes
1.	Commonly used protocols: HTTP, HTTPs, TELNET, Electronic Mail-POP3, SMTP etc., WWW-Evolution and its characteristics..	1, 2	BB	3
2.	Basics of Web Technology: Static web page, Dynamic web page, Active web page.	1,2,3	BB	1
3.	HTML: Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Form, Iframe, Colors, Colorname, Colorvalue. Image Maps.	1,2,3	BB,PPT	3
4.	CSS: Types, Layout	1	BB,PPT	1

Module 2:

Session No.	Topics to be covered	Ref	Teaching Method	No. of Required Classes
1.	**Web page scripting** Java Script: Data types, variables, operators, conditional statements, array object, date object, string object.	1,2,3	PPT,BB	4
2.	Extensible Markup Language (XML): Introduction, Tree, Syntax, Elements, Attributes, Validation, Viewing. XHTML in brief.	1,2,3	PPT	3
3.	Java Servlet: Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions.	1,2	PPT,BB	3

Module 3:

Session No.	Topics to be covered	Ref	Teaching Method	No. of Required Classes
1.	JSP: JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP.	1,2	BB,PPT	4
2.	Handle the processing request from user and generating dynamic response for the user, using include and forward action.	1,2	BB,PPT	2
3.	Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement. Build website with database connectivity. J2EE: An overview of J2EE web services**.**	1,2	BB,PPT	4

Module 4:

Session No.	Topics to be covered	Ref	Teaching Method	No. of Required Classes
1.	Threats: Malicious code-viruses, Trojan horses, worms	1,2	BB,PPT	2
2.	Active and Passive attacks: eavesdropping, spoofing, modification, denial of service attacks..	1,2	BB,PPT	2
3.	Network security techniques: Password and Authentication; VPN, IP Security, security in electronic transaction, Secure Socket Layer (SSL).	1,2	BB,PPT	2
4.	Firewall: Introduction, Packet filtering, Stateful, Application layer, Proxy.	1,2	BB,PPT	2

Textbooks:

1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Dreamtech Press; first edition.
2. Web Technologies, Godbole and Kahate, Tata McGraw-Hill Education.
3. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson,2011.

Reference Books

1. Web Technology: A Developer's Perspective, N.P.Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013.
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011.
3. Java Servlets and JSP, Murach's.

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Mechanics for Engineers   Paper Code: MECH 2106

Lecture Plan

EE 2nd year

Lecture No./Date	Chapter/Module	Topics to be covered	Reference books	Remarks
05.08.20	**Module 3**	Centre of gravity; Centre of mass & centroid;	Engineering Mechanics: Statics and Dynamics by Meriam &KraigeWiley India Engineering Mechanics by I.H. Shames	**Done**
12.18.20		Centroid of an arc; Centroid of plane areas – triangle, circular sector, quadrilateral		**Done**
19.08.20		Centroid of a composite area consisting of above figures.		**Done**
26.08.20		Problem Discussion		**Done**
02.09.20	**Module 4**	Introduction to dynamics: Kinematics & kinetics;	Engineering Mechanics: Statics and Dynamics by Meriam &KraigeWiley India Engineering Mechanics by I.H. Shames	**Done**
09.09.20		Rectilinear motion of particles with uniform acceleration.		**Done on 11.11.20**
16.09.20		Problem Discussion		**Done on 25.1.20**
23.09.20		Rectilinear motion of particles with non-uniform acceleration.		**Done**
30.09.20		Problem Discussion		**Done**
07.10.20		Plane curvilinear motion of particles: Rectangular components (projectile motion).		**Done**
14.10.20		Problem Discussion		**Done**
04.11.20		General Discussion		**Done**

HERITAGE INSTITUTE OF TECHNOLOGY (AUTONOMOUS), KOLKATA-700107

Department of Applied Electronics and Instrumentation Engineering

Lesson Plan

Course Name: Fundamental of Sensors and Transducers **Course Code:** AEIE 3221

Program: B. Tech **Semester:** 6th **Session:** 2020-21

Total number of Lectures available in the session: 36

Faculty Name: Dr. Anil Kumar Bag

Course Outcomes (COs):

After the completion of the course students will be able to:

1. Use different methods for converting a physical parameter into an electrical quantity.
2. Select the best fit transducers, including those for measurement of temperature, strain, motion, position and light intensity.
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like displacement, stress, force, acceleration, flow, etc.
4. Acquire knowledge on high temperature sensing systems used in steel, aluminium, and copper plants.
5. Learn basic principle of smart sensors.
6. Identify different type of sensors used in real life applications and know their importance.

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	Definition, principle of sensing & transduction, classification of transducers.	Lecturer PPT	Learn transduction principle	Understand, remember	1	1	Quiz, Class test

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
I	Potentiometric transducer-Construction, symbol, materials, loading effect, error calculations, sensitivity.	Lecturer PPT, E-books, NPTEL video lectures	Apply for measurement of various physical parameters.	Understand, apply	1,2,3	2	Assignment, Class test, Semester Exam
I	Strain gauge-Theory, type, materials, gauge factor, temperature compensation and dummy gauge	Lecturer PPT, E-books, NPTEL video lectures	Apply for stress strain measurement	Apply, evaluate, design	1,2,3	1	Assignment, Class test, Semester Exam
I	Strain measurement circuit- quarter, half and full bridge configuration.	Lecturer PPT, E-books, NPTEL video lectures	Design the SCU for SG	Understand, apply,Design	1,2,3	2	Assignment, Class test, Semester Exam
I	Inductive sensor-Principle, common types, Reluctance change type,	Lecturer PPT, E-books, NPTEL video lectures	Apply for displacement and rpm measurement	Remember. Understand, apply	1,2,3	2	Assignment, Class test, Semester Exam
I	Mutual inductance change type, transformer action type. LVDT-Construction,	Lecturer PPT, E-books, NPTEL video lectures	Apply LVDT for different parameter measurement	Understand, apply and evaluate	1,2,3	2	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
	working principle.						
II	Capacitive sensors: Variable distance-parallel plate type, variable area-parallel plate, variable dielectric constant type, calculation of sensitivity,	Lecturer PPT, E-books, NPTEL video lectures	Apply for measurement of level, displacement etc.	Understand, remember, apply, evaluate	1,2,3	2	Assignment, Class test, Semester Exam
II	Microphone, response characteristics.	Lecturer PPT, E-books, NPTEL video lectures	Sound measurement	Understand, analyse	1,2,3	1	Assignment, Class test, Semester Exam
II	piezoelectric effect, charge and voltage co-efficient and relationships, crystal model, materials, natural & synthetic type, charge amplifier.	Lecturer PPT, E-books, NPTEL video lectures	Understand theory of piezoelectricity	Understand	1,2,3	2	Assignment, Class test, Semester Exam
II	Ultrasonic sensors-Liquid velocity and level measurements.	Lecturer PPT, E-books, NPTEL video lectures	Apply to measure various parameters.	Understand, Learn and apply	1,2,3	1	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
II	Magnetoresistive effect and Magnetostrictive sensors.	Lecturer PPT, E-books, NPTEL video lectures	Apply magnetostrictive transducers for torque and force measurement.	Understand, apply, analyze	1,2,3	1	Assignment, Class test, Semester Exam
III	Thermal sensors: Resistance Temperature Detector (RTD) - materials, temperature range, R-T characteristics, configurations, applications.	Lecturer PPT, E-books, NPTEL video lectures	Design SCU for RTD and apply	Understand, Design, apply	3,4	2	Assignment, Class test, Semester Exam
III	Thermistors- materials, shape, R-T characteristics, ranges and accuracy specification.	Lecturer PPT, E-books, NPTEL video lectures	Design SCU for RTD and apply	Understand, apply, analyse	3,4	1	Assignment, Class test, Semester Exam
III	Thermocouple- Thermo electric laws, types, temperature ranges, series and parallel configurations, cold	Lecturer PPT, E-books, NPTEL video lectures	Theory of thermocouple, types	Understand	3,4	3	Assignment, Class test, Semester Exam

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
	junction compensation, compensating cables.						
III	Thermal Radiation sensors- types, constructions and comparison.	Lecturer PPT, E-books, NPTEL video lectures	Application of thermal radiation sensors	Understand, apply	4	2	Assignment, Class test, Semester Exam
III	Introduction to semiconductor type temperature sensors.	Lecturer PPT, E-books, NPTEL video lectures	Apply	Understand	3,4,6	1	Assignment, Class test, Semester Exam
IV	LED, LDR, photodiodes, Photovoltaic cells, photo emissive cell types, materials, construction, response, applications.	Lecturer PPT, E-books, NPTEL video lectures	Apply LM350, AD590	Apply	3,4,6	3	Assignment, Class test, Semester Exam
IV	Geiger counters,	Lecturer PPT, E-books, NPTEL video lectures	Operation of radiation counters	Understand	6	2	Assignment, Class test, Semester Exam
IV	Scintillation detectors.	Lecturer PPT, E-books, NPTEL	Operation of radiation counters	Understand	6	1	Assignment, Class test, Semester

Module No.	Topic	Materials/ Equipments/ References	Learning Outcomes	Blooms level(s)	COs	Number of Lectures	Evaluation Pattern
		video lectures					Exam
IV	Introduction to smart sensors.	Lecturer PPT, E-books, NPTEL video lectures	Smart sensor network	Understand	5	1	Assignment, Class test, Semester Exam

B. Tech. Honors

COMMUNICATION for PROFESSIONALS (Theory) – [3L/Week] **12 weeks/ 36 Lectures**

Paper code HMTS-1011

Module- I (10 hrs.)

Introduction to Linguistics

Lecture	Topic
1 & 2	• Phonetics- Vowel and Consonant Sounds (Identification & Articulation) Introduction to phonetics, types (Articulatory, Acoustic and Auditory), vowel and consonant sounds, long and short vowels, definition of phoneme, IPA symbols and transcription, introduction to place and manner of articulation
3 & 4	• Word- stress, stress in connected speech • Intonation (Falling and Rising Tone) • Voice Modulation • Accent Training Syllable, stress- word, sentence, paragraph, primary and secondary stress, intonation, Received Pronunciation- British, American, Indian
5	Practice- stress, transcription
6, 7 & 8	• The concept of Word Formation Introduction to morpheme, morphology, word, free and bound morpheme, and allomorph, methods- conversion, compounding and affixation
9	• Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives • Root words from foreign languages and their use in English • Vocabulary Building Methods- affixation and derivation, foreign words- Latin and Greek influence

	Practice
10	• Synonyms, Antonyms and standard abbreviations Practice

Module- II (10 hrs.)

Communication Skills

1	• Definition, nature & attributes of Communication
2 & 3	• Process of Communication Basic process, illustration, elements- sender/ encoder, message, channel, medium, form, receiver/ decoder, feedback; stages- ideation, encoding, transmission, decoding, feedback,
4	Types- verbal & non-verbal, non-verbal – sub-types
5	• Levels of communication Intrapersonal, extrapersonal, interpersonal, group communication, mass communication, organizational
6	• Channels of Communication Organisational communication- types (internal, external, personal), channels- formal (upward, downward, lateral, diagonal) and informal (grapevine)
7 & 8	• Models or Theories of Communication Shannon-Weaver's Mathematical Model & Schramm's model- concept, process, illustration, strengths , weaknesses
9 & 10	• Barriers to Communication Intrapersonal, Interpersonal, Organisational

Module- III (10 hrs.)

Professional Writing Skills

1	Seven Cs of business writing with examples, Letter Writing : Importance, Types
2	• Form and Structure, Style and Tone Format and parts of a letter
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4	Placing an order and reply
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7	• Proposal Writing: Purpose, Types of Proposals, Structure of Formal Proposals.
8, 9 & 10	• Report Writing: Importance and Purpose, Types of Reports (Informative and Analytical), Formats & Structure of Formal Reports (letter, memo and manuscript), Writing Strategies. Examples and practice

<u>Module- IV </u>(6 hrs.)

Communication skills at Work

1 & 2	• Communication and its role in the workplace • Benefits of effective communication in the workplace • Common obstacles to effective communication Practice- Cases
3 & 4	• Approaches and Communication techniques for multiple needs at workplace: persuading, convincing, responding, resolving conflict, delivering bad news, making positive connections Practice- Caselets
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B. Tech. Honors

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3	Seeking quotation and reply
4	Placing an order and reply
5	Claim and adjustment
6	
7	• Proposal Writing: Purpose, Types of Proposals, Structure of Formal Proposals.
8, 9 & 10	• Report Writing: Importance and Purpose, Types of Reports (Informative and Analytical), Formats & Structure of Formal Reports (letter, memo and manuscript), Writing Strategies. Examples and practice

Module- IV (6 hrs.)

Communication skills at Work

1 & 2	• Communication and its role in the workplace • Benefits of effective communication in the workplace • Common obstacles to effective communication Practice- Cases
3 & 4	• Approaches and Communication techniques for multiple needs at workplace: persuading, convincing, responding, resolving conflict, delivering bad news, making positive connections Practice- Caselets
5 & 6	• Identify common audiences and design techniques for communicating with each audience Presentation techniques

<u>B. Tech. Honors</u>

<u>COMMUNICATION for PROFESSIONALS</u> (Theory) – [3L/Week] **12 weeks/ 36 Lectures**

<u>Paper code HMTS-1011</u>

<u>Module- I</u> (10 hrs.)

Introduction to Linguistics

Lecture	Topic
1 & 2	• Phonetics- Vowel and Consonant Sounds (Identification & Articulation) Introduction to phonetics, types (Articulatory, Acoustic and Auditory), vowel and consonant sounds, long and short vowels, definition of phoneme, IPA symbols and transcription, introduction to place and manner of articulation
3 & 4	• Word- stress, stress in connected speech • Intonation (Falling and Rising Tone) • Voice Modulation • Accent Training Syllable, stress- word, sentence, paragraph, primary and secondary stress, intonation, Received Pronunciation- British, American, Indian
5	Practice- stress, transcription
6, 7 & 8	• The concept of Word Formation Introduction to morpheme, morphology, word, free and bound morpheme, and allomorph, methods- conversion, compounding and affixation
9	• Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives • Root words from foreign languages and their use in English • Vocabulary Building Methods- affixation and derivation, foreign words- Latin and Greek influence

	Practice
10	• Synonyms, Antonyms and standard abbreviations Practice

<u>Module- II</u> (10 hrs.)

Communication Skills

1	• Definition, nature & attributes of Communication
2 & 3	• Process of Communication Basic process, illustration, elements- sender/ encoder, message, channel, medium, form, receiver/ decoder, feedback; stages- ideation, encoding, transmission, decoding, feedback,
4	Types- verbal & non-verbal, non-verbal – sub-types
5	• Levels of communication Intrapersonal, extrapersonal, interpersonal, group communication, mass communication, organizational
6	• Channels of Communication Organisational communication- types (internal, external, personal), channels- formal (upward, downward, lateral, diagonal) and informal (grapevine)
7 & 8	• Models or Theories of Communication Shannon-Weaver's Mathematical Model & Schramm's model- concept, process, illustration, strengths , weaknesses
9 & 10	• Barriers to Communication Intrapersonal, Interpersonal, Organisational

<u>Module- III</u> (10 hrs.)

Professional Writing Skills

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B.Tech (Regular)

BUSINESS ENGLISH (THEORY)-[2L/Week] 12 weeks/24 Lectures

Paper Code: HMTS 1202

<table>
<tr><td></td><td>Module-I (5 hrs)</td></tr>
<tr><td>Lecture</td><td>Topic</td></tr>
<tr><td>1&2</td><td>• Subject-verb agreement
• Noun-pronoun agreement
• Redundancies

Grammar (Identifying Common Errors in Grammatical Usage, General Rules and Exception to the rules, Other Norms, Redundancies and Clichés in Oral and Written Communication)</td></tr>
<tr><td>3&4</td><td>• Articles
• Prepositions
• Misplaced Modifiers
Various kinds of errors in the usage of articles and prepositions and the guiding principles, correction or error identification questions, different kinds of modifier errors.</td></tr>
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Different types of phrases and clauses and difference between phrases and clauses. Purpose and usage. Checking cogency in sentences and paragraphs.</td></tr>
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B.Tech (Regular)

BUSINESS ENGLISH (THEORY)-[2L/Week] 12 weeks/24 Lectures

Paper Code: HMTS 1202

3&4	• Techniques for writing precisely • Different styles of writing: descriptive, narrative, expository Various styles of writing, identification and understanding of the different types of writing techniques and the specific purpose of each, tips to apply them in writing.
5	• Importance of proper punctuation • Revision Exercises- Error Correction
	Module-III (8 hours)
1&2	• Business Communication- Scope & Importance • Writing Formal Business Letters: Form and Structure-Parts of a Business letter, Business Letter Formats, Style and Tone, Writing strategies. The importance of written communication within organizations, format of a business letter, developing content, conveying purpose, structuring a letter.
3&4	• Organizational Communication: Agenda & minutes of a meeting, Notice, Memo, Circular Purpose of writing an Agenda, Minutes of a Meeting, Notice, Memo and Circular, format, types of a Memo, developing content.
5&6	• Organizing e-mail messages, E-mail etiquette • Job Application Letter: Responding to Advertisements and Forced Applications • Letter Plan: Opening Section, Middle Section, Closing Section • Qualities of well-written Application Letters: The You-Attitude, Length, Knowledge of Job Requirement, Reader-Benefit Information, Organization, Style, Mechanics - Letter Plan: Opening Section, Middle Section, Closing Section

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Paper Code: HMTS 1202

7&8	• Resume and CV • Difference, Content of the Resume Formulating Career Plans: Self Analysis, Career Analysis, Job Analysis, Matching Personal Needs with Job Profile – Planning Resume – Structuring the Resume: Chronological Resume, The Functional Resume, Combination of Chronological and Functional Resume, Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honors and Achievements, Personal Profile, Special Interests, References
	Module- IV (6hrs) Writing skills
1	• Comprehension: Identifying the central idea, inferring the lexical and contextual meaning, comprehension passage – practice
2 & 3	• Paragraph Writing: Structure of a paragraph, Construction of a paragraph, Features of a paragraph, Writing techniques/developing a paragraph.
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B.Tech (Regular)

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Lesson Plan

Subject Code: MATH2001 (Module-IV)

Instructor Name: Moulipriya Sarkar

Odd Semester 2020-21

(15L)

Lecture	Topics to be covered (PDE)
1, 2	Introduction to partial differential equations, Formation of partial differential equations.
3,4	Linear and Nonlinear PDE of first order, Lagrange's method of solution.
5,6	Charpit's method of solution.
7,8,9	Second order partial differential equations with constant coefficients.
10	Boundary value problems and their solution by the method of separation of variables.
11, 12	Illustration of wave equation.
13, 14	One dimensional heat equation.
15	Laplace's equation.

LESSON PLAN (Session: 2011-2012 Even)
Computer Graphics & Multimedia [MCAP3102]
Faculty: Sandipan Ganguly (SNG), Palash Ghosh (PG)

Lecture	Topics Covered	Reference Index	Concerned Faculty
1	Definitions: CG, CAD, CAM, IG. Definitions: Pixel, raster, resolution, aspect ratio. Colour Models: RGB, CMY and conversion factor.	T1, T2	SNG
2	Image Representation: direct coding, lookup table; Raster scan display (monochrome CRT, Colour CRT)		
3	Concept of bit planes (bitmap, pixmap). Flat panel Displays. 3D viewing devices, Graphics Devices: Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices;		
4	Computer graphics software. Software Standards. Image files formats, function calls (setPixel, getPixel). Display processors		
5	Points & lines, General characteristics of line drawing algorithms; DDA algorithm	T1, T2	PG
6	Bresenham's line algorithm (mathematical derivation, algorithm, advantages over DDA), discussion on polyline ( ) function		
7	Circle generation algorithm; mid-point (mathematical derivation, algorithm)	T2	
8	Bresenham's Circle drawing (mathematical derivation, algorithm), Contrast of Bresenham's and Midpoint approach		
9	Midpoint Ellipse generation (mathematical derivation, algorithm)		
10	Region Filling: Classification of regions, Concept of neighbourhood of pixels, Flood fill algorithm, boundary fill algorithm and their comparison		
11	Convex and Concave Polygon, Scan line polygon filling.	T1	
12	Side effects of scan conversion (aliasing) Techniques of anti-aliasing (Area sampling, super sampling, etc.)		
13	Two dimensional transformations: translation, rotation, scaling, reflection, shear; Matrix representations & homogeneous coordinates	T1, T2	
14	Composite Transformations (inverse, general pivot point rotation, general fixed point scaling)		
15	Reflection through an arbitrary line, transformations between coordinate systems;		
16	Viewing pipeline, Window to viewport co-ordinate transformation,		

17	clipping operations and their applications, point clipping	T1, T3	SNG
18	Line Clipping, Cohen-Sutherland Line Clipping (with discussion of region codes for line end-points),		
19	Midpoint Subdivision algorithm and comparisons with Cohen Sutherland's algo.	T2, T3	
20	Cyrus-Beck Algorithm (Partially Visible Lines, Totally Visible lines), Comparative study of the three line clipping algorithm discussed	T3	
21	Polygon Clipping: Convex Polygonal Clipping Windows, Sutherland-Hodgeman Polygon Clipping, its problems, Weiler Atherton Polygon Clipping		
22	3D transformations: translation, rotation, scaling & other transformations, General three-dimensional rotation (Rotation about an arbitrary axis in space), reflection through an arbitrary plane;	T1	
23	Taxonomy of projection (perspective, parallel: principles, mathematical description)		
24	3D viewing: Specifying the view plane, view plane coordinates, specifying the view volume, clipping: clipping strategies (direct clipping, canonical clipping), clipping algorithms (technical difference from 2d clipping)		
25	Viewing Transformation: Screen projection Plane, Constructing a 3d view, 3d graphics pipeline		
26	Curve representation: curved surfaces, designs, B-Splines, Bernstein Polynomials	T1, R2	PG
27	Spline Interpolation, problem of approximation, Bezier-Bernstein Approximation, Bezier-B-Spline Approximation, Properties of Bezier-B-Spline Approximation		
28	Visible Surfaces- Floating Horizon Algo (Upper & Lower Horizon algorithm)	T1, R1, R2	SNG
29	aliasing		
30	Roberts's algo (Volume matrices, plane equations, Self-hidden planes, lines hidden by other volumes)		
31	Warnock algorithm (quadtree data structure, subdivision criteria, finding surrounding polygons)		
32	Z-buffer algorithm (Incrementally calculating the depth, hierarchical Z-buffer), scanline Z-buffer algorithm.		
33	Rendering: introduction, illumination models, shading: Gouraud Shading, Phong Shading. Shadowing- scan conversion shadow algorithms, multiple-pass visible surface shadow algorithms, penumbra shadows, ray tracing shadow algorithms.	T4	
34	Texture: Projected texture, texture mapping, solid texture		
35	Introduction to multimedia: concepts, Characteristics of multimedia presentation, uses of multimedia, hypertext and hyper media, Introduction to Image, video and audio components, H/Wand S/W requirements.		
36	Digital audio, Analog to digital conversion, sampling, quantization, Nyquist's theorem, Digital to analog conversion, Quantization Error		

37	Pulse code modulation, DPCM, ADPCM, MIDI		
38	Introduction to Image, colour models, JPEG Image coding standard		
39	Introduction to compression, Types of compression, JPEG compression		
40	Introduction to Video, MPEG compression		

Text Books:

1. Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson Education
2. Z. Xiang, R. Plastock – "Schaum's outlines Computer Graphics (2nd Ed.)"
3. Rogers – "Procedural Elements for Computer Graphics (2nd Ed.)" – TMH
4. Ranjan Parekh - Principles of Multimedia

Reference Books:

1. Computer Graphics: Principles and Practice in C (2nd Edition) (Systems Programming Series) by James D. Foley,
2. Andries van Dam, Steven K. Feiner, John F. Hughes

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Engineering Mechanics   Paper Code: MECH 2101

Lecture Plan

ME 2nd year

Lecture No./Date	Chapter/Module	Topics to be covered	Reference books	Remarks
11.08.20	**Module 3**	Centre of gravity; Centre of mass & centroid;	Engineering Mechanics: Statics and Dynamics by Meriam &KraigeWiley India Engineering Mechanics by I.H. Shames	**Done**
18.08.20		Centroid of an arc; Centroid of plane areas – triangle, circular sector, quadrilateral		**Done**
25.08.20		Centroid of a composite area consisting of above figures.		**Done**
01.09.20		Problem Discussion		**Done**
08.09.20		Area moment of inertia: Moment of inertia of a plane figure;		**Done**
15.09.20		Problem Discussion		**Done on 13.10.20**
22.09.20		Polar moment of inertia of a plane figure;		**Done**
29.09.20		Problem Discussion		**Done**
06.10.20		Radius of gyration, Parallel axes theorem.		**Done**
13.10.20		Problem Discussion		**Done**
20.10.20		Problem Discussion		**Done**
03.11.20		Problem Discussion		**Done**
10.11.20		Problem Discussion		**Done**
24.11.20		General Discussion		**Done**

Paper Name: Fluid Mechanics & Hydraulics Paper Code: MECH 2102

Name of Faculty: Arindam Mandal (AM)

Lecture No.	**Chapter/ Module**	**Topics to be covered**	**Reference books**	**Remarks**
1	Module 1	Definition of fluid and importance of fluid mechanics; Concept of Continuum; Fluid properties- density, specific weight, specific volume, specific gravity.	TB1-S,B & C TB2- B. Massey TB3- A.K Jain	
2	Module 1	Viscosity: definition, causes of viscosity, Newton's law of viscosity.		
3	Module 1	Ideal and Real fluids; No-slip condition, dimensional formula and units of viscosity, kinematic viscosity.		
4	Module 1	Variation of viscosity with temperature. Newtonian and Non-Newtonian fluids with Rheology diagram.		
5	Module 1	Compressibility and Bulk modulus of elasticity. Difference between compressible and incompressible fluids. Problem Discussion		
6	Module 1	Fluid statics: Pascal's Law-statement and proof; Basic Hydrostatic Law and its proof.		
7	Module 1	Variation of pressure with depth in incompressible fluid, piezometric head, pressure head; Unit and scales of pressure measurement & Problem Discussion		
8	Module 1	Measurement of fluid pressure: Piezometer, Manometers - Simple and Differential U-tube manometer.		
9	Module 1	Inverted tube manometer, Inclined tube manometer. Characteristics and choice of manometric fluid.		
10	Module 1	Problem Discussion		
11	Module 2	Hydrostatic thrust on submerged plane surfaces.		
12	Module 2	Hydrostatic thrust on submerged curved surfaces.		
13	Module 2	Buoyancy.		
14	Module 2	Stability of submerged and floating bodies.		
15	Module 2	Problem Discussion		
16		Quiz 1		
17	Module 2	Stream line, Stream tube, Path line; Equation of streamline and path line.		
18	Module 2	Concept of control volume, Continuity equation in finite (1-D) and differential form in 3-D Cartesian coordinate system.		
19	Module 2	Continued and Problem Discussion		
20	Module 3	Application of linear momentum to control volume-linear momentum equation, analysis of force exerted by a fluid stream on a solid boundary- thrust on pipe bend		
21	Module 3	Problem Discussion		
22	Module 3	Boundary layer theory: concept of boundary layer.		

23	Module 3	Boundary layer thickness, displacement thickness.		
24	Module 3	Momentum thickness, growth of boundary layer.		
25	Module 3	Boundary layer separation, Problem Discussion		
26	Module 4	Dimensional analysis and Buckingham Pi theorem.		
27	Module 4	Application of Buckingham Pi theorem.		
		Quiz 2		

Text Books:

1. Introduction to Fluid Mechanics and Fluid Machines- Som, Biswas and Chakraborty, TMH, 3e
2. Fluid Mechanics and Machinery-C.S.P Ojha, R. Berndtsson, P.N. Chandramouli, OUP, 1e
3. Fluid Mechanics – Fox, Mcdonald & Pritchard, Wiley, 8e
4. Mechanics of Fluids- B Massey, Taylor & Francis, 8e

Reference books:

1. Fluid Mechanics – Dr. A.K. Jain, Khanna Publishers, 11e
2. Engineering Fluid Mechanics – Graebel. W. P, Taylor & Francis (Yes Dee Publishing Pvt. Ltd), 1st Indian reprint, 2013

Paper Name: Fluid Mechanics & Hydraulics   Paper Code: MECH 2102

Name of Faculty: Arindam Mandal (AM)

Lecture No.	Chapter/ Module	Topics to be covered	Reference books	Remarks
1	Module 1	Definition of fluid and importance of fluid mechanics; Concept of Continuum; Fluid properties- density, specific weight, specific volume, specific gravity.	TB1-S,B & C TB2- B. Massey TB3- A.K Jain	
2	Module 1	Viscosity: definition, causes of viscosity, Newton's law of viscosity.		
3	Module 1	Ideal and Real fluids; No-slip condition, dimensional formula and units of viscosity, kinematic viscosity.		
4	Module 1	Variation of viscosity with temperature. Newtonian and Non-Newtonian fluids with Rheology diagram.		
5	Module 1	Compressibility and Bulk modulus of elasticity. Difference between compressible and incompressible fluids. Problem Discussion		
6	Module 1	Fluid statics: Pascal's Law-statement and proof; Basic Hydrostatic Law and its proof.		
7	Module 1	Variation of pressure with depth in incompressible fluid, piezometric head, pressure head; Unit and scales of pressure measurement & Problem Discussion		
8	Module 1	Measurement of fluid pressure: Piezometer, Manometers - Simple and Differential U-tube manometer.		
9	Module 1	Inverted tube manometer, Inclined tube manometer. Characteristics and choice of manometric fluid.		
10	Module 1	Problem Discussion		
11	Module 2	Hydrostatic thrust on submerged plane surfaces.		
12	Module 2	Hydrostatic thrust on submerged curved surfaces.		
13	Module 2	Buoyancy.		
14	Module 2	Stability of submerged and floating bodies.		
15	Module 2	Problem Discussion		
16		Quiz 1		
17	Module 2	Stream line, Stream tube, Path line; Equation of streamline and path line.		
18	Module 2	Concept of control volume, Continuity equation in finite (1-D) and differential form in 3-D Cartesian coordinate system.		
19	Module 2	Continued and Problem Discussion		
20	Module 3	Application of linear momentum to control volume-linear momentum equation, analysis of force exerted by a fluid stream on a solid boundary- thrust on pipe bend		
21	Module 3	Problem Discussion		
22	Module 3	Boundary layer theory: concept of boundary layer.		

23	Module 3	Boundary layer thickness, displacement thickness.		
24	Module 3	Momentum thickness, growth of boundary layer.		
25	Module 3	Boundary layer separation, Problem Discussion		
26	Module 4	Dimensional analysis and Buckingham Pi theorem.		
27	Module 4	Application of Buckingham Pi theorem.		
		Quiz 2		

Text Books:

1. Introduction to Fluid Mechanics and Fluid Machines- Som, Biswas and Chakraborty, TMH, 3e
2. Fluid Mechanics and Machinery-C.S.P Ojha, R. Berndtsson, P.N. Chandramouli, OUP, 1e
3. Fluid Mechanics – Fox, Mcdonald & Pritchard, Wiley, 8e
4. Mechanics of Fluids- B Massey, Taylor & Francis, 8e

Reference books:

1. Fluid Mechanics – Dr. A.K. Jain, Khanna Publishers, 11e
2. Engineering Fluid Mechanics – Graebel. W. P, Taylor & Francis (Yes Dee Publishing Pvt. Ltd), 1st Indian reprint, 2013

Department of Mechanical Engineering

Lecture Plan [ME -2nd yr Sec –A] (ODD Sem 2021-22)

Paper Name: Fluid Mechanics & Hydraulics Paper Code: MECH-2102

Name of Faculty: Rajarshi Sengupta (RS)

Lecture No./Date	Chapter/ Module	Topics to be covered	Reference books	Remarks
1	Module 2	Fluid kinematics: Definition; Flow field and description of fluid motion (Eulerian & Lagrangian method).	TB1- Som,Biswas & Chakraborty TB2- B. Massey TB3- A.K Jain	
2		Steady and unsteady flow, uniform and non-uniform flow-examples.	do	
3	Module 3	Acceleration of a fluid particle-local acceleration, convective acceleration-examples	do	
4		Problem discussion	do	
5		Concept of control volume, Continuity equation in finite form. Problem discussion on fluid kinematics.	do	
6		Fluid dynamics: Euler's equation of motion;	do	
7		Bernoulli's equation and its significance;	do	
8		Bernoulli's Equation for a real fluid with applications in flow measurement-Venturimeter	do	
9		Orifice meter ; Problem discussion on Venturimeter and orificemeter	do	
10		Pitot tube	do	
11	Module 4	Characteristics of Laminar and Turbulent flow; Reynolds experiment, critical Reynolds number;	do	
12		Laminar flow through pipe: Hagen-Poiseuille equation.	do	
13		Laminar flow through pipe- continued	do	
14		Problem discussion	do	
15		Flow through closed conduits: Darcy Weisbach equation;	do	
16		Concept of friction factor in a pipe flow, Variation of friction factor with Reynolds Number; Moody's diagram and its use;	do	
17		Minor losses- at sudden expansion, at sudden contraction, at bends, at valves, and fittings etc.	do	
18		Concept of flow potential and flow resistance.	do	
19		Pipes connected in series and parallel.	do	
20		Problem discussion	do	

Text Books:

1. Introduction to Fluid Mechanics and Fluid Machines- Som, Biswas and Chakraborty, TMH, 3e
2. Fluid Mechanics and Machinery-C.S.P Ojha, R. Berndtsson, P.N. Chandramouli, OUP, 1e
3. Fluid Mechanics – Fox, Mcdonald & Pritchard, Wiley, 8e
4. Mechanics of Fluids- B Massey, Taylor & Francis, 8e

Reference Books:

1. Fluid Mechanics – Dr. A.K. Jain, Khanna Publishers, 11e
2. Engineering Fluid Mechanics – Graebel. W. P, Taylor & Francis (Yes Dee Publishing Pvt. Ltd), 1st Indian reprint, 2013

Department of Mechanical Engineering

Lecture Plan [ME -2nd yr Sec –B] (ODD Sem 2020-21)

Paper Name: Fluid Mechanics & Hydraulics Paper Code: MECH-2102

Name of Faculty: Rajarshi Sengupta (RS)

Lecture No./Date	Chapter/ Module	Topics to be covered	Reference books	Remarks
1	Module 2	Fluid kinematics: Definition; Flow field and description of fluid motion (Eulerian & Lagrangian method).	TB1- Som,Biswas & Chakraborty TB2- B. Massey TB3- A.K Jain	
2		Steady and unsteady flow, uniform and non-uniform flow-examples.	do	
3	Module 3	Acceleration of a fluid particle-local acceleration, convective acceleration-examples	do	
4		Problem discussion	do	
5		Concept of control volume, Continuity equation in finite form. Problem discussion on fluid kinematics.	do	
6		Fluid dynamics: Euler's equation of motion;	do	
7		Bernoulli's equation and its significance;	do	
8		Bernoulli's Equation for a real fluid with applications in flow measurement-Venturimeter	do	
9		Orifice meter ; Problem discussion on Venturimeter and orificemeter	do	
10		Pitot tube	do	
11	Module 4	Characteristics of Laminar and Turbulent flow; Reynolds experiment, critical Reynolds number;	do	
12		Laminar flow through pipe: Hagen-Poiseuille equation.	do	
13		Laminar flow through pipe- continued	do	
14		Problem discussion	do	
15		Flow through closed conduits: Darcy Weisbach equation;	do	
16		Concept of friction factor in a pipe flow, Variation of friction factor with Reynolds Number; Moody's diagram and its use;	do	
17		Minor losses- at sudden expansion, at sudden contraction, at bends, at valves, and fittings etc.	do	
18		Concept of flow potential and flow resistance.	do	
19		Pipes connected in series and parallel.	do	
20		Problem discussion	do	

Text Books:

1. Introduction to Fluid Mechanics and Fluid Machines- Som, Biswas and Chakraborty, TMH, 3e
2. Fluid Mechanics and Machinery-C.S.P Ojha, R. Berndtsson, P.N. Chandramouli, OUP, 1e
3. Fluid Mechanics – Fox, Mcdonald & Pritchard, Wiley, 8e
4. Mechanics of Fluids- B Massey, Taylor & Francis, 8e

Reference Books:

1. Fluid Mechanics – Dr. A.K. Jain, Khanna Publishers, 11e
2. Engineering Fluid Mechanics – Graebel. W. P, Taylor & Francis (Yes Dee Publishing Pvt. Ltd), 1st Indian reprint, 2013

HERITAGE INSTITUTE OF TECHNOLOGY
Department of Computer Applications
LESSON PLAN

Subject: **Programming with Python (MCAP1102)** **Course:** **[L-T-P = 3-1-0]**
Class: **1st Year 1st Semester MCA**

Sl. No.	Name of the Topics	Number of Lectures
1	**Introduction to Python** History of Python, Applications Basics of Python Programming, Installing Python, Python Syntax, Comments, Writing a program using Python.	02
2.	**Expression and Console I/O** Variables and Values, Built-in Data Types, Numeric data type and Type Casting, Boolean Expression Evaluation, Operators, Expression Evaluation, Printing Information, User Input.	02
3.	**Control Statement** Statements Execution, Conditions and If Statements, Indentation, If-Else Statements, Nested If Statements, Short Hand If and If-Else, pass Statement, While Loop, For Loop, Nesting Loops, Controlling Loops using Break and Continue, Else Statement, Range Statement and Pass Statement in Loop	05
4.	**Collections** Lists, Lists – Operations, Slicing, Tuples, Sets, Dictionaries, Sequences, Comprehensions	04
5.	**String** String - String Literals, String Assignment, Multiline Strings, Slicing, Negative Indexing, Check String, String Concatenation, String Format, Escape Character, String Methods.	02
6.	**Functions** Creating a Function, Calling a Function, Arguments, Arbitrary Arguments, Arbitrary Keyword Arguments, Default Parameter Value, List as an Argument, Return Values, pass Statement, Recursive Function, Lambda Function.	05
7.	**Classes and Objects** Create a Class, Create Object, __Init__() Function, Methods, Self Parameter, Modification and Deletion of Object Parameter, Deletion of Object, Pass Statement, Inheritance and Polymorphism. Aggregation in Python, Exception Handling	06
8.	**Introduction to Module and Package** Module, Built-In Math Function, Math Module, Module datetime and Date Objects, RegEx Module and RegEx Functions, Create Package, Access Package.	04
9.	**File Handling** Kinds of Files, Creating Files, Opening Files, Reading Files, Writing Files, Delete Files and Folder, Simple APIs.	04
10.	**Python Library (NumPy, Matplotlib)** NumPy Creating Arrays, Array Indexing, Array Slicing, Data Types, Copy vs View, Array Shape and Reshape, Array Iterating, Splitting, Joining, Sorting, Filtering, Universal Functions(ufuncs), Statistical functions. Matplotlib Scatter Plot, Histogram.	06
	TOTAL	**40**

BOOKS REQUIRED

1. Python: The Complete Reference, Martin C. Brown,McGraw-Hill Education
2. Let Us Python, YashavantKanetkar, BPB

FACULTY MEMBER CONCERNED

1. Prof. Sumon Ghosh, Assistant Professor, Department of Computer Applications
2. Prof. (Dr.) Jyotirmoy Ghosh, Assistant Professor, Department of Computer Applications

HERITAGE INSTITUTE OF TECHNOLOGY
Department of Computer Applications
LESSON PLAN

Subject: **Data Structures and Algorithms (MCAP 1201)** **Course:** **[L-T-P = 3-1-0]**
Class: **1st Year 2nd Semester MCA**

Sl. No.	Name of the Topics	Number of Lectures
1	**Introduction to Data Structures** (Data structure overview, Data types, Creation and analysis of programs,Algorithm analysis-performance measurement and analysis, Time and Space complexity, Introduction to order functions)	03
2.	**Linear Data Structures – ARRAY** (Linear Array & its Representation, Two-Dimensional Array & its Representation, Multi-Dimensional Array, Operations on Arrays, Applications – Linear System Equations, Polynomials, Sparse Matrix)	04
3.	**Linear Data Structures – STACK** (Stacks & its Representation, Operations on Stacks, Applications – ArithmeticExpression Evaluation, Parenthesis Matching, Recursion, Tower of Hanoi)	05
4.	**Linear Data Structures – QUEUE** (Queues & its Representation, Operations on Queues, Circular Queues, DoubleEnded Queue, Priority Queue)	03
5.	**Linear Data Structures – LINKED LIST** (Linked List, Operations on Linked List, Circularly Linked List, Doubly Linked List, Representing Stacks & Queues, Representing Polynomial, Applications – Polynomial Manipulation, Ordered Polynomial)	05
6.	**Non-Linear Data Structures – TREE** (Binary Tree & its Representation, Traversal Operation, Complete Binary Tree,Binary Search Tree, Height Balanced Tree, AVL Tree, , m-way Search trees)	05
7.	**Non-Linear Data Structures – GRAPH** (Graph & its Representation, Graph Traversal, Graph search algorithms, Spanning tree algorithms, Shortest Path Algorithms- (Dijkstra's, Floyd Warshall)	05
8.	**Sorting & Searching** (Selection Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, Insertion Sort,Radix Sort, Linear and Binary Search)	05
9.	**Hashing** (Hashing, Hashing Techniques, Applications)	02
10.	**Concepts of Algorithm Design Techniques** (Divide and conquer, Greedy, Dynamic Programming, Backtracking, Branch and Bound)	03
	TOTAL	**40**

BOOKS REQUIRED

1. Classic Data Structures –DebasisSamanta, PHI Learning
2. Data Structures and Algorithms in Java - Goodrich, Tammasia, Goldwasser, Wiley

FACULTY MEMBER CONCERNED

1. Prof. Sumon Ghosh, Assistant Professor, Department of Computer Applications
2. Prof. Palash Ghosh, Assistant Professor, Department of Computer Applications

HERITAGE INSTITUTE OF TECHNOLOGY
Department of Computer Applications
LESSON PLAN

Object Oriented Programming with Java

Code :	**MCAP 2101**	**Contacts:**	**3L + 1T**
Stream:	**MCA**	**Crédits :**	**4**
Year :	**2nd ,1st Semester**	**Batch :**	**2019 – 2022**

(I) CLASSES

1. Monday – 02:00 to 2:50
2. Tuesday – 04.00 to 4.50
3. Wednesday – 02:00 to 3:50
4. Thursday –10:00 to 10:50

(II) LECTURE PLAN

Lecture No	Topic	Sub Topic	No of Lectures	Recommended Books
1, 2	Introduction to Object Orientation	*Introduction to Object* – Oriented Programming	1	Core Java I – Horstmann and Cornell Object Oriented modeling & Design, James R. RumBaugh,
		Object Oriented Concepts – Objects & Classes, Abstraction, Encapsulation, Message Passing, Access Specifier, Comparison of Procedural & OOP		
		Advanced Concepts in Object Oriented Programming – Relationships, Aggregation, Links & Associations, Generalization & Specialization, Inheritance, Abstract Classes, Meta-Class, Grouping Constructs	1	
		Conclusion – Object Oriented Design, Best Practices in OOD		
3, 4	Introduction to Java	The History Behind	2	The Java Programming Language – James Gosling Gateway to Java 2 Programming Sun Certification – Keyur Shah
		Creation of java		
		Types of java programs		
		The Java Virtual Machine		
		Features of Java		
5, 6, 7	Overview of Java Programs	Writing, Compiling and Executing Java Programs	3	JAVA 2 : The Complete Reference – H. Schildt Core Java I– Horstmann and Cornell
		Some Sample Java Programs		
8, 9	Java Language Features	Comments, Keywords, Identifiers, Literals, Separators	2	JAVA 2 : The Complete Reference – H. Schildt Java – How to Program – Deitel and Deitel
		Data Types, Variables, Type Conversion and Casting, Symbolic Constants		
		Operators		
		Control Statements		
		Arrays		
10, 11	String Handling	Definition	2	JAVA 2 : The Complete Reference – H. Schildt Java – How to Program – Deitel and Deitel
		String Class		
		String Methods		
		String Arrays		
		Command Line Arguments		
		StringBuffer Class, StringBuffer Methods		

12, 13, 14, 15	**Classes and Objects**	Introduction	1	JAVA 2 : The Complete Reference – H. Schildt Core Java I – Horstmann and Cornell Java – How to Program – Deitel and Deitel
		Defining a Class, Creating Objects		
		Assigning Object Reference Variables		
		Introducing Methods		
		Array of Objects	2	
		Constructors		
		Method Overloading		
		Passing Objects as Parameters, Returning Objects		
		“this” Keyword and Static Members	1	
		Introducing Access Control		
		Inner and Nested Classes		
16, 17	**Inheritance**	Introduction	1	JAVA 2 : The Complete Reference – H. Schildt Core Java I – Horstmann and Cornell Java – How to Program – Deitel and Deitel
		Types of Inheritance		
		Dealing with “super”		
		Multilevel Inheritance		
		Method Overriding	1	
		Using “final” Keyword		
		The Object Class		
		Abstract Classes		
18	**Interfaces**	Introduction	1	JAVA 2 : The Complete Reference – H. Schildt The Java Programming Language – James Gosling
		Defining an Interface		
		Implementing Interfaces		
		Extending Interfaces		
		Interfaces and Multiple Inheritance		
20	**Packages**	Introduction & Definition	1	JAVA 2 : The Complete Reference – H. Schildt Core Java I – Horstmann and Cornell
		Java API		
		User Defined packages		
		Finding Packages and Classpath		
		Access Control		
21, 22	**Exception Handling**	Introduction	1	JAVA 2 : The Complete Reference – H. Schildt Core Java I – Horstmann and Cornell Java – How to Program – Deitel and Deitel
		Exception and Exception Handling		
		Exception Types		
		Syntax of Exception handling		
		Java’s Built-in Exception	1	
		“throw”, “throws”, “finally” Clause		
		Creating our own Exceptions		
		Chained Exception		
23, 24, 25	**Multithreading**	Multitasking & Multithreading	1	JAVA 2 : The Complete Reference – H. Schildt The Java Programming Language – James Gosling Core Java II – Horstmann and Cornell
		Java and Multithreading		
		Creating Threads		
		Life Cycle of a Thread	1	
		Thread Methods		
		Thread Priorities		
		Synchronization, Deadlock	1	
26	**Garbage Collection**	Introduction	1	JAVA 2 : The Complete Reference – H. Schildt The Java Programming Language – James Gosling
		“finalize” Method		
		Invoking the Garbage Collector		
27, 28, 29, 30	**Excerpts from java.lang and java.util**	Wrapper Classes	1	JAVA 2 : The Complete Reference – H. Schildt Core Java I – Horstmann and Cornell
		System Class		
		Runtime Class		
		Object Class	1	
		Class Class		
		Collections Framework (Introduction, Collections Interfaces, Collections Classes, Vector Class, Stack Class, Hashtable Class)	1	
		String Tokenizer	1	
		java.util.zip and java.util.jar		

31, 32	**Applets**	Introduction	2	JAVA 2 : The Complete Reference – H. Schildt Java – How to Program – Deitel and Deitel
		Writing Applets		
		Applet life Cycle		
		Applet Methods		
		Some Examples		
33, 34, 35, 36, 37, 38	**AWT and Event Handling**	Introduction	1	JAVA 2 : The Complete Reference – H. Schildt Java – How to Program – Deitel and Deitel Thinking in Java – Bruce Eckel
		Two Event Handling Mechanisms		
		The Delegation Event Model		
		Event Classes		
		Sources of Events	1	
		Event Listener Interfaces		
		Using the Delegation Event Model		
		Adapter Classes, Anonymous Inner Classes		
		AWT Classes		
		Window Fundamentals, Working with Frames		
		Creating a Frame Window in an Applet	1	
		Creating a Windowed Program		
		Displaying Information Within a Window		
		Labels	1	
		Using Buttons		
		Applying Check Boxes		
		CheckboxGroup		
		Choice Controls	1	
		Using Lists		
		Managing Scroll Bars		
		Using a TextField and TextArea		
		Understanding Layout Managers	1	
		Menu Bars and Menus		
		Dialog Boxes		
		FileDialog		
		Handling Events by Extending AWT Components		
39, 40	**Graphics**	Introduction	2	JAVA 2 : The Complete Reference – H. Schildt (TMH) Java – How to Program – Deitel and Deitel (PHI)
		Graphics Contexts and Graphics Objects		
		Color control and Font Control		
		Drawing Lines, Rectangles, Ovals, Arcs, Polygons		
		Java 2D API		

(III) BOOKS REQUIRED

1. JAVA 2 : The Complete Reference – H. Schildt (TMH)
2. The Java Programming Language – James Gosling (Addison Wesley)
3. Core Java I and II – Horstmann and Cornell (Sun Microsystems)
4. Java – How to Program – Deitel and Deitel (PHI)
5. Gateway to Java 2 Programming Sun Certification – Keyur Shah (TMH)
6. Thinking in Java – Bruce Eckel (e – book)
7. Object Oriented modeling & Design, James R. RumBaugh, (PHI)

Book given in Online is: JAVA 2 : The Complete Reference – H. Schildt (TMH)

(IV) FACULTY MEMBER CONCERNED

Prof. Sumon Ghosh, Assistant Professor, Department of Computer Applications
Prof. Subhajit Rakshit, Assistant Professor, Department of Computer Applications

HERITAGE INSTITUTE OF TECHNOLOGY
DEPARTMENT OF COMPUTER APPLICATIONS

LESSON PLAN

Cryptography and Network Security

Code :	**MCAP 2262**	**Contacts:**	**3L + 1T**
Stream:	**MCA**	**Crédits :**	**4**
Year :	**2nd, Semester: 2nd**	**Session :**	**2020 – 2021**

(I) CLASSES

1. Monday – 10:00 to 10:50
2. Thursday – 10:00 to 11:50

(II) GOOGLE MEET LINK: https://meet.google.com/jna-sgkv-dfj

(III) LECTURE PLAN

Lecture No	Module	Topic	Sub Topic	No of Lectures	Recommended Books
1, 2	I	**Introduction to Security**	*Security Trends and Attacks* - security of information, new threats, examples of security violations, challenges in security, security models, security goals, security trends, OSI security architecture, types of attacks	2	William Stallings Forouzan, et al. Atul Kahate
3, 4			*Security Services and Mechanisms* - security services, security mechanism, services and mechanisms, techniques	2	
5, 6, 7, 8, 9	II	**Symmetric Key Encryption**	*Classical Encryption* - symmetric cipher model, cryptosystems and cryptanalysis, substitution techniques, transposition techniques	5	William Stallings Forouzan, et al. B. Schneier D.R. Stinson
10			*Block Ciphers* - motivation for feistel structure, the feistel ciphers, feistel encryption and decryption, complete encryption and decryption	1	
11, 12, 13, 14			*Data Encryption Standard (DES)* - development of DES, overview of function of DES, function of DES in detail, DES illustration, strength of DES, attacks on DES, block cipher design issues, double and triple DES	4	
15			*Stream Ciphers* - operation of stream ciphers, RC4	1	
16, 17	I	**Mathematical Foundation**	*Modular Arithmetic* *Euclidean Theorem*	2	William Stallings B. Schneier D.R. Stinson
18, 19			*Prime Numbers* *Fermat's Theorem* *Euler's Theorem*	2	
20			*Chinese Remainder Theorem* *Discrete Logarithms*	1	
21, 22	III	**Asymmetric Key Encryption**	*Principles of Public Key Systems* - overview of public key systems, conventional versus public key encryption, requirements of public key cryptography, cryptanalysis	2	William Stallings Forouzan, et al. B. Schneier D.R. Stinson
23, 24			*RSA* - algorithm, examples, computational aspects, security of RSA, attacks	2	
25			*EIGamal Public Key Encryption* - algorithm, security, efficiency	1	
26, 27	III	**Key Management and Exchange**	*Key Management* - distribution of public keys, distribution of secret keys using public key cryptography	2	William Stallings Forouzan, et al.

			Key Exchange - Diffie Hellman key exchange protocol		
28, 29	III	**Authentication**	*Authentication Requirements*	2	William Stallings Forouzan, et al. Atul Kahate
			Message Authentication Code		
30, 31			*Hash Functions*	2	
			Secure Hash Algorithm		
32			*Digital Signature*	1	
33	IV	**Network Security Applications**	*Authentication Applications* - Kerberos, X509, Public Key Infrastructure	1	William Stallings Charlie Kaufman, et al.
34, 35			*E-mail Security* - PGP, S/MIME	2	
36, 37			*IP and Web Security* - IPSec, SSL, TLS	2	
38, 39	IV	**System Security**	*Intruder Detection and Password Management* - intruders, intrusion detection, password management, challenges in security	2	William Stallings Forouzan, et al. Charlie Kaufman, et al.
			Malicious Software and Firewalls - malicious programs, viruses, worms, virus counter measures, firewalls		
40	IV	**Wireless Network Security**	*Introduction to Wireless Networking*	1	Charlie Kaufman, et al.
			Security Threats and Risks		
			Best Practices on Using Wireless Networks		
			Total	**40**	

(IV) SYLLABUS

Subject Name: CRYPTOGRAPHY AND NETWORK SECURITY					
Paper Code: MCAP 3160					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Point**
	3	**1**	**0**	**4**	**4**

Module I - [10L]

Introduction to Security
Security Goals, Threats, Vulnerabilities and Attacks, Types of Attacks, Security Services and Mechanisms.

Mathematical Foundation
Modular Arithmetic, Euclidean Algorithm, Prime Numbers, Fermat and Euler’s Theorem, Chinese Remainder Theorem, Discrete Logarithm.

Module II - [10L]

Symmetric Key Encryption
Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers, Simple DES, DES Analysis, Double and Triple DES, RC4.

Module III - [10L]

Asymmetric Key Encryption and Hash Functions
Diffie-Hellman Key Exchange, EIGamal Public Key Encryption, RSA, SHA, Digital Signature.

Module IV - [10L]

Network Security Applications
Authentication Applications: Kerberos, X509, Public Key Infrastructure.
Electronic Mail Security – PGP, S/MIME.
IP and Web Security – IPSec, SSL, TLS.

System Security
Intruders, Malicious Software, Viruses, Worms, Firewalls, Security Standards.

Wireless Network Security

Introduction to Wireless Networking, Security Threats and Risks, Best Practices on Using Wireless Networks.

(V) BOOKS REQUIRED

Text Books:

1. Cryptography and Network Security: Principals and Practice – William Stallings, Pearson Education India.
2. Cryptography and Network Security – Forouzan & Mukhopadhyay, McGraw Hill Education.

Reference Books:

1. Cryptography and Network Security: Principals and Practice – Atul Kahate, Tata MCGrawHill.
2. Cryptography: Theory and Practice – D.R. Stinson, CRC Press.
3. Applied Cryptography – B. Schneier, Wiley.
4. Network Security: Private Communication in a Public World by – Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall India.

(VI) FACULTY MEMBER CONCERNED

Prof. (Dr.) Souvik Basu, Head, Department of Computer Applications, HITK

HERITAGE INSTITUTE OF TECHNOLOGY
DEPARTMENT OF COMPUTER APPLICATIONS

LESSON PLAN

Cryptography and Network Security

Code :	**MCAP 3160**	**Contacts:**	**3L + 1T**
Stream:	**MCA**	**Crédits :**	**4**
Year :	**3rd, Semester: 5th**	**Session :**	**2020 – 2021**

(I) CLASSES

1. Monday – 10:00 to 10:50
2. Wednesday – 10:00 to 11:50
3. Thursday – 10:00 to 11:50

(II) GOOGLE MEET LINK: meet.google.com/smt-idrd-izg

(III) LECTURE PLAN

Lecture No	Module	Topic	Sub Topic	No of Lectures	Recommended Books
1	I	Introduction to Security	*Security Trends and Attacks* - security of information, new threats, examples of security violations, challenges in security, security models, security goals, security trends, OSI security architecture, types of attacks	1	William Stallings Forouzan, et al. Atul Kahate
2, 3			*Security Services and Mechanisms* - security services, security mechanism, services and mechanisms, techniques	2	
4, 5, 6	II	Symmetric Key Encryption	*Classical Encryption* - symmetric cipher model, cryptosystems and cryptanalysis, substitution techniques, transposition techniques	3	William Stallings Forouzan, et al. B. Schneier D.R. Stinson
7, 8			*Block Ciphers* - motivation for feistel structure, the feistel ciphers, feistel encryption and decryption, complete encryption and decryption	2	
9, 10, 11, 12			*Data Encryption Standard (DES)* - development of DES, overview of function of DES, function of DES in detail, DES illustration, strength of DES, attacks on DES, block cipher design issues, double and triple DES	4	
13, 14, 15			*Stream Ciphers* - operation of stream ciphers, RC4	3	
16, 17	I	Mathematical Foundation	*Modular Arithmetic* *Euclidean Theorem*	2	William Stallings B. Schneier D.R. Stinson
18, 19			*Prime Numbers* *Fermat's Theorem* *Euler's Theorem*	2	
20, 21			*Chinese Remainder Theorem* *Discrete Logarithms*	2	
22	III	Asymmetric Key Encryption	*Principles of Public Key Systems* - overview of public key systems, conventional versus public key encryption, requirements of public key cryptography, cryptanalysis	1	William Stallings Forouzan, et al. B. Schneier D.R. Stinson
23, 24			*RSA* - algorithm, examples, computational aspects, security of RSA, attacks	2	
25			*EIGamal Public Key Encryption* - algorithm, security, efficiency	1	
26, 27	III	Key	*Key Management* - distribution of public keys,	2	William Stallings

		Management and Exchange	distribution of secret keys using public key cryptography *Key Exchange* - Diffie Hellman key exchange protocol		Forouzan, et al.
28, 29	**III**	**Authentication**	*Authentication Requirements* *Message Authentication Code*	2	William Stallings Forouzan, et al. Atul Kahate
30, 31			*Hash Functions* *Secure Hash Algorithm*	2	
32			*Digital Signature*	1	
33	**IV**	**Network Security Applications**	*Authentication Applications* - Kerberos, X509, Public Key Infrastructure	1	William Stallings Charlie Kaufman, et al.
34, 35			*E-mail Security* - PGP, S/MIME	2	
36, 37			*IP and Web Security* - IPSec, SSL, TLS	2	
38, 39	**IV**	**System Security**	*Intruder Detection and Password Management* - intruders, intrusion detection, password management, challenges in security *Malicious Software and Firewalls* - malicious programs, viruses, worms, virus counter measures, firewalls	2	William Stallings Forouzan, et al. Charlie Kaufman, et al.
40	**IV**	**Wireless Network Security**	*Introduction to Wireless Networking* *Security Threats and Risks* *Best Practices on Using Wireless Networks*	1	Charlie Kaufman, et al.
			Total	**40**	

(IV) SYLLABUS

Subject Name: CRYPTOGRAPHY AND NETWORK SECURITY					
Paper Code: MCAP 3160					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit Point**
	3	**1**	**0**	**4**	**4**

Module I - [10L]

Introduction to Security

Security Goals, Threats, Vulnerabilities and Attacks, Types of Attacks, Security Services and Mechanisms.

Mathematical Foundation

Modular Arithmetic, Euclidean Algorithm, Prime Numbers, Fermat and Euler's Theorem, Chinese Remainder Theorem, Discrete Logarithm.

Module II - [10L]

Symmetric Key Encryption

Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers, Simple DES, DES Analysis, Double and Triple DES, RC4.

Module III - [10L]

Asymmetric Key Encryption and Hash Functions

Diffie-Hellman Key Exchange, EIGamal Public Key Encryption, RSA, SHA, Digital Signature.

Module IV - [10L]

Network Security Applications

Authentication Applications: Kerberos, X509, Public Key Infrastructure.
Electronic Mail Security – PGP, S/MIME.
IP and Web Security – IPSec, SSL, TLS.

System Security

Intruders, Malicious Software, Viruses, Worms, Firewalls, Security Standards.

Wireless Network Security
Introduction to Wireless Networking, Security Threats and Risks, Best Practices on Using Wireless Networks.

(V) BOOKS REQUIRED

Text Books:

1. Cryptography and Network Security: Principals and Practice – William Stallings, Pearson Education India.
2. Cryptography and Network Security – Forouzan & Mukhopadhyay, McGraw Hill Education.

Reference Books:

1. Cryptography and Network Security: Principals and Practice – Atul Kahate, Tata MCGrawHill.
2. Cryptography: Theory and Practice – D.R. Stinson, CRC Press.
3. Applied Cryptography – B. Schneier, Wiley.
4. Network Security: Private Communication in a Public World by – Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall India.

(VI) FACULTY MEMBER CONCERNED

Prof. (Dr.) Souvik Basu, Head, Department of Computer Applications, HITK
Prof. Subhajit Rakshit, Assistant Professor, Department of Computer Applications, HITK

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Fluid Mechanics & Hydraulics. Paper Code: MECH 2102

Lecture Plan

ME 2nd year

Lecture No./Date	Chapter/ Module	Topics to be covered	Remarks
05-Aug	Module 2	Fluid kinematics: Definition; Flow field and description of fluid motion (Eulerian & Lagrangian method),	Done
07-Aug		Steady and unsteady flow, uniform and non-uniform flow-examples.	Done
10-Aug		Problem Discussion	Done
12-Aug		Stream line, Stream tube, Path line; Equation of streamline and path line	Done
14-Aug		Concept of control volume, Continuity equation in finite (1-D)	Done
19-Aug		Continuity equation in differential form in 3-D Cartesian coordinate system.	Done
21-Aug	Module 3	Acceleration of a fluid particle-local acceleration, convective acceleration	Done
26-Aug		Problem Discussion	Done
28-Aug		Fluid dynamics: Euler's equation of motion; Bernoulli's equation and its significance	Done
02-Sep		Bernoulli's Equation for a real fluid with applications in flow measurement -Venturi meter.	Done
04-Sep		Discussion on Orifice meter & Problem Discusion	Done
09-Sep		Discussion on Pitot tube	Done on 06.11.2020
11-Sep	Module 4	Characteristics of Laminar and Turbulent flow;	Done on 11.11.2020
16-Sep		Reynolds experiment, Critical Reynolds number	Done on 13.11.2020
18-Sep		Laminar flow through pipe- Hagen-Poiseuille equation.	Done on 27.11.2020
23-Sep		Cont..Laminar flow through pipe- Hagen-Poiseuille equation	Done
24-Sep		Problem Discussion	Done
25-Sep		Flow through closed conduits: Darcy Weisbach equation;	Done
30-Sep		concept of friction factor in a pipe flow, Variation of friction factor with Reynolds Number	Done

07-Oct		concept of friction factor in a pipe flow, Variation of friction factor with Reynolds Number	**Done**
09-Oct		concept of friction factor in a pipe flow, Variation of friction factor with Reynolds Number	**Done**
14-Oct		concept of friction factor in a pipe flow, Variation of friction factor with Reynolds Number	**Done**
16-Oct		Problem Discussion	**Done**
04-Nov		Discussion	**Done**

Paper Name: Physics - II

Paper Code : PHYS2101

Module 1:

Lecture 1: Introduction to Rigid Body dynamics, Degrees of freedom, numerical problems.

Lecture 2: Centre of mass (continuous mass distribution and discrete system of particles).

Lecture 3: Angular momentum of a particle, total angular momentum of a system of particles/rigid body, kinetic energy of a system of particles.

Lecture 4: Rotation about a fixed axis, moment of inertia and products of inertia

Lecture 5: Calculation of some simple moments and products of inertia to understand the relation between angular velocity and angular momentum.

Lecture 6: Rotation about any axis, introduction to inertia tensor, its properties.

Lecture 7: Calculation of inertia tensor for a few particle system, solid cube, solid cone.

Lecture 8: Principal Axes of inertia, principal moments, finding the principal axes, Eigenvalue equations.

Lecture 9: Calculation of Principal Axes of a cube about a corner and corresponding moments.

Lecture 10: Changes in inertia tensor under translation, parallel axes and perpendicular axes theorem.

Lecture 11: Euler's equation of motion.

Lecture 12: Symmetric Top.

Paper Name: Physics - II

Paper Code : PHYS2101

Module 1:

Lecture 1: Introduction to Rigid Body dynamics, Degrees of freedom, numerical problems.

Lecture 2: Centre of mass (continuous mass distribution and discrete system of particles).

Lecture 3: Angular momentum of a particle, total angular momentum of a system of particles/rigid body, kinetic energy of a system of particles.

Lecture 4: Rotation about a fixed axis, moment of inertia and products of inertia

Lecture 5: Calculation of some simple moments and products of inertia to understand the relation between angular velocity and angular momentum.

Lecture 6: Rotation about any axis, introduction to inertia tensor, its properties.

Lecture 7: Calculation of inertia tensor for a few particle system, solid cube, solid cone.

Lecture 8: Principal Axes of inertia, principal moments, finding the principal axes, Eigenvalue equations.

Lecture 9: Calculation of Principal Axes of a cube about a corner and corresponding moments.

Lecture 10: Changes in inertia tensor under translation, parallel axes and perpendicular axes theorem.

Lecture 11: Euler's equation of motion.

Lecture 12: Symmetric Top.

Lecture Plan
Turbo Machinery [MECH 3237]

Sl. No.	Topic to be covered	Remarks
1. 18.03.21	Definition, Classification and Application of turbo machines. Incompressible and compressible flow turbomachines. Radial, Axial and Mixed flow type machines	Done
2. 23.03.21	Comparison of turbo machines with positive displacement machines; Similarity and model study in turbo machines;	Done
3. 25.03.21	dimensional analysis of incompressible flow turbomachines; unit and specific quantities,	Done
4. 30.03.21	Non- dimensional parameters and their significance; effect of Reynolds number, specific speed. Installation losses of turbo machines.	Done
5. 01.04.21	Pump: Classification and applications, Main components and their function and power transmission system in pump;	Done
6. 06.04.21	Velocity diagram; Multi stage of pump; slip factor; Minimum speed of pump to deliver liquid	Done
7. 08.04.21	overall design considerations of pump; similarity relations and specific speed, selection of pump; cavitation and NPSH,	Done
8. 13.04.21	Horizontal inclined and vertical pump, bore hole pump/ deep well pump/submersible pump. Axial thrust in pump.	Done
9. 15.04.21	Problems	Done on 11.05.21
10. 20.04.21	Problems	Done on 22.04.21
11. 22.04.21	Hydraulic Turbines: Classification and applications; Main components and their functions; degree of reaction;	Done
12. 27.04.21	design aspects of Pelton wheel, Francis and Kaplan turbines; Run away speed of turbine, model and selection of turbine	Done
13. 29.04.21	models and their testing, similarity considerations, relation between the characteristic data of a turbine and that of its model;	Done on 13.05.21
14. 04.05.21	Comparison between hydraulic turbine and steam turbine; governing of water turbine;	Done
15. 06.05.21	Water conveyance system and surge tank.	Done

Lecture Plan
AY 2021-2022 (ODD)

Class No.	Topics to be discussed	Remarks
1.	Carpentry	
2.	Fitting	
3	Lathe Operations	
4.	Lathe opertions Thread cutting	
5	Shaping Machine	
6	Milling Machine	
7	Foundry	
8	MMA welding	
9	Sheet Metal Job	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Workshop/Manufacturing Practices   Paper Code: MECH 1051

Lecture Plan (AY 2020-21) (EVEN) (Theory)

CSE 1st year Sec C

Lecture No./Date	Topics to be covered	Remarks
08.04.21	Introduction to Workshop, Different shops and their functions, Brief descriptions about the shops, Workshop safety, shop wise Dos and Don’ts	
09.04.21	Manufacturing processes and its classification, Brief description of detail classification	
16.04.21	Fitting: Introduction, Importance, Fitting operations (job holding, filing, measuring, marking, sawing, chipping, drilling, reaming)	
22.04.21	Fitting: Thread, Thread nomenclature, Different types of standard threads. Tapping – Tap drill size calculation, Dieing, Twist drill and its nomenclature. Power tools – details about upright drilling machine.	
23.04.21	Carpentry: Introduction to carpentry, Timber - Market forms of converted Timber Types of Wood Hard Wood Soft Wood, Seasoning of wood-Natural seasoning-Artificial seasoning, Carpentry tools	
29.04.21	Carpentry: Carpentry tools, Carpentry process, Different types of joints.	
30.04.21	Sheet Metal Work: Specification of sheet metal, SWG vs. mm, types of sheets, sheet metal operations and tools, Bending machine	
06.05.21	Welding: Definition, types, Gas welding, mechanisms, chemical reactions, components, process. brazing	
07.05.21	Arc Welding: types, MMAW its working principle, components, process, flux, electrodes, safety precautions.	
13.05.21	Machining: basic principle, different motions of machining, cutting tool and its type	
20.05.21	Lathe, components, types of jobs, specifications, types of lathe, operation details	
21.05.21	Shaping machine: Types, working principle, cutting motions, operations, quick return mechanism, specifications	
27.05.21	Milling machine: Types, working principle, up milling and down milling, specifications	
28.05.21	Metal Casting: pattern, moulding, casting, furnace, sand making Metal Casting: foundry shop, foundry tools, bench mould casting process, casting defects.	

Heritage Institute of technology
Department of Mechanical Engineering

BREAK-UP OF LECTURES
Paper Name: **Engineering Graphics & Design**
Paper Code: **MECH 1052**
For Lab Classes
ODD Semester (2021-22)

Lecture No.	Chapter	Topics to be covered	Drg. Sheet No.
01	**Introduction & Lines**	Importance of Engineering Graphics; Demonstration of Equipment and Accessories required for Engineering Drawing. Types and thickness of lines and their applications. Discussion of Title Block with borderline.	
02	**Projection of Points**	Introduction to concept of orthographic projection: 1st angle and 3rd angle projection method; Symbols; Projection of Points with dimensions (details of dimensioning will be discussed in theory classes)	Sheet 1
03	**Projection of Straight lines**	Projection of Straight lines: (a) parallel to both the planes (b) inclined to one plane only. Projection of lines inclined to both HP and VP. Some other problems.	Sheet 2
04	**Projection of Lamina**	Circle, pentagon, hexagon etc (inclined to HP and parallel to VP and vice versa).	Sheet 3
05	**Projection of Solids**	Cube, hexagonal prism, cylinder, pyramid and cone will be taken. Projections on principal and auxiliary planes,	Sheet 4
06	**Section of Solids**	Section of Solids: Projections on principal and auxiliary planes, true shape (cylinder, cone, hexagonal pyramid and prism only).	Sheet 5
07	**Viva-voce**	For entire syllabus	

Reference books:

1) Engineering Drawing by **KL Narayana & P Kannaiah**
2) Engineering Drawing by **Bhatt & Panchal**

Heritage Institute Of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics & Design (Theory)
Paper Code: MECH1052 (Theory)

Academic Year: 2021-2022 (Odd)

CSE, ECE, IT,AEIE,CSBS

Lecture Plan
AY 2021-2022 (ODD)

Class No.	Topics to be discussed	Remarks
1.	Importance of Engineering Graphics; Mention with specifications of Equipment and Accessories required for Engineering Drawing.	
2.	Different Types and thickness of lines and their applications. Basic concepts in lettering : ratio of letter height and width;	
3	Formation of grids. Practicing vertical letters. Discussion of Title Block with borderline.	
4.	Different system of dimensioning with practice: i) Aligned system & ii) Unidirectional system, Discussion of Dimensioning Terminology and execution: Dimension Lines. Extension Lines, Projection Lines, Leader or Pointer Lines, Note, Arrowheads (size). Placing of Dimensions, Aligned System for Linear & Angular Dimensioning, Unidirectional System for Linear & Angular Dimensioning.	
5	Arrangement of Dimensions:Continuous or chain Dimensions. Dimensioning from a common Feature:Progressive or Parallel Dimensioning. Introduction to Scale, Representative fraction, Reducing scale, Enlarging scale	
6	Introduction to concept of Orthographic projection: 1st angle and 3rd angle projection method; Symbols;	
7	Projection of Points with dimensions	
8	Projection of Straight lines: (a) Parallel to both the planes (b) Inclined to one plane only. Projection of lines inclined to both HP and VP. Some other problems.	
9	Projection of lines inclined to both HP and VP. Some other problems	
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11	Projection of Solids: Cube, rectangular prism, hexagonal prism, cylinder, pyramid and cone will be taken, Projections on principal and auxiliary planes.	
12	Section of Solids: Introduction to Section of Solids, Projections on principal and auxiliary planes, true shape (cylinder, hexagonal pyramid and prism only).	

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Department of Mechanical Engineering

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AY 2021-2022 (ODD)

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5	Arrangement of Dimensions:Continuous or chain Dimensions. Dimensioning from a common Feature:Progressive or Parallel Dimensioning. Introduction to Scale, Representative fraction, Reducing scale, Enlarging scale	
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Lecture Plan
AY 2020-2021 (ODD)

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11	Projection of Solids: Cube, rectangular prism, hexagonal prism, cylinder, pyramid and cone will be taken, Projections on principal and auxiliary planes.	
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Heritage Institute Of Technology

Department of Mechanical Engineering

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Academic Year: 2021-2022 (Odd)

CSE, ECE, IT,AEIE,CSBS

Lecture Plan
AY 2021-2022 (ODD)

Class No.	Topics to be discussed	Remarks
1.	Importance of Engineering Graphics; Mention with specifications of Equipment and Accessories required for Engineering Drawing.	
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12	Section of Solids: Introduction to Section of Solids, Projections on principal and auxiliary planes, true shape (cylinder, hexagonal pyramid and prism only).	

Heritage Institute Of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics & Design (Theory)
Paper Code: MECH1052 (Theory)

Academic Year: 2020-2021 (EVEN)

ME

Lecture Plan
AY 2020-2021 (EVEN)

Class No.	Topics to be discussed	Remarks
1.	Importance of Engineering Graphics; Mention with specifications of Equipment and Accessories required for Engineering Drawing.	
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7	Projection of Points with dimensions	
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Heritage Institute Of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics & Design (Theory)
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Academic Year: 2020-2021 (EVEN)

ME

Lecture Plan
AY 2020-2021 (EVEN)

Class No.	Topics to be discussed	Remarks
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Heritage Institute Of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics & Design (Theory)
Paper Code: MECH1052 (Theory)

Academic Year: 2020-2021 (EVEN)

ME

Lecture Plan
AY 2020-2021 (EVEN)

Class No.	Topics to be discussed	Remarks
1.	Importance of Engineering Graphics; Mention with specifications of Equipment and Accessories required for Engineering Drawing.	
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Heritage Institute Of Technology

Department of Mechanical Engineering

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Academic Year: 2020-2021 (Odd)

CSE, ECE, IT,AEIE,CSBS

Lecture Plan
AY 2020-2021 (ODD)

Class No.	Topics to be discussed	Remarks
1. 19.11.2020	Importance of Engineering Graphics; Mention with specifications of Equipment and Accessories required for Engineering Drawing.	Done
2. 20.11.2020	Different Types and thickness of lines and their applications. Basic concepts in lettering : ratio of letter height and width;	Done
3. 26.11.2020	Formation of grids. Practicing vertical letters. Discussion of Title Block with borderline.	Done
4. 27.11.2020	Different system of dimensioning with practice: i) Aligned system & ii) Unidirectional system, Discussion of Dimensioning Terminology and execution: Dimension Lines. Extension Lines, Projection Lines, Leader or Pointer Lines, Note, Arrowheads (size). Placing of Dimensions, Aligned System for Linear & Angular Dimensioning, Unidirectional System for Linear & Angular Dimensioning.	Done
5. 03.12.2020 & 04.12.2020	Arrangement of Dimensions: Continuous or chain Dimensions. Dimensioning from a common Feature: Progressive or Parallel Dimensioning. Introduction to Scale, Representative fraction, Reducing scale, Enlarging scale	Done
6. 10.12.2020 11.12.2020	Introduction to concept of Orthographic projection: 1st angle and 3rd angle projection method; Symbols;	Done
7. 17.12.2020 18.12.2020	Projection of Points with dimensions	Done
8. 24.12.2020 31.12.2020	Projection of Straight lines: (a) Parallel to both the planes (b) Inclined to one plane only. Projection of lines inclined to both HP and VP. Some other problems.	Done
9. 08.01.2021 14.01.2021	Projection of lines inclined to both HP and VP. Some other problems	Done
10. 21.01.2021 22.01.2021	Projection of Lamina: Circle, pentagon, hexagon etc (inclined to HP and parallel to VP and vice versa).	Done
11. 28.01.2021 29.01.2021	Projection of Solids: Cube, rectangular prism, hexagonal prism, cylinder, pyramid and cone will be taken, Projections on principal and auxiliary planes.	Done
12. 04.02.2021 05.02.2021	Section of Solids: Introduction to Section of Solids, Projections on principal and auxiliary planes, true shape (cylinder, hexagonal pyramid and prism only).	Done
13. 04.03.2021	Class Test	Done

Heritage Institute Of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics & Design (Theory)
Paper Code: MECH1052 (Theory)

Academic Year: 2020-2021 (Odd)

EE

Lecture Plan
AY 2020-2021 (ODD)

Class No.	Topics to be discussed	Remarks
1. 06.04.21	Importance of Engineering Graphics; Mention with specifications of Equipment and Accessories required for Engineering Drawing.	Done
2. 09.04.21	Different Types and thickness of lines and their applications. Basic concepts in lettering : ratio of letter height and width;	Done
3. 13.04.21	Formation of grids. Practicing vertical letters. Discussion of Title Block with borderline.	Done
4. 16.04.21	Different system of dimensioning with practice: i) Aligned system & ii) Unidirectional system, Discussion of Dimensioning Terminology and execution: Dimension Lines. Extension Lines, Projection Lines, Leader or Pointer Lines, Note, Arrowheads (size). Placing of Dimensions, Aligned System for Linear & Angular Dimensioning, Unidirectional System for Linear & Angular Dimensioning.	Done
5. 20.04.21 23.04.21	Arrangement of Dimensions: Continuous or chain Dimensions. Dimensioning from a common Feature: Progressive or Parallel Dimensioning. Introduction to Scale, Representative fraction, Reducing scale, Enlarging scale	Done
6. 23.04.21 27.04.21	Introduction to concept of Orthographic projection: 1st angle and 3rd angle projection method; Symbols;	Done
7. 30.04.21 04.05.21	Projection of Points with dimensions	Done
8. 07.05.21 11.05.21	Projection of Straight lines: (a) Parallel to both the planes (b) Inclined to one plane only. Projection of lines inclined to both HP and VP. Some other problems.	Done
9. 14.05.21 18.05.21	Projection of lines inclined to both HP and VP. Some other problems	Done
10. 21.05.21 25.05.21	Projection of Lamina: Circle, pentagon, hexagon etc (inclined to HP and parallel to VP and vice versa).	Done
11. 28.05.21 01.06.21	Projection of Solids: Cube, rectangular prism, hexagonal prism, cylinder, pyramid and cone will be taken, Projections on principal and auxiliary planes.	Done
12. 04.06.21	Section of Solids: Introduction to Section of Solids, Projections on principal and auxiliary planes, true shape (cylinder, hexagonal pyramid and prism only).	Done
13. 15.06.21	Class Test	Done
14. 18.06.21	General Discussion	Done

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics and Design   Paper Code: MECH 1052

<u>Practical Plan</u>

<u>CSE Sec A Gr 2</u>

Lecture No./Date	Topics to be covered	Reference books	Remarks
28.10.21	Introduction of engineering drawing. Different instruments required for drawing and their application	**Engineering Drawing by N. D. Bhatt**	
11.11.21	Concept of orthographic projection. Projection of points		
	Projection of straight lines. Straight line parallel to both the planes. Straight lines parallel to one plane inclined to another plane		
	Projection of straight lines inclined to both the planes		
	Projection of area and lamina. Concept of lamina. Drawing of polygon.		
	Projection of solids. Concept of different types of solids		
	Projection of solids (Contd…)		
	Section of solids. Concept of section, section plane, auxiliary plane		
	Section of solids (Contd..)		
	Isometric projection. Concept of isometric projection, difference between isometric projection and isometric view.		
	VIVA VOCE		

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Engineering Graphics and Design   Paper Code: MECH 1052

Practical Plan

CSE Sec B Gr 2

Lecture No./Date	Topics to be covered	Reference books	Remarks
29.10.21	Introduction of engineering drawing. Different instruments required for drawing and their application	**Engineering Drawing by N. D. Bhatt**	
12.11.21	Concept of orthographic projection. Projection of points		
	Projection of straight lines. Straight line parallel to both the planes. Straight lines parallel to one plane inclined to another plane		
	Projection of straight lines inclined to both the planes		
	Projection of area and lamina. Concept of lamina. Drawing of polygon.		
	Projection of solids. Concept of different types of solids		
	Projection of solids (Contd…)		
	Section of solids. Concept of section, section plane, auxiliary plane		
	Section of solids (Contd..)		
	Isometric projection. Concept of isometric projection, difference between isometric projection and isometric view.		
	VIVA VOCE		

Course Name: ENGINEERING GRAPHICS & DESIGN					
Course Code: MECH 1052					
Contact Hours per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	1	**0**	**4**	**5**	**3**

Course Outcomes:

After going through the course, the students will be able

1. To understand the meaning of engineering drawing.
2. To have acquaintance with the various standards (like lines, dimensions, scale etc.) and symbols followed in engineering drawing.
3. To represent a 3-D object into 2-D drawing with the help of orthographic and isometric projections.
4. To read and understand projection drawings.
5. To draw the section view and true shape of a surface when a regular object is cut by a section plane.
6. To use engineering drawing software (CAD).

Lecture Plan (13 L)

1. Importance and principles of engineering drawing (1 L)
2. Concepts of Conic sections and Scale (1 L)
3. Introduction to concept of projection (Projections of points, lines and surfaces) (4 L)
4. Definitions of different solids and their projections (1 L)
5. Section of solids and sectional view (1 L)
6. Isometric projection (2 L)
7. Introduction to CAD (2 L)
8. Viva Voce (1 L)

Detailed contents of Lab hours (52 hrs)

Module 1: Introduction to Engineering Drawing covering**,**
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lines, lettering & dimensioning, Conic section like Ellipse (General method only); Involute; Scales – Plain, Diagonal.

(4 hrs + 4 hrs)

Module 2: Orthographic Projections covering**,**
Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina.

(4 hrs+4 hrs + 4 hrs)

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views.

(4 hrs + 4 hrs)

Module 4: Sections and Sectional Views of Right Angular Solids covering**,**
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids.

(4 hrs)

Module 5: Isometric Projections covering**,**
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

(4 hrs + 4 hrs)

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

(4 hrs)

Module 7: Customisation& CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

(2 hrs)

Module 8: Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation.

(2 hrs)

Module 9: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame.

(4 hrs)

References:

1. Bhatt, N.D., Panchal V.M. & Ingle P.R., (2014) “Elementary Engineering Drawing” ; Charotan Publishing House

2. Narayana, K.L. and KannaaiahP “Engineering Graphics”; TMH

3. Lakshminarayanan, V. and VaishWanar, R.S “Engineering Graphics” Jain Brothers.

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.

5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, TMH Publications.

Course Name: ENGINEERING GRAPHICS & DESIGN					
Course Code: MECH 1052					
Contact Hours per week:	**L**	**T**	**P**	**Total**	**Credit Points**
	1	**0**	**4**	**5**	**3**

<u>Course Outcomes:</u>

After going through the course, the students will be able

1. To understand the meaning of engineering drawing.
2. To have acquaintance with the various standards (like lines, dimensions, scale etc.) and symbols followed in engineering drawing.
3. To represent a 3-D object into 2-D drawing with the help of orthographic and isometric projections.
4. To read and understand projection drawings.
5. To draw the section view and true shape of a surface when a regular object is cut by a section plane.
6. To use engineering drawing software (CAD).

Lecture Plan (13 L)

1. Importance and principles of engineering drawing (1 L)
2. Concepts of Conic sections and Scale (1 L)
3. Introduction to concept of projection (Projections of points, lines and surfaces) (4 L)
4. Definitions of different solids and their projections (1 L)
5. Section of solids and sectional view (1 L)
6. Isometric projection (2 L)
7. Introduction to CAD (2 L)
8. Viva Voce (1 L)

Detailed contents of Lab hours (52 hrs)

Module 1: Introduction to Engineering Drawing covering**,**
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lines, lettering & dimensioning, Conic section like Ellipse (General method only); Involute; Scales – Plain, Diagonal.

(4 hrs + 4 hrs)

Module 2: Orthographic Projections covering**,**
Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina.

(4 hrs+4 hrs + 4 hrs)

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views.

(4 hrs + 4 hrs)

Module 4: Sections and Sectional Views of Right Angular Solids covering**,**
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids.

(4 hrs)

Module 5: Isometric Projections covering**,**
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

(4 hrs + 4 hrs)

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

(4 hrs)

Module 7: Customisation& CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

(2 hrs)

Module 8: Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation.

(2 hrs)

Module 9: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame.

(4 hrs)

References:

1. Bhatt, N.D., Panchal V.M. & Ingle P.R., (2014) "Elementary Engineering Drawing" ; Charotan Publishing House

2. Narayana, K.L. and KannaaiahP "Engineering Graphics"; TMH

3. Lakshminarayanan, V. and VaishWanar, R.S "Engineering Graphics" Jain Brothers.

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.

5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, TMH Publications.

Course Name: ENGINEERING GRAPHICS & DESIGN					
Course Code: MECH 1052					
Contact Hours per week:	L	T	P	Total	Credit Points
	1	0	4	5	3

Course Outcomes:

After going through the course, the students will be able

1. To understand the meaning of engineering drawing.
2. To have acquaintance with the various standards (like lines, dimensions, scale etc.) and symbols followed in engineering drawing.
3. To represent a 3-D object into 2-D drawing with the help of orthographic and isometric projections.
4. To read and understand projection drawings.
5. To draw the section view and true shape of a surface when a regular object is cut by a section plane.
6. To use engineering drawing software (CAD).

Lecture Plan (13 L)

1. Importance and principles of engineering drawing (1 L)
2. Concepts of Conic sections and Scale (1 L)
3. Introduction to concept of projection (Projections of points, lines and surfaces) (4 L)
4. Definitions of different solids and their projections (1 L)
5. Section of solids and sectional view (1 L)
6. Isometric projection (2 L)
7. Introduction to CAD (2 L)
8. Viva Voce (1 L)

Detailed contents of Lab hours (52 hrs)

Module 1: Introduction to Engineering Drawing covering**,**
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lines, lettering & dimensioning, Conic section like Ellipse (General method only); Involute; Scales – Plain, Diagonal.

(4 hrs + 4 hrs)

Module 2: Orthographic Projections covering**,**
Principles of Orthographic Projections - Conventions - Projections of Points and lines inclined to both planes; Projections on Auxiliary Planes. Projection of lamina.

(4 hrs+4 hrs + 4 hrs)

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views.

(4 hrs + 4 hrs)

Module 4: Sections and Sectional Views of Right Angular Solids covering**,**
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids.

(4 hrs)

Module 5: Isometric Projections covering**,**
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

(4 hrs + 4 hrs)

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

(4 hrs)

Module 7: Customisation& CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

(2 hrs)

Module 8: Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation.

(2 hrs)

Module 9: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame.

(4 hrs)

References:

1. Bhatt, N.D., Panchal V.M. & Ingle P.R., (2014) "Elementary Engineering Drawing" ; Charotan Publishing House

2. Narayana, K.L. and KannaaiahP "Engineering Graphics"; TMH

3. Lakshminarayanan, V. and VaishWanar, R.S "Engineering Graphics" Jain Brothers.

4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Edication.

5. Agarwal B. & Agarwal C. M. (2012), Engineering graphics, TMH Publications.

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Mechanics for Engineers   Paper Code: MECH 2106

Lecture Plan (AY 2021-22)

EE 2nd year

Lecture No./Date	Chapter/Module	Topics to be covered	Remarks
25.10.21	**MODULE 1**	Vector and scalar quantities, Vector algebra –definition and notation Types of vectors – equal , equivalent , free , bound sliding ;	
27.10.21		Addition , subtraction of vectors ; Parallelogram law, triangle law, vector polygon	
28.10.21		Scalar multiplication of vectors, Resolution of vectors in Cartesian co–ordinate system ; Unit vector, unit co–ordinate vectors (i, j, k) Direction cosines; Addition/ subtraction of vectors in components form.	
03.11.21		Dot product , cross product and the application ;	
10.11.21		Important vector quantities (position vector , displacement vector, velocity vector, acceleration vector, force vector);	
11.11.21		Force, Moment of a force about a point and about an axis , moment of a couple ; Representation of force and moments in items of i, j, k .	
18.11.21		Principle of transmissibility of force (sliding vector); Varignon's theorem for a system of concurrent forces with proof; Resolution of a force by its equivalent force-couple system; Resultant of forces., Problem discussion	
20.11.21	**MODULE 2**	Force system, Free Body Diagram, Concept and equilibrium of forces in two dimensions;	
22.11.21		Equations of equilibrium; Equilibrium of three concurrent forces, Lami's Theorem	
25.11.21		Concept of friction: Laws of Coulomb's friction; Angle of friction, angle of repose, Coefficient of friction -- static and kinetic.	
20.11.21		Problem Discussion	
29.11.21		Problem Discusion	
12.01.21	**MODULE 4**	Introduction to dynamics: Kinematics & kinetics; Law of gravitation and acceleration due to gravity; Rectilinear motion of particles with uniform & non – uniform acceleration.	
13.01.21		Plane curvilinear motion of particles: Rectangular components (projectilemotion).	
19.01.21		Kinetics, Newton's 2^{nd} law of motion; D' Alembert Principle	
20.01.21		Principle of Work Energy. Conservation of energy	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Mechanics for Engineers   Paper Code: MECH 2106

Lecture Plan (AY 2020-21)

EE 2nd year

Lecture No./Date	Chapter/Module	Topics to be covered	Reference books	Remarks
10.08.20		Vector and scalar quantities, Vector algebra –definition and notation		
13.08.20		Types of vectors – equal , equivalent , free , bound , sliding ;		
17.08.20		Addition , subtraction of vectors ; Parallelogram law, triangle law, vector polygon		
20.08.20		Scalar multiplication of vectors, Resolution of vectors in Cartesian co–ordinate system ; Unit vector, unit co–ordinate vectors (i, j, k)		
24.08.20		Direction cosines; Addition/ subtraction of vectors in components form.		
27.08.20		Dot product , cross product and the application ;		
31.08.20		Important vector quantities (position vector , displacement vector, velocity vector, acceleration vector, force vector);		
03.09.20		Force, Moment of a force about a point and about an axis , moment of a couple ; Representation of force and moments in items of i, j, k . Principle of transmissibility of force (sliding vector);		
07.09.20		Varignon's theorem for a system of concurrent forces with proof; Resolution of a		

		force by its equivalent force-couple system; Resultant of forces.		
21.09.20		Problem discussion		
24.09.20	**MODULE 2**	Type of forces – collinear, concurrent, parallel, concentrated, distributed; Active and reactive forces, different types of reaction forces; Free body concept and diagram;		
28.09.20		Concept and equilibrium of forces in two dimensions;		
01.10.20		Equations of equilibrium; Equilibrium of three concurrent forces		
05.10.20		Lami's theorem.		
12.10.20		Problem discussion		
08.10.20		Problem discussion		
15.10.20		Problem discussion		
19.10.20		Problem discussion		
03.11.20		Concept of friction: Laws of Coulomb's friction; Angle of friction, angle of repose,		
05.11.20		Coefficient of friction -- static and kinetic.		
09.11.20		Problem discussion		
12.11.20	**Module 3**	Concept of simple stress and strain ; normal stress , shear stress , normal strain, shear strain; hooke's law; poisson's ratio;		
19.11.20		Stress- strain diagram of ductile and brittle material; proportional limit, elastics limit, yield point, ultimate stress, breaking point, modulus of elasticity. Factor of safety for design calculations		
23.11.20		Problem discussion		
26.11.20		Problem discussion		

Lecture Plan
Engineering Thermodynamics [MECH 2203]

Sl. No.	Topic to be covered	Remarks
1. 09.04.21	Compression process, work of compression	Done
2. 16.04.21	Single stage reciprocating compressor,	Done on 11.02.21
3. 23.04.21	Volumetric efficiency, efficiency of a compressor;	Done
4. 30.04.21	Multistage compression, advantages, ideal intermediate pressure	Done
5. 07.05.21	Carnot cycle and its practical difficulties; Basic Rankine cycle with steam	Done
6. 21.05.21	Mean temperature of heat addition, steam rate, heat rate;	Done
7. 28.05.21	Reheat cycle	Done
8. 04.06.21	Regenerative cycle	Done on 02.06.21
9. 18.06.21	General Discussion	Done

Heritage Institute of Technology

Department of Mechanical Engineering

LAB MANUAL

Sub: Fluid Mechanics & Hydraulic
Machines Lab (MECH 2252)

Course Name : FLUID MECHANICS & HYDRAULIC MACHINES LAB

Course Code: MECH 2252

Course Outcomes: At the end of the course, a student will be able to	
CO 1	Identify different flow patterns and regimes.
CO 2	Evaluate Coefficient of Discharge of Flow Measuring Devices.
CO 3	Understand the determination of airflow velocity by a Pitot Static Tube.
CO 4	Analyze the validity of the Bernoulli's equation for steady flow of water in a tapered duct.
CO 5	Demonstrate practical understanding of friction losses in internal pipe flow.
CO 6	Evaluate the overall efficiencies of Pelton turbine, Francis Turbine and Centrifugal pump.

List of Experiments / Jobs to be carried out during the semester

1. Characteristics of Laminar & Turbulent flow.
2. Verification of Bernoulli's Equation.
3. Determination of Coefficient of Discharge of Flow Measuring Devices in pipe flow.
4. Pipe friction characteristics in different flow regimes for flow through pipes.
5. Determination of Coefficient of Discharge of V-Notch & Rectangular Weir.
6. Determination of airflow velocity by a Pitot Static Tube.
7. Performance test of a Centrifugal Pump.
8. Performance test of a Pelton Turbine.
9. Performance test of a Francis Turbine.

Paper Name: Fluid Mechanics and Hydraulics Lab Paper Code: MECH 2252;

Name of Faculty: Arindam Mandal (AM) Session: 2020-21;

Class No.	Topics to be discussed	Remarks
1.	Experiment: Characteristic of Laminar & Turbulent flow.	
2.	Verification of Bernoulli's Equation	
3.	Experiment: Determination of Coefficient of Discharge of Flow Measuring Devices in pipe flow.	
4.	Experiment: Performance test of a Francis Turbine.	
5.	Experiment: Pipe friction characteristics in different flow regimes for flow through pipes.	
6.	Experiment: Determination of airflow velocity by using a Pitot static tube.	
7.	Experiment: Performance test of a Centrifugal pump.	
8.	Experiment: Performance test of a Pelton Turbine.	

Course Name: HEAT TRANSFER					
Course Code: MECH 3102					
Contact Hours per week:	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcomes:

After completion of the course, the students will be able to:

CO1	Recognize the basic laws of heat transfer, and implement the concepts to account for the heat transfer in thermal analyses of engineering systems.
CO2	Evaluate heat transfer rates involving one-dimensional steady-state heat conduction in simple geometries
CO3	Examine heat transfer rates for extended bodies and heat transfer in transient conduction. Define and analyze radiation heat transfer between black surfaces, as well as radiation heat exchange between gray bodies.
CO4	Examine heat transfer by convection by evaluating heat transfer coefficients for forced convection inside ducts and over external surfaces.
CO5	Evaluate heat transfer rates for (i) free convection on a vertical flat plate and (ii) laminar film condensation.
CO6	Understand boiling heat transfer phenomenon and analyze heat exchanger performance by using the methods of LMTD and ε-NTU.

Sl. No.	Syllabus	Contact Hrs
Module 1	Fundamentals: Modes of heat transfer: Physical origins and rate equations; Relationship to Thermodynamics; Analysis of heat transfer problems-methodology; Relevance of heat transfer.	1
	Introduction to Conduction: The conduction rate equation (Fourier's law); Thermal conductivity, isotropic, homogeneous medium, effect of temperature on thermal conductivity of solids, liquids and gases; Thermal diffusivity.	2
	The heat diffusion equation in Cartesian, Cylindrical and Spherical coordinates and its reduction to specific cases.	2
	One-dimensional, steady-state conduction without heat generation: Plane Wall — temperature distribution, thermal resistance, electrical analogy, composite wall, thermal contact resistance.	3
	Radial Systems— the Cylinder and the Sphere, critical thickness of insulation; Overall heat transfer coefficient.	2
	One-dimensional, steady-state conduction with heat generation: Plane wall and radial systems.	2

Module 2	Heat Transfer from Extended Surfaces: General conduction-convection analysis, types of fin, heat flow analysis through fin of uniform cross section (infinitely long, insulated tip, fixed rate of heat loss at the tip and tip with fixed temperature), efficiency and effectiveness of fin Transient Conduction: Lumped capacitance method, thermal time constant, validity of lumped parameter approach, Biot number, Fourier number Radiation: Physical mechanism of thermal radiation, spectral radiation intensity, spectral emissive power and total emissive power; Blackbody radiation: definition of black body, radiation laws, emissivity, absorptivity, reflectivity, transmissivity, Kirchoff's identity; Gray body. Radiation exchange between black bodies, radiation shape factors and various relationships; Heat exchange between non-black bodies, concept of opaque, gray and diffuse surface, irradiation, radiosity, radiation heat exchange among surfaces forming enclosure.	3 2 3 3
Module 3	Forced Convection: Principles of convection; Newton's law of cooling and significance of heat transfer coefficient. Dimensional analysis applied to forced convection; Dimensionless numbers and their physical significance; Empirical correlations Derivation of continuity, momentum and energy equations in 2-D The velocity and thermal boundary layer and its significance; Local and average convection coefficients; Momentum and energy equations of laminar boundary layer on a flat plate; Similarity methods. General solution of von Kármán integral momentum and energy equation of boundary layer; Relation between fluid friction and heat transfer; Introduction to turbulent boundary layer heat transfer. Forced Convection (Continued): Heat transfer in laminar tube flow; Bulk temperature; Empirical relations for pipe and tube flow.	1 1 3 3 4 2
Module 4	Natural Convection: Mechanism of free convection; Velocity and thermal boundary layers. Free convection heat transfer on a vertical flat plate; Empirical relations for free convection. Introduction to Boiling Heat Transfer: General aspects, Boiling regimes, Bubble shape, size, growth and collapse, Critical diameter; Factors affecting nucleate boiling. Condensation Heat Transfer: General aspects; laminar film condensation. Heat Exchangers: Uses and types of heat exchangers; Parallel and counter-flow types. Introduction to LMTD method; correction factors; Fouling factor.	2 2 1 1

	ϵ-NTU method for heat exchangers	1 2 2
		48

Text Books:

1. Introduction to Heat Transfer- S.K. Som, PHI, 2e
2. Heat & Mass Transfer, P.K. Nag, TMH, 3e

Reference Books:

1. Fundamentals of Heat and Mass Transfer-Incropera, DeWitt, Bergmam, & Lavine, Wiley India
2. Heat and Mass Transfer: A Practical Approach- Yunus A. Cengel, McGraw-Hill, 2007
3. Heat Transfer-J P Holman &Souvik Bhattacharyya, TMH
4. NPTEL lecture series on heat transfer

Professional Elective -I Lab

Course Name : FLUID POWER CONTROL LAB					
Course Code: MECH 3181					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

Course Outcomes:

At the end of the course, a student will be able to	
CO 1	Identify the basic components of fluid power control systems.
CO 2	Apply the knowledge of engineering fundamentals to understand the working principle of different components used in fluid power control circuits.
CO 3	Prepare different circuits with relevant components for actuator control and demonstrate the same.
CO 4	Calculate various useful parameters from the experimental readings with some knowledge on related errors in the experimental readings/setup/procedure/instruments.
CO 5	Relate pressure, flow rate from one set of units to another for computing performance analysis parameters.
CO 6	Justify the use of different fluid power control circuits for desired outcome.

List of Experiments:

1. Study of a hydraulic trainer system.
2. Study of a pneumatic trainer system.
3. Controlling the speed of a pneumatic cylinder using a flow control valve.
4. Controlling the speed of a hydraulic cylinder using a flow control valve.
5. Prepare an ‘AND’ logic circuit using pneumatic components.
6. Prepare an ‘OR’ logic circuit using pneumatic components.
7. Operation and study of the function of a pressure reducing valve in a hydraulic circuit.
8. Preparation and operation of a hydraulic circuit for sequencing two hydraulic cylinders using a sequence valve.

Professional Elective -I Lab

Course Name : FLUID POWER CONTROL LAB					
Course Code: MECH 3181					
Contact hrs per week:	**L**	**T**	**P**	**Total**	**Credit points**
	0	**0**	**3**	**3**	**2**

Course Outcomes:

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Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Advanced Welding Technology   Paper Code: MECH 3222

Lecture Plan [AY 2020-2021]

ME 3RD Year

Lecture No./Date	Topics to be covered	Reference books	Remarks
17.03.2021	Introduction, Brief classification of welding, MMAW welding	**A text book of Welding Technology by OP Khanna**	
19.03.2021	Sequence of welding in long T joint		
24.03.2021	Process description and parametric influence of SMAW, GTAW and SAW		
26.03.2021	Process description and parametric influence of GMAW and MAG		
31.03.2021	Process description and parametric influence of FCAW , Types of power source		
07.04.2021	Problems of welding		
09.04.2021	Basic concept of resistance welding process		
16.04.2021	Detail discussion on PAW and LBW		
21.04.2021	Detail discussion on EBW and USW. Discussion on electro slag welding		
23.04.2021	Solid state welding: process description of pressure welding, friction welding and diffusion welding techniques		
28.04.2021	Process description of friction stir welding		
30.05.2021	Process description of Underwater welding		
05.05.2021	Welding of plastics and ceramics		
07.05.2021	Welding of composite materials		
12.05.2021	Welding defects: Types, causes and remedial measure		
19.05.2021	Testing of welded joints; destructive tests		
21.05.2021	Testing of welded joints; non-destructive tests		
26.05.2021	Safe practice of welding		
28.05.2021	Viva Voce		

Closure Report:

Design of Mechanical Systems-II (MECH 3251)

Class No	Date	Module	Topic	Remark
1		1A	❖ What is a Gear? ❖ Classification of gears. ❖ Application of gears in industry and in daily life. ❖ Discussion on nomenclatures of a gear tooth in detail. ❖ Various materials of a gear.	
2			❖ Discussion on various tooth profiles and their merits and demerits. ❖ Concept of Line of Action and Pressure Angle. ❖ Laws of Gearing. ❖ Interference and under cutting in gear teeth. ❖ Solving few problems on Laws of Gearing	
3		1B	❖ Discussion on various constructional parameters like Circular Pitch, Diametral Pitch, Module, Gear Ratio and Center Distance. ❖ Expression of various gear parameters in terms of Module based on Basic Racks.	
4			❖ Discussion on force analysis of meshing gears and practicing few related problems. ❖ Derivation of Lewis formula for determining beam strength. ❖ Concept of Tooth Form factor and Lewis Form Factor.	
5			❖ Beam strength analysis of gear tooth using Lewis formula. ❖ Concept of service factor and velocity factor. ❖ Buckingham formula for checking dynamic load.	
6			❖ Wear strength analysis of gear tooth using Buckingham formula based on Hertz's theory. ❖ Solving various problems for comparative study.	
7		1C	❖ Detailed discussion on nomenclatures of helical gear tooth. ❖ Discussion on various parameters like Normal Circular Pitch, Transverse Circular Pitch, Normal Diametral Pitch, Transverse Diametral Pitch, Normal Module, Transverse Module, Normal Pressure Angle, Transverse Pressure Angle and Helix Angle.	
8			❖ Concept of Formative or Virtual Spur gear and Virtual Number of Teeth. ❖ Force analysis of helical gears in meshing	
9			❖ Beam strength analysis of helical gear tooth using Lewis formula. ❖ Buckingham formula for checking dynamic load.	

			❖ Wear strength analysis of helical gear tooth using Buckingham formula based on Hertz's theory.	
10		2A	❖ Various types of bevel gears and their use. ❖ Nomenclature of Bevel Gear tooth. ❖ Concept of Formative or Virtual Spur gear and Virtual Number of Teeth for a Bevel Gear. ❖ Force analysis of Bevel gears in meshing	
11			❖ Beam strength analysis of bevel gear tooth using Lewis formula. ❖ Buckingham formula for checking dynamic load. ❖ Wear strength analysis of bevel gear tooth using Buckingham formula based on Hertz's theory.	
12		2B	❖ Terminologies and their inter-relation ❖ Preferred combination of various parameters ❖ Efficiency ❖ Materials.	
13		2C	❖ Various types of pressure vessels and their use in industries and in daily life. ❖ Derivation of Transverse Stress and Longitudinal Stress in a thin-walled pressure vessel as a function of wall thickness, diameter and fluid pressure.	
14			❖ Detailed discussion on thick-walled pressure vessel: concept of principal stresses, derivation of radial stress and tangential stress.	
15			❖ Derivation of Lame's equation, Clavarino's equation and Birnie's equation. ❖ Application of above equations in designing a thick-walled pressure vessel according to various conditions and materials.	
16			❖ Discussion on compound pressure vessel. ❖ Concept of Autofrettage. ❖ Designing of pressure vessel following industrial codes as per ASME standards.	
17		3	❖ Function of a Clutch, Various types of clutches and materials of a clutch. ❖ Derivation of Torque Transmitting Capacity of a single plate clutch as per Uniform Pressure Theory.	
18			❖ Derivation of Torque Transmitting Capacity of a single plate clutch as per Uniform Wear Theory. ❖ Modification in the above expression for calculating torque transmitting capacity for multiplate clutches.	
19			❖ Discussion on the constructional details and working principal of a Cone Clutch. ❖ Derivation of Torque Transmitting Capacity of a Cone Clutch.	
20			❖ Discussion on the constructional details and working principal of a Centrifugal Clutch.	

			❖ Derivation of Torque Transmitting Capacity of a Centrifugal Clutch. ❖ Discussion on Thermal Aspect of a clutch design.	
21			❖ Function of a Brake and its types. ❖ Detailed discussion on Block Brake with single short shoe and double short shoes. ❖ Self-energizing and Self-locking aspects of a brake.	
22			❖ Block Brake and Pivoted Block Brake with long shoe. ❖ Internal Expanding Brake.	
23			❖ Detailed discussion on Band Brakes- Simple and Differential types. ❖ Energy equation for braking time calc	
24			❖ Magnetic and hydraulic thruster operated fail-safe brakes ❖ Brake lining materials ❖ Thermal considerations during braking.	
25		4A	❖ What is bearing and its utility in industries as well as in daily life. ❖ Classification of Bearings in detail with definition of each type and their uses. ❖ Different types of Lubricant Materials.	
26			❖ About Viscosity and Viscosity Index ❖ Petroff's Equation and solving a problem using Petroff's equation. ❖ Mckee's Investigation and Stribeck Curve	
27			❖ Derivation for discharge of viscous flow through rectangular Slot ❖ Derivation for discharge and load carrying capacity of Hydrostatic foot step bearing.	
28			❖ Derivation for energy losses in Hydrostatic Bearing ❖ Solving problems on viscous flow in different types of Hydrostatic Bearings	
29			❖ A detailed discussion on Hydrodynamic Bearings. ❖ Mathematical expressions of Reynold's Equation for infinite bearing.	
30			❖ Discussion on Raimondi and Boyd method for solving finite bearing problems. ❖ Solving few numerical questions on hydrodynamic bearing.	
31		4B	❖ An overview about Rolling contact bearing and its detailed classification. ❖ A detailed discussion on utility of different types of rolling contact bearings and logic behind the selection of bearing types on the basis of load types.	
32			❖ A detailed discussion on Static Load carrying capacity and Stribec's Equation	

33			❖ A detailed discussion on Dynamic Load carrying capacity and Equivalent Bearing Load. ❖ Discussion on Load-Life relationship.	
34			❖ A detailed discussion on selection methodology of bearings from manufacturers' catalog.	
35			❖ Discussion of different types of lubrication and methods of bearing mounting on journal and bearing block. ❖ Solving few problems on Rolling Contact bearing.	
36			❖ Problem solving and doubt clearance.	

CAD/CAM (MECH 3264)

Class No	Date	Module	Topic	Remark
1		1	❖ A general discussion on Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) and their role in modern industry.	
2			❖ An overview about computer graphics and its importance as well as utility in CAD/CAM. ❖ Brief discussions about various display units.	
3			❖ Discussion on various types of Video Graphics Array, their developments starting from the primitive one and their utility. ❖ Brief discussion on various types of graphics standards according to the hierarchy.	
4			❖ Various types of CAD data exchange formats. ❖ A detailed discussion on IGES and STEP format for exchange of CAD data.	
5			❖ DDA line drawing algorithm ❖ Simple Bresenham algorithm for drawing line in first quadrant.	
6			❖ Integer Bresenham line drawing algorithm ❖ Generalized Bresenham line drawing algorithm.	
7			❖ Matrix representation of coordinates of a point. ❖ Translation and Scale transformations.	
8			❖ Reflection transformation and Rotation transformation.	
9			❖ Homogeneous representation of transformation matrix. ❖ Composite transformations and concept of concatenated transformation matrix to find out final coordinate data.	
10		2	❖ Various curve entities and their explicit and implicit form. ❖ Parametric representation of curve and comparison with analytical representation.	
11			❖ A detailed discussion of parametric representation of a straight line. ❖ Determination of coordinate of the intersection point of two straight lines parametrically.	
12			❖ Parametric representation of a straight line which is orthogonal to another straight line expresses by a parametric equation.	
13			❖ Determination of perpendicular distance of a point from a given straight line represented parametrically.	
14			❖ Parametric representation of a circle having radius ‘r’ and center at (x,y).	

			❖ Determination of parametric expression of a circle passing through three given points.	
15			❖ Parametric representation of a circle having radius ‘r’ and passing through two given points. ❖ Parametric representation of a circle having radius ‘r’ and tangent to two given straight lines expressed parametrically.	
16			❖ Parametric representation of a Cubic Spline curve and discussion on its characteristics. ❖ Discussion on parametric representation of a Bezier curve and its properties.	
17			❖ A brief discussion on Non-Uniform Rational Bezier Spline (NURBS) and its properties.	
18			❖ Various types of analytical surface geometries and a brief qualitative discussion on each. ❖ Various types of aesthetic surface geometries and a brief qualitative discussion on each.	
19			❖ Various types of solid geometries used into a CAD system. ❖ Discussion of construction methodology (not analytical) of CSG and B-rep.	
20		3	❖ An overview about FEA method and its utility in CAD/CAM. ❖ Discussion on field variables, domain variables, governing differential equation and solution of governing differential by various numerical methods.	
21			❖ Method of weighted residual and method of Galarkin weighted residual. ❖ Solving various related problems.	
22			❖ Principle of Stationary Total Potential (PSTP) and its implementation to find out total potential energy equation. ❖ Reighley-Ritz method to find out approximate solution for the field variable in terms of domain variable from expression of total potential energy.	
23			❖ Determination of shape function [N] of a 2-node Bar element in terms of domain variable and elemental dimensions or length of the Bar element.	
24			❖ Determination of Strain-displacement relationship matrix [B] and elemental stiffness matrix $[k]^e$ of the 2-node Bar element from the general expression of $[k]^e$ as a function of [B]. ❖ Solving related problems.	
25			❖ Determination of shape function [N] of a 3-node Bar element in terms of domain variable and elemental dimensions or length of the Bar element.	

26			❖ determination of strain-displacement relationship matrix [B] and elemental stiffness matrix $[k]^e$ of the 3-node Bar element from the general expression of $[k]^e$ as a function of [B]. ❖ Solving related problems	
27			❖ Discussion on transformation matrix to transform stiffness matrix of a Bar element into global coordinate system from local coordinate system to solve Truss problems.	
28			❖ Detailed discussion on method of globalization of elemental stiffness matrices to find out global stiffness matrix of all the elements generated after discretizing a topology under analysis.	
29			❖ Determination of shape function [N] of a 2-node Beam element in terms of domain variable and elemental dimensions or length of the Beam element. ❖ Solving various truss problems	
30			❖ determination of strain-displacement relationship matrix [B] and elemental stiffness matrix $[k]^e$ of the 2-node Beam element from the general expression of $[k]^e$ as a function of [B]. ❖ Solving related problems	
31		4	❖ A detailed discussion on Computer Aided Manufacturing (CAM) and its importance in modern manufacturing activity.	
32			❖ A detailed discussion on Computer Integrated Manufacturing (CIM) and its importance in industrial product manufacturing.	
33			❖ An overview about Computerized Numerically Controlled (CNC) machine and its working methodology. ❖ A discussion on various standards followed to specify its construction and workings.	
34			❖ Fundamentals of part programming and process planning to create a job using CNC machine. ❖ Various types of preparatory functions, that is, ‘G’ codes.	
35			❖ Detailed discussion on ‘Motion’ group of functions, ‘Dwell’ function, ‘Active plan selection’ group of functions, ‘Cutter compensation’ group of functions, ‘Units’ group of functions, ‘Hole making canned cycle’ group of functions and ‘Coordinate system’ group of functions.	
36			❖ Various types of Miscellaneous functions, that is, ‘M’ codes. ❖ Writing manual part programs on various milling and turning operations.	

Paper Name: Advance Fluid Mechanics Lab   Paper Code: MECH 3283;

Name of Faculty: Arindam Mandal (AM)   Session: 2020-21;

Class No.	Topics to be discussed	Remarks
1.	Experiment: Determination of Cavitation parameters of a Centrifugal Pump.	
2.	Experiment: Minor Losses in pipes fitting apparatus	
3.	Experiment: Performance test of pumps in Series	
4	Experiment: Performance test of pumps in Parallel	
5.	Experiment: Verification of Stokes Law	
6.	Experiment: Performance Test of Submersible Pump	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Engineering Computational Techniques Paper Code: MECH 4124

Lecture Plan (AY 2021-22)

CSE 4th year

Lecture No./Date	Chapter/Module	Topics to be covered	Remarks
04.10.21	**MODULE 1**	Simple Mathematical model of engineering problem, Conservation Laws in Engineering.	
25.10.21		Formulation and solution of linear algebraic equations by Gauss elimination method.	
27.10.21		Formulation and solution of linear algebraic equations by LU decomposition method.	
01.11.21		Solution of linear algebraic equations through iteration methods, discussion on Gauss Seidel method. Testing of convergence for iterative method. Approximations– Significant figures,	**Done on 07.11.21**
03.11.21		Discussion of round of error, significant digits, order of magnitude. Accuracy, Precision & Error definition and formulations.	
08.11.21		Discussion on truncation errors, Taylor series expansion, error propagation.	
10.11.21		Roots of Equation: Newton-Raphson method, Secant Method, roots of polynomial: Muller's method, Bairstow's method	
15.11.21	**MODULE 2**	Discussion on Linear regression, standard error of regression, coefficient of determination andcoefficient of correlation.	
01.12.21		Discussion on polynomial regression	
06.12.21		Discussion on multiple linear regression, general least square	
08.12.21		Discussion on multiple linear regression, general least square	
13.12.21		Studying of Interpolation methods: Newton's divided difference interpolation of polynomials,	
15.12.21		Studying of Lagrange interpolation of polynomials.	
		Optimization: one dimensional unconstrained problem, Golden-section search, multi dimension unconstrained problem, Gradient method	
20.12.21	**MODULE 3**	Numerical Integration: The Trapezoidal rule, Discussion of Simpson's rule.	
22.12.21		Discussion of Gauss quadrature	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Computational Methods in Engineering   Paper Code: MECH 4128

Lecture Plan (AY 2021-22)

ME 4th year

Lecture No./Date	Chapter/Module	Topics to be covered	Remarks
04.10.21	**MODULE 1**	Simple Mathematical model of engineering problem, Conservation Laws in Engineering.	
25.10.21		Formulation and solution of linear algebraic equations by Gauss elimination method.	
27.10.21		Formulation and solution of linear algebraic equations by LU decomposition method.	
01.11.21		Solution of linear algebraic equations through iteration methods, discussion on Gauss Seidel method. Testing of convergence for iterative method. Approximations–Significant figures,	**Done on 07.11.21**
03.11.21		Discussion of round of error, significant digits, order of magnitude. Accuracy, Precision & Error definition and formulations.	
08.11.21		Discussion on truncation errors, Taylor series expansion, error propagation.	
10.11.21		Roots of Equation: Newton-Raphson method, Secant Method, roots of polynomial: Muller's method, Bairstow's method	
15.11.21	**MODULE 2**	Discussion on Linear regression, standard error of regression, coefficient of determination andcoefficient of correlation.	
01.12.21		Discussion on polynomial regression	
06.12.21		Discussion on multiple linear regression, general least square	
08.12.21		Discussion on multiple linear regression, general least square	
13.12.21		Studying of Interpolation methods: Newton's divided difference interpolation of polynomials,	
15.12.21		Studying of Lagrange interpolation of polynomials.	
		Optimization: one dimensional unconstrained problem, Golden-section search, multi dimension unconstrained problem, Gradient method	
20.12.21	**MODULE 3**	Numerical Integration: The Trapezoidal rule, Discussion of Simpson's rule.	
22.12.21		Discussion of Gauss quadrature	

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Computational Methods in Engineering   Paper Code: MECH 4142

Lecture Plan (AY 2020-21)

ME 4th year

Lecture No./Date	Chapter/Module	Topics to be covered	Reference books	Remarks
05.08.20	**MODULE 1**	Simple Mathematical model of engineering problem,	Numerical Methods for engineers by Steven C Chapra& Raymond P. Canale, McGraw- Hill	
07.08.20		Problem discussion		
14.08.20		Conservation Laws in Engineering.		
19.08.20		Approximations– Significant figures, Accuracy, Precision & Error definition and formulations.		
21.08.20		Discussion of round of error, significant digits, order of magnitude		
26.08.20		Discussion on truncation errors, Taylor series expansion, error propagation.		
28.08.20		Problem discussion		
02.09.20		Formulation and solution of linear algebraic equations by Gauss elimination method.		
04.09.20		Problem discussion		
25.09.20		Formulation and solution of linear algebraic equations by LU decomposition method.		
26.09.20		Problem discussion		
30.09.20	**MODULE 2**	Solution of linear algebraic equations through iteration methods, discussion on Gauss Seidel method		
07.10.20		Testing of convergence for iterative method.		
09.10.20		Discussion on Linear regression, standard error of regression, coefficient of determination andcoefficient of correlation.		
14.10.20		Discussion on polynomial regression		
16.10.20		Discussion on multiple linear regression, general least square		
04.11.20		Studying of Interpolation		

		methods: Newton's divided difference interpolation of polynomials,		
06.11.20		Studying of Lagrange interpolation of polynomials.		
11.11.20		Problem discussion		
13.11.20	**MODULE 3**	Numerical Integration: The Trapezoidal rule		
18.11.20		Discussion of Simpson's rule,		
20.11.20		Discussion of Gauss quadrature		
25.11.20		Problem discussion		
27.11.20		VIVA VOCE		

Department of Mechanical Engineering

Lecture Plan [ME -4th yr] (EVEN Sem 2020-21)

Paper Name: DESIGN OF A INDUSTRIAL PRODUCT **Paper Code: MECH 4221**

Name of Faculty: Rajarshi Sengupta (RS)

Title: Design of a submersible pump

Lecture No./Date	Topics discussed	Reference Materials	Remarks
1	Submersible Pump : description and its application	Hydraulic Machines : by Jagdish Lal Reference Journal Papers relevant to design	
2	Discussion on Components of Submersible pump		
3.	Literature review &Input data selection.		
4.	Discussion of steps of calculations for the dimensions		
5.	Discussion on validation of calculated data with Industry Standards.		
6.	Discussion on GA Drawing		
7.	Discussion on Component drawings.		
8.	Discussion & Finalization of all the components with GA & component drawings		

Heritage Institute of Technology

Department of Mechanical Engineering

Paper Name: Mechanical Handling of Materials   Paper Code: MECH 4281

Lecture Plan [AY 2020-2021]

CE 4th year

Lecture No./Date	Topics to be covered	Reference books	Remarks
17.03.2021	Introduction of material handling system. Use and characteristics of belt conveyor,	**Introduction to Materials Handling by Siddhartha Ray**	
22.03.2021	constructional features of flat and troughed belt conveyor;		
24.03.2021	Design aspects of flat belt conveyors		
31.03.2021	Use and constructional features of Flg. types of chain conveyors – apron, car and trolley type;		
05.04.2021	Construction of link-plate chains; Dynamic phenomena in chain drive;		
07.04.2021	Use and constructional features of roller conveyors; Gravity and powered roller conveyor		
12.04.2021	Pneumatic conveyor-use and advantages; Positive, negative and combination system of pneumatic conveyors;		
19.04.2021	Constructional feature, application and conveying capacity of screw conveyor, bucket elevator.		
21.04.2021	Problem discussion on screw conveyor		
26.04.2021	Advantage of using steel wire rope over chain; constructional features of wire ropes;		
28.04.2021	Rope drum design; Pulley system-simple vs. multiple pulley		
03.05.2020	Load handling attachments : hooks, grabs, tongs, grab bucket;		
05.05.2020	Use and constructional features of hand operated trolley hoist, winch Jib crane,		
10.05.2021	Load handling attachments : Overhead traveling crane and wharf crane; Level luffing system of a wharf crane;		
12.05.2021	Utility of truck mounted and crawler crane.		
17.05.2021	Auxiliary Handling Equipment : Descriptive specification and use of – Slide and trough gates,		
19.05.2021	Descriptive specification and use of -belt, screw and vibratory feeders,		
24.05.2021	Auxiliary Handling Equipment : Chutes, positioners like elevating platform, ramps, universal vise; ball table.		
26.05.2021	Viva voce		
31.05.2021	Revision		

Closure Report:

LESSON PLAN

Subject: Workshop / Manufacturing Practices **Subject Code: MECH1051**

Contact: 1L **Credit: 3**

Class No	Contents	Theoretical Topics needs to be covered in the class
1	Introduction to Workshop and Safety precautions	Introduction to workshop - various shops in a typical workshop - Carpentry, Fitting, Foundry, Sheet Metal Shop, Welding and Brazing Shop, Machine Shop , Forging & Smithy - Safety precautions to be followed in a workshop - Familiarization of various safety devices and their uses.
2	Manufacturing Methods – Casting, Forming, Forming, Machining, Joining, Advanced Manufacturing	Manufacturing Process – classification of manufacturing processes – metal casting process – Important terms used in casting – steps in making sand casting. Introduction to forming process – Rolling – Forging – Extrusion – Die Forming – Bending – Shearing – Advantages of forming – Disadvantages of forming.
3		Introduction to Machining – different machining operations (Facing, Turning, Taper turning, Grooving, Knurling, Drilling, Boring, Reaming, Milling, Shaping) - Advantages and Disadvantages of machining
4		Introduction to Joining Process – different joining process (Mechanical fastening, Riveting, Welding, Soldering, Brazing) – Welding Process - Advantages and Limitations of welding Process – Types of Welding – Arc Welding – Resistance Welding – Oxy-Fuel gas welding – Solid state welding – Diffusion welding – Friction stir welding – Ultrasonic welding – Different types welding Joints. Advanced manufacturing process – classification of advanced machining – Electrochemical (ECM, ECG) – Thermal (EDM, WEDM, LBM, EBM) – Mechanical (AJM, WJM, AWJM, USM).
5	CNC Machining and Additive Manufacturing	Introduction to CNC machining – working principle – benefits. Introduction to Additive manufacturing – working principle - Benefits
6	Fitting Operations and Power Tools	Introduction to Fittings – Importance of fittings - Fitting operations (Marking, Drilling, Reaming, Thread cutting – Thread nomenclature, Different types of standard threads – BSW, BSP, TPI; Tapping – Tap drill size calculation, Sawing, Dyeing etc) – Holding Tools (Vices, V-block, C-Clamp etc) –Marking and Measuring Tools (Surface plate, Try square, Scriber, Calipers, Divider, Punch etc) - Cutting Tools (Hack saw, Chisel, Twist drill, Taps and tap wrenches, Die and Die-holders etc) – Finishing Tools (Reamers, Files etc) - Miscellaneous tools – Power tools – right and wrong working practices.
7	Electrical and Electronics	Introduction – Basics of electrical & electronics (Electricity, Voltage, Current, AC, DC, Current, Resistance, Capacitance, Inductance) – Conductor –Semiconductor – Insulator – Electrical & Electronics Components (Power source, resistor, Capacitor, Inductor, Diode, Transistor, Switch, Rectifiers) – Electrical machines (Transformer, Motor) – Tools (Pliers, Wire cutter, Wire stripper, Tester, Multi-meter, Solder iron).
8	Carpentry	Introduction to Carpentry – Timber - Market forms of converted Timber e.g. log, balk, plank, batten, beam - Types of Wood - Hard Wood - Soft Wood - Seasoning of wood - Natural seasoning - Artificial seasoning - Carpentry Tools - Marking Tools - Cutting Tools - Planning Tools - Boring Tools - Striking Tools - Holding & Miscellaneous Tools - Carpentry Processes (marking, sawing, planning, Chiseling, boring, grooving etc.) - Safety precautions in Carpentry Shop.

9	Foundry and Metal Casting	Introduction to moulding – Pattern – Importance of pattern – pattern material – Types of pattern – Pattern Allowances - Mould making – Constituents of moulding sand – Types of moulding sand - Preparation of sand (silica, clay, moisture, and misc items and their functions) - Properties of a good sand mould - General procedure for making a good sand mould - Different tools used for preparation of a mould - Explanation of various terms (Cope and Drag Box, Runner, Riser, Gating and its utility, Parting sand, Vent holes). Mould making – placing of sprue – gate cutting – melting of metals in muffle furnaces – Pouring of molten metal in cavity – Solidification – removal of casting – Checking of casting defects – finishing.
10	Plastic Injection Moulding	Introduction to Injection Moulding –Advantages and limitations - Applications – Working principle – Procedure of injection moulding
11	Welding – Arc Welding	Welding – Weldability - Types of Welding – MMAW - Gas Welding – Electrode - Functions of Flux - Equipment for MMAW - Different types of welding joints - AC Welding - DC Welding - Safety precautions in Welding Shop.
12	Welding – Gas Welding, Brazing	Specification of sheet metal - SWG vs. mm - HR sheet - CR sheet - GI Sheet - Stainless Steel Sheet - Aluminum sheets - Tin Plates - Sheet metal working Tools – Micrometer – Chisels – Punches – Hammers – Mallets - Hand Shear or Snippets - Various sheet metal forming operations – Shearing – Marking – Punching – Drilling – Bending – Drawing – Brazing - Safety precautions in Sheet Metal Working Shop. Introduction to Gas welding – Chemistry of Oxy-acetylene gas welding – Oxy-Acetylene ratio control by regulators - Welding torch - Different types of Flames in Gas Welding and Gas Cutting - Neutral Flame – Oxidizing Flame –Carburizing Flame - Brazing
13		Viva-voce

Recommended books:-

1. Elements of Workshop Technology (Vol- I and II) - Hajra Choudhury, Media Promoter & Publishers Privet Limited.
2. Workshop Technology (Vol- I and II) – Chapman, Viva Books Privet Limited.
3. Workshop Technology – R.S Khurmi, J.K Gupta , S Chand & Company Ltd
4. Manufacturing Technology Vol – I and II – P. N Rao, Tata McGrawHill House

LESSON PLAN

Subject: Workshop / Manufacturing Practices **Subject Code: MECH1051**

Contact: 1L **Credit: 3**

Class No	Contents	Theoretical Topics needs to be covered in the class
1	Introduction to Workshop and Safety precautions	Introduction to workshop - various shops in a typical workshop - Carpentry, Fitting, Foundry, Sheet Metal Shop, Welding and Brazing Shop, Machine Shop , Forging & Smithy - Safety precautions to be followed in a workshop - Familiarization of various safety devices and their uses.
2	Manufacturing Methods – Casting, Forming, Forming, Machining, Joining, Advanced Manufacturing	Manufacturing Process – classification of manufacturing processes – metal casting process – Important terms used in casting – steps in making sand casting. Introduction to forming process – Rolling – Forging – Extrusion – Die Forming – Bending – Shearing – Advantages of forming – Disadvantages of forming.
3		Introduction to Machining – different machining operations (Facing, Turning, Taper turning, Grooving, Knurling, Drilling, Boring, Reaming, Milling, Shaping) - Advantages and Disadvantages of machining
4		Introduction to Joining Process – different joining process (Mechanical fastening, Riveting, Welding, Soldering, Brazing) – Welding Process - Advantages and Limitations of welding Process – Types of Welding – Arc Welding – Resistance Welding – Oxy-Fuel gas welding – Solid state welding – Diffusion welding – Friction stir welding – Ultrasonic welding – Different types welding Joints. Advanced manufacturing process – classification of advanced machining – Electrochemical (ECM, ECG) – Thermal (EDM, WEDM, LBM, EBM) – Mechanical (AJM, WJM, AWJM, USM).
5	CNC Machining and Additive Manufacturing	Introduction to CNC machining – working principle – benefits. Introduction to Additive manufacturing – working principle - Benefits
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Heritage Institute of technology
Department of Mechanical Engineering
BREAK-UP OF LECTURES
Paper Name: **Engineering Graphics & Design**
Paper Code: **MECH 1052**
For Lab Classes
Odd Semester (2021-22)

Lecture No.	Chapter	Topics to be covered	Drg. Sheet No.
01	**Introduction & Lines**	Importance of Engineering Graphics; Demonstration of Equipment and Accessories required for Engineering Drawing. Types and thickness of lines and their applications. Discussion of Title Block with borderline.	
02	**Projection of Points**	Introduction to concept of orthographic projection: 1st angle and 3rd angle projection method; Symbols; Projection of Points with dimensions (details of dimensioning will be discussed in theory classes)	Sheet 1
03	**Projection of Straight lines**	Projection of Straight lines: (a) parallel to both the planes (b) inclined to one plane only.	Sheet 2A
04	**Projection of Straight lines**	Projection of lines inclined to both HP and VP. Some other problems.	Sheet 2B
05	**Projection of Lamina**	Circle, pentagon, hexagon etc (inclined to HP and parallel to VP and vice versa).	Sheet 3
06	**Projection of Solids**	Cube, rectangular prism, hexagonal prism, cylinder, pyramid and cone will be taken	Sheet 4A
07	**--do—(contd. .)**	--do—(contd..)	Sheet 4B
08	**Projection of Solids & Section of Solids introduction**	Projections on principal and auxiliary planes, true shape (cylinder, hexagonal pyramid only). Introduction to Section of Solids	Sheet 5
09	**Section of Solids**	Section of Solids: Projections on principal and auxiliary planes, true shape (cylinder, cone, hexagonal pyramid and prism only).	Sheet 5
10	**Isometric Projection**	Basic concepts, isometric scale; Isometric projection and view. Practice with simple laminar objects.	Sheet 6
11	**--do—(contd. .)**	--do—(contd…) solid objects	Sheet 7
12	**AUTO CAD & Building Drg**	Introduction on AUTO CAD & Building Drg	
13	**Viva-voce**	For entire syllabus	

Reference books:

1) Engineering Drawing by **KL Narayana & P Kannaiah**
2) Engineering Drawing by **Bhatt & Panchal**

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HERITAGE INSTITUTE OF TECHNOLOGY

MECHANICAL ENGINEERING DEPARTMENT

LESSON PLAN

SUBJECT: MACHINE DRAWING I

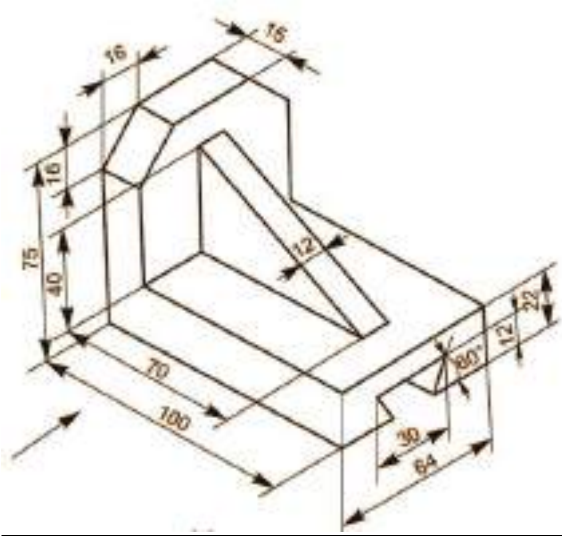
SUBJECT CODE: MECH2156

<u>CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC VIEW</u>

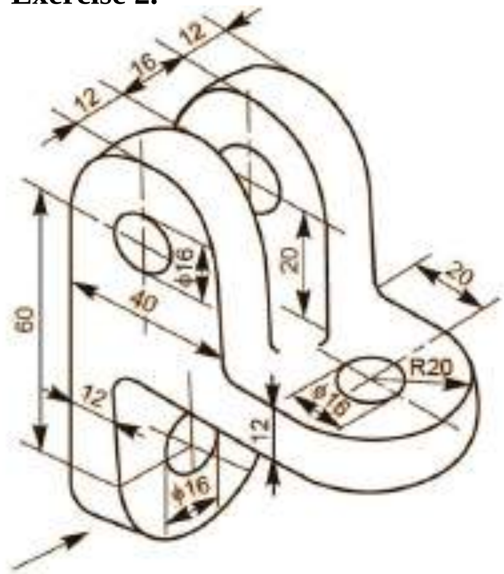
<u>Sheet No: S1</u>*(To be Hand Drawn)*

Draw the orthographic view of the following object from the given Isometric View. All dimensions are in mm.

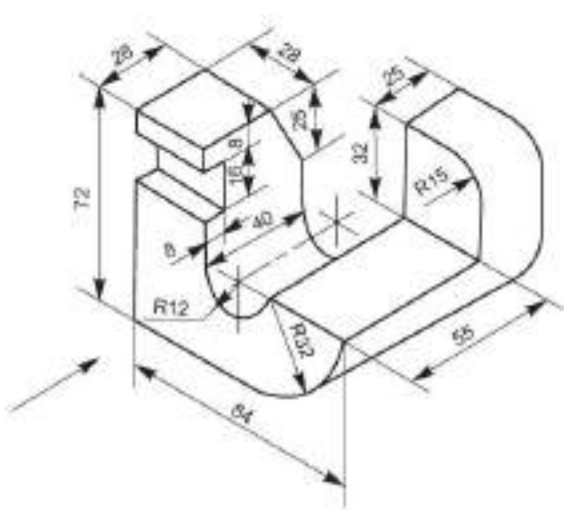
Exercise 1



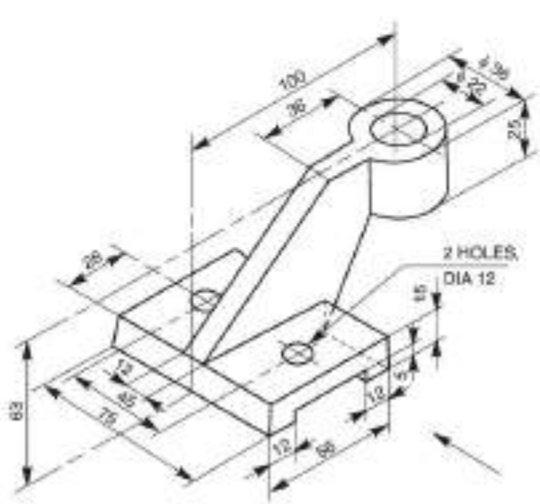
Exercise 2.



Exercise 3.



Exercise 4.

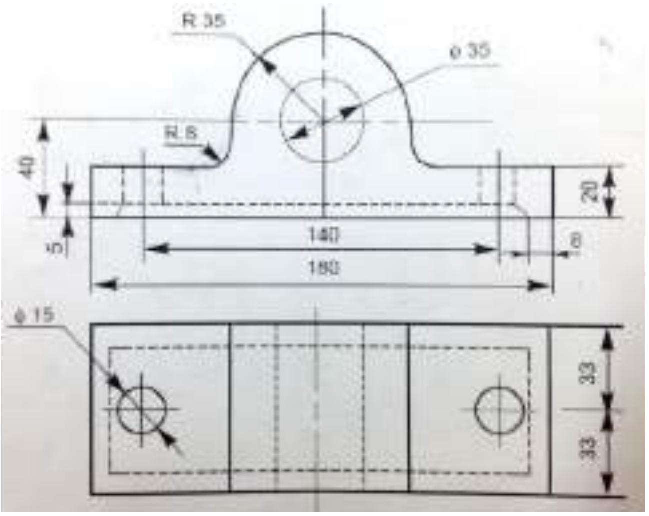


<u>CONVERSION OF MULTI-VIEW TO ISOMETRIC VIEW</u>

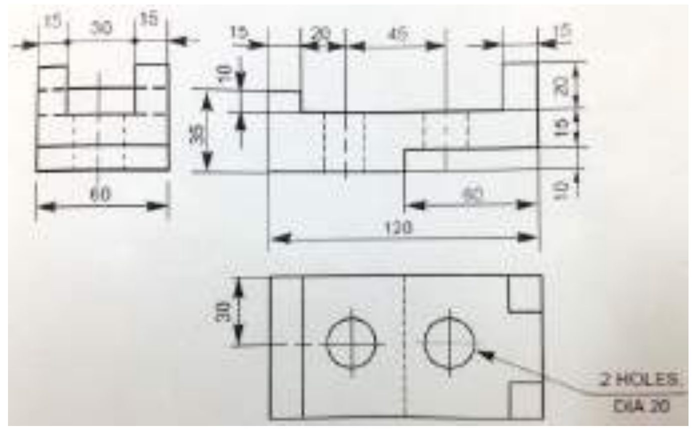
<u>Sheet No: 2</u> *(To be Hand Drawn)*

Draw the Isometric view of the following objects from their multi-view projections. All Dimensions are in mm

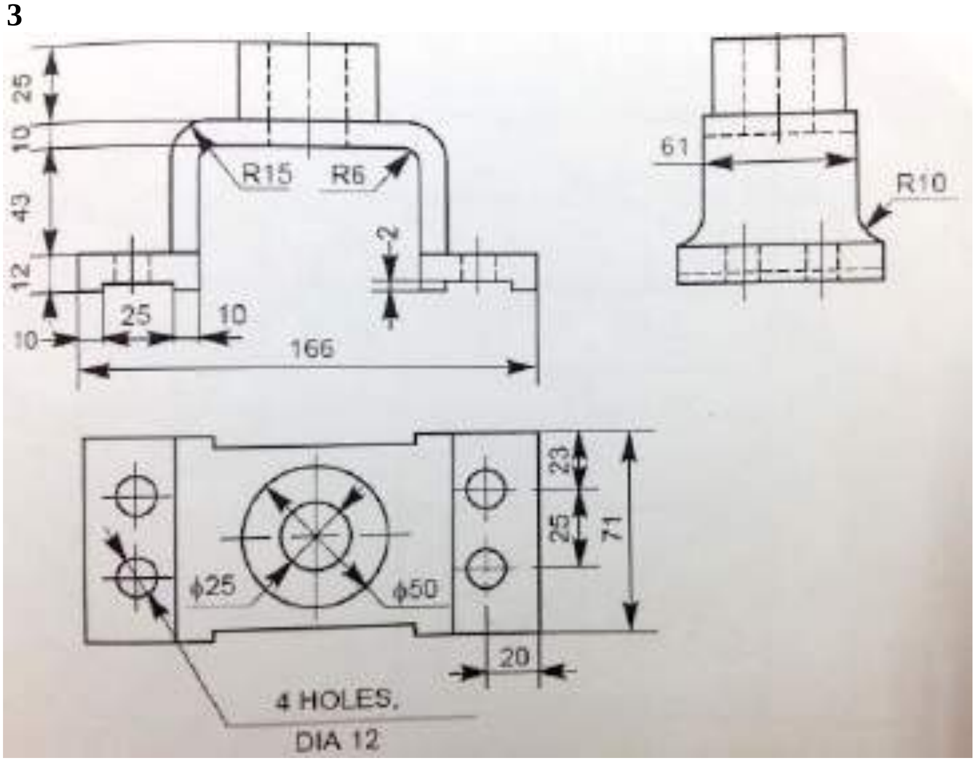
Exercise 1



Exercise 2



Exercise 3



INTRODUCTION TO AutoCAD

Tools to be discussed:

- **Dynamic Input**
- **Line**
- **Coordinate Systems**
- **Absolute Coordinate System**
- **Relative Coordinate System**
- **Erase**
- **Object Selection**
- **Circle**
- **Zoom**
- **Pan**
- **Units Format**
- **Limits**
- **Plot**

Exercise 1

RELATIVE RECTANGULAR & POLAR COORDINATES

Draw the profile in AutoCAD shown in Figure below by using the relative rectangular and relative polar coordinates of the points given in the following table. The distance between the dotted lines is 1 unit.

Point Coordinates

1 3.0, 1.0

2 ________

3 ________

4 ________

5 ________

6 ________

7 ________

8 ________

9 ________

10 ________

11 ________

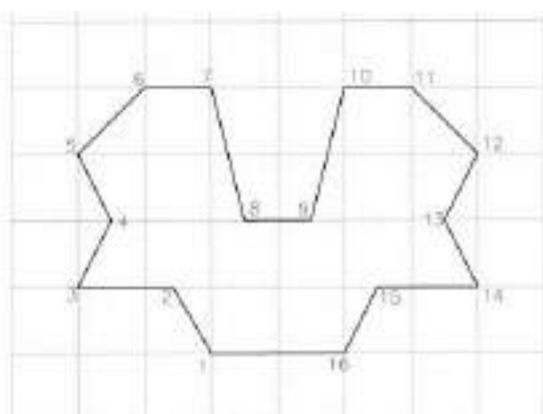
12 ________

13 ________

14 ________

15 ________

16 ________

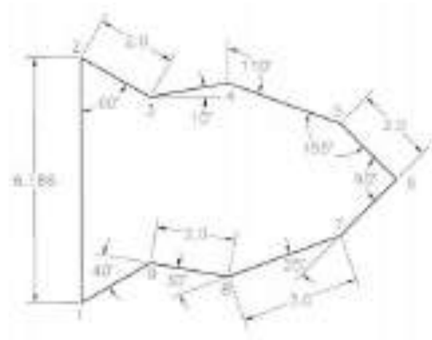


Exercise 2

RELATIVE POLAR COORDINATES

For the drawing shown in Figure below, enter the relative polar coordinates of the points in the following table. Next, use these coordinates to create the drawing. Dimension the drawing assuming suitable units.

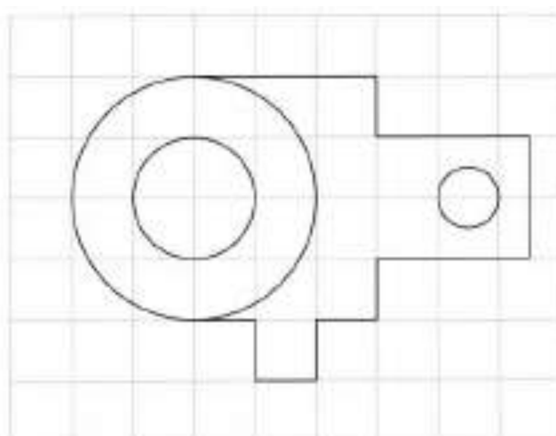
Point Coordinates
1 1.0, 1.0
2 _______
3 _______
4 _______
5 _______
6 _______
7 _______
8 _______
9 _______



Exercise 3

LINE AND CIRCLE

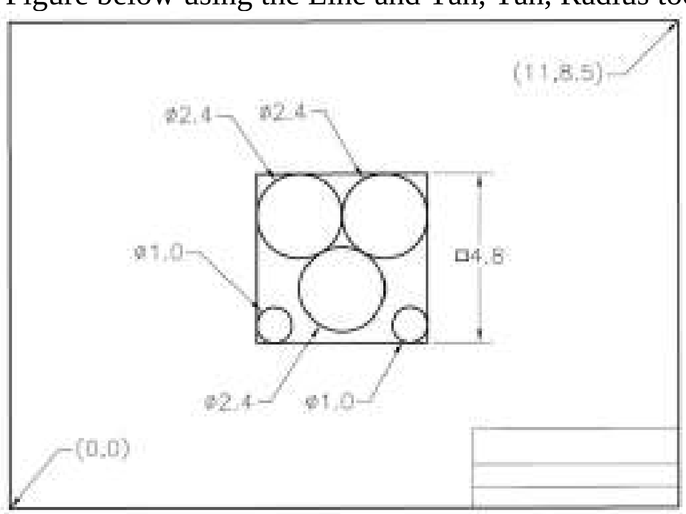
Draw the sketch shown in Figure below by using the Line and Center, Radius tools. The distance between the dotted lines is 1.0 unit.



Exercise 4

LINE AND CIRCLE TANGENT TO TWO OBJECTS

Draw the sketch shown in Figure below using the Line and Tan, Tan, Radius tools. Assume suitable units.



ADVANCED SKETCHING IN AutoCAD

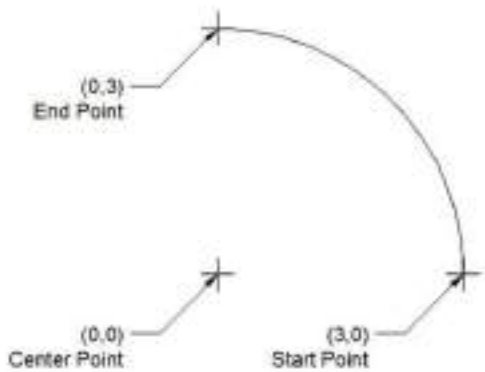
Tools to be discussed:

- **Arc**
- **Rectangles**
- **Explode**
- **Ellipse**
- **Elliptical Arc**
- **Polygon**
- **Poly lines**
- **Points**
- **Construction Line**
- **Text**

Exercise 1

3-POINT

Draw several arcs by using the 3-Point tool. The points can be selected by entering coordinates or by specifying points on the screen. Also, try to create a circle by drawing two separate arcs and a single arc and notice the limitations of the Arc tools.

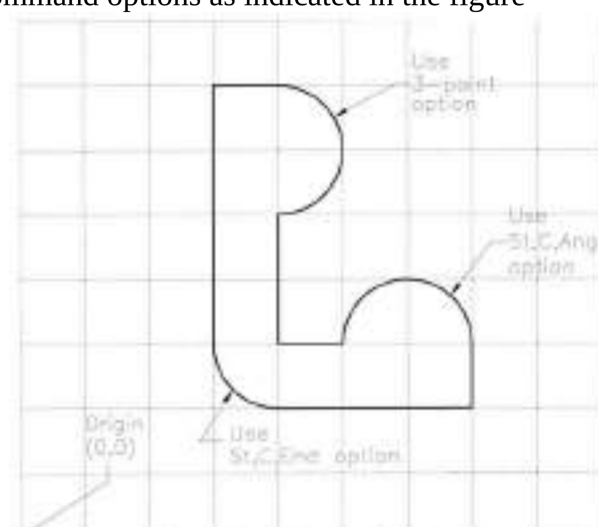


Exercise 2

START, CENTER, ANGLE

a) Draw an arc whose start point is at 6,3, center point is at 3,3, and the included angle is 240 degrees.

b) Draw the profile shown in Figure below. The distance between the dotted lines is 1.0 unit. Create the arcs by using different arc command options as indicated in the figure

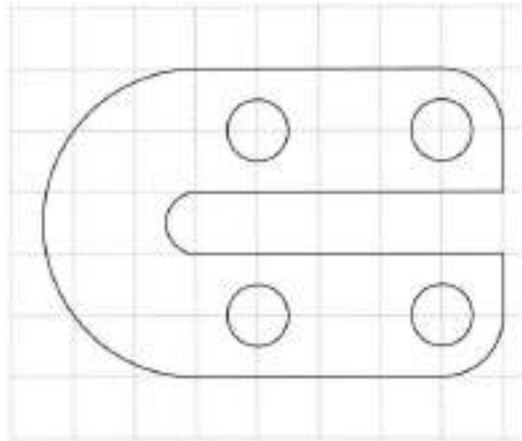


Exercise 3

START, END, DIRECTION

a) Specify the directions and coordinates of two arcs in such a way that they form a circular figure.

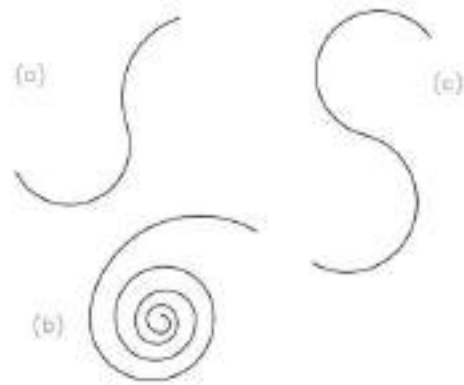
b) Draw the profile shown in Figure below. Create the curves by using the Start, End, Direction tool. The distance between the dotted lines is 1.0 unit and the diameter of the circles is 1 unit.



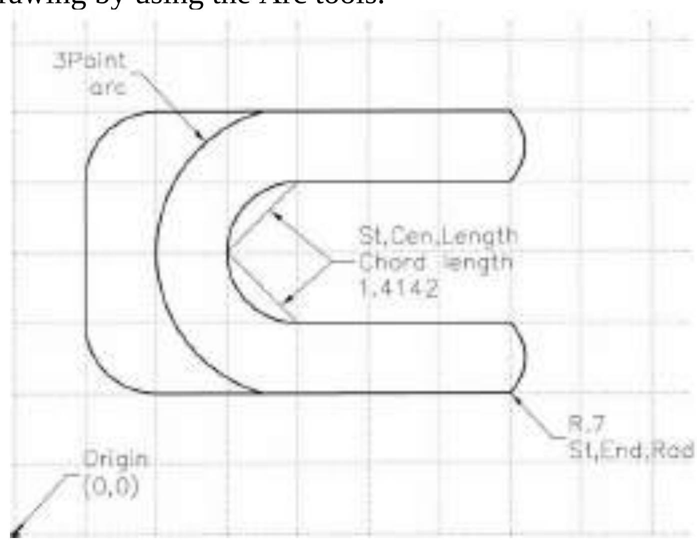
Exercise 4

CENTER, START, LENGTH

a. Use the Center, Start, Angle, and Continue tools to draw the profiles shown in Figure below.



b. Draw the profile shown in Figure below. The distance between the dotted lines is 1.0 unit. Create the radii as indicated in the drawing by using the Arc tools.



Exercise 5

DRAWING RECTANGLES

Draw a rectangle of length 4 units, width 3 units, and start point at (1,1). Draw another rectangle of length 2 units and width 1 units, with its first corner at 1.5,1.5, and which is at an angle of 65-degree.

Exercise 6

DRAWING ELLIPSES

Ribbon: Home > Draw > Ellipse drop-down Toolbar: Draw > Ellipse Tool Palettes: Draw > Ellipse
Command: ELLIPSE

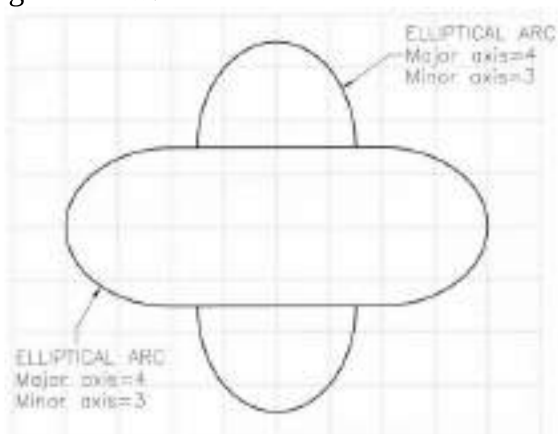
Draw an ellipse whose major axis is 4 units and the rotation around this axis is 60 degrees. Draw another ellipse whose rotation around the major axis is 15 degrees.

Exercise 7

ELLIPTICAL ARC

a) Construct an ellipse with center at (2,3), axis endpoint at (4,6), and the other axis endpoint at a distance of 0.75 unit from the midpoint of the first axis.

b) Draw the profile shown in Figure below. The distance between the dotted lines is 1.0 unit.



Exercise 8

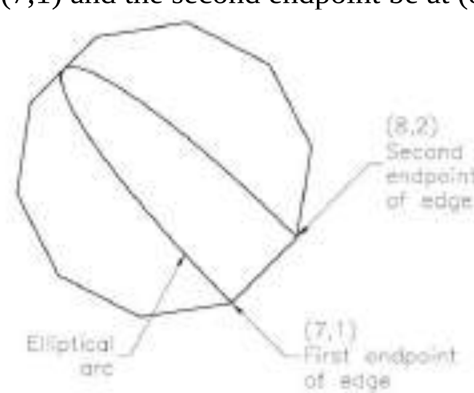
DRAWING REGULAR POLYGONS

Ribbon: Home > Draw > Polygon Toolbar: Draw > Polygon Tool Palettes: Draw > Polygon
Command: POLYGON

Draw a circumscribed polygon of eight sides by using the Center of Polygon method.

Exercise 9

Draw a polygon of ten sides by using the Edge option and an elliptical arc, as shown in Figure 3-35. Let the first endpoint of the edge be at (7,1) and the second endpoint be at (8,2).



Exercise 10

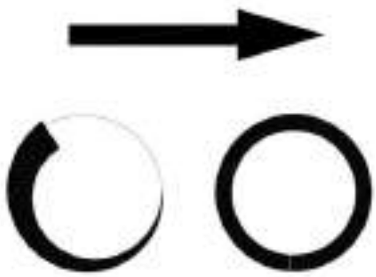
DRAWING POLYLINES

Ribbon: Home > Draw > Polyline Toolbar: Draw > Polyline Tool Palettes: Draw > Polyline

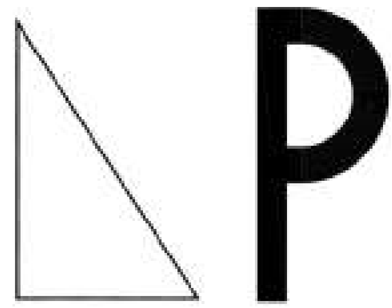
Command: PLINE or PL

Draw the objects shown in Figures (a) and (b) by using the polylines of different width.

(a)



(b)



WORKING WITH DRAWING AIDS

Tools to be discussed:

- **Layer**
- **Freeze**
- **Plot Style**
- **Reconciling Layers**
- **Isolating Layers**
- **Quick Properties**
- **Global Line type scaling**
- **Current Line type scaling**
- **Design Center**
- **DSETTINGS**
- **OSNAP**

To be discussed

WORKING WITH LAYERS

Merging Layers, Deleting Layers, Managing the Display of Columns, Selective Display of Layers, Layer States, Isolating and Unisolating Layers, Controlling the Layer Settings

OBJECT PROPERTIES

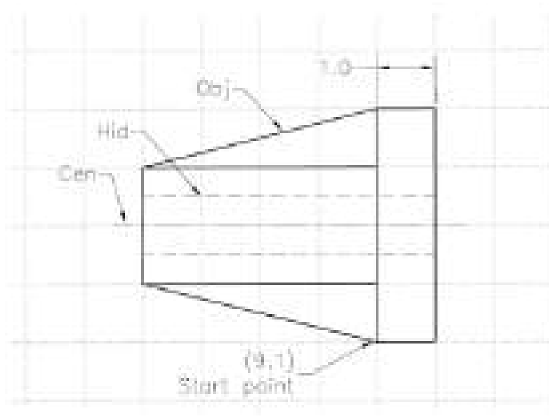
Changing the Color, Changing the Line type, Changing the Line weight, Changing the Plot Style, Changing Object Properties using the Properties Palette, Changing Object Properties using the Quick Properties Palette

Exercise 1

LAYERS

Set up three layers with the following line types and colors. Then, create the drawing shown in Figure below (without dimensions).

Layer Name	**Color**	**Line Type**	**Line weight**
Obj	Red	Continuous	0.012"
Hidden	Yellow	Hidden	0.008"
Centre	Green	Center	0.006"



Exercise 2

OBJECT PROPERTIES

Draw a hexagon on the **Obj** layer in red. Keep the line type hidden. Now, use the **Properties** palette to change the layer, the color to yellow, and the line type to continuous.

To be discussed

DRAFTING SETTINGS DIALOG BOX

Setting Grid

Snap Type

Isometric Snap, Polar Snap

DRAWING STRAIGHT LINES USING THE ORTHO MODE

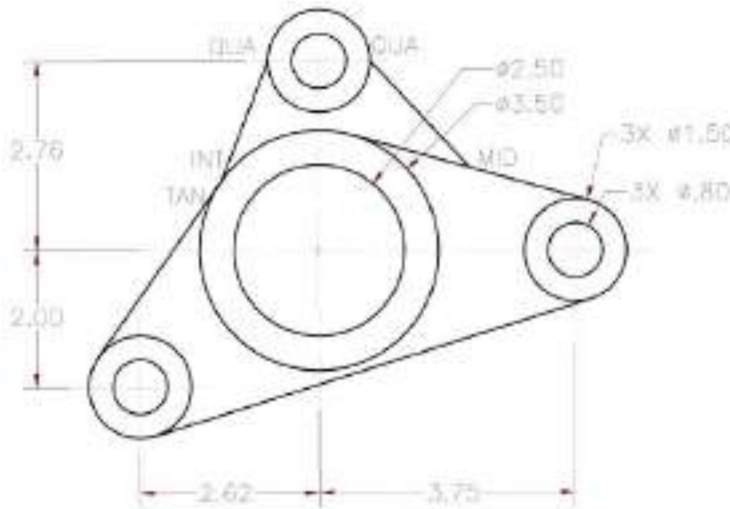
WORKING WITH OBJECT SNAPS

Toolbar: Object Snap

BASIC DIMENSIONING

Exercise 3

Set up layers, line types, and colors and then make the drawing shown in Figure below. Use the object snaps as indicated.

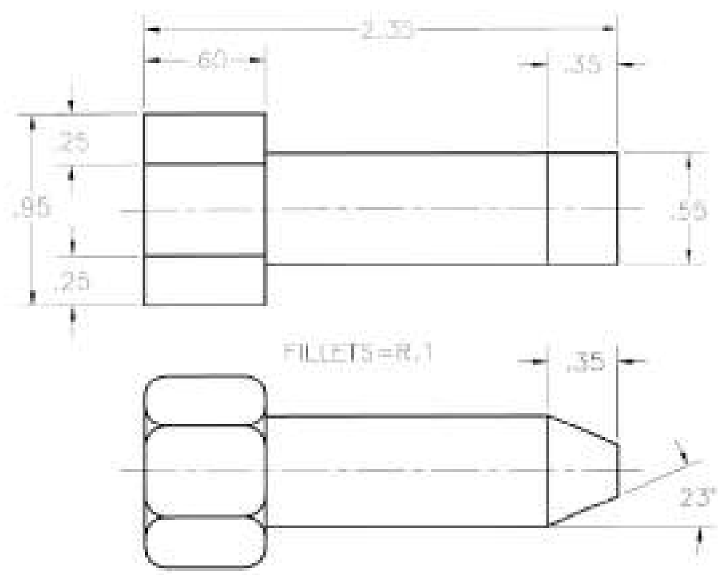


EDITING SKETCHED OBJECTS

Tools to be discussed:

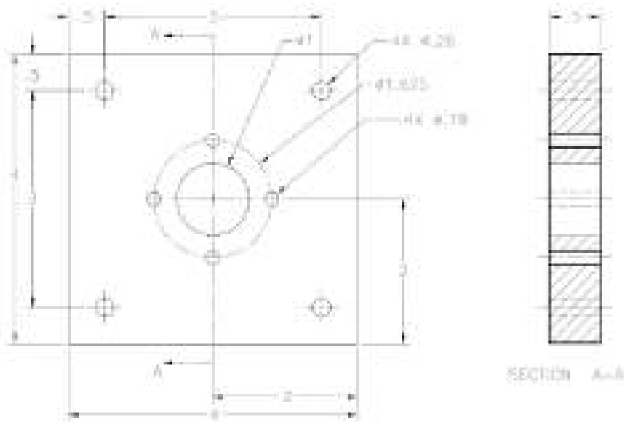
- **Move**
- **Copy**
- **Break**
- **Offset**
- **Chamfer**
- **Trim**
- **Extend**
- **Stretch**
- **Array**
- **Rotate**
- **Mirror**
- **Scale**
- **Lengthen**
- **Measure**
- **Divide**

Exercise 1
FILLET, CHAMFER, AND TRIM
Draw the top illustration shown in Figure below and then use the **Fillet**, **Chamfer**, and **Trim** tools to obtain the next illustration given in the same figure. Assume the missing dimensions.

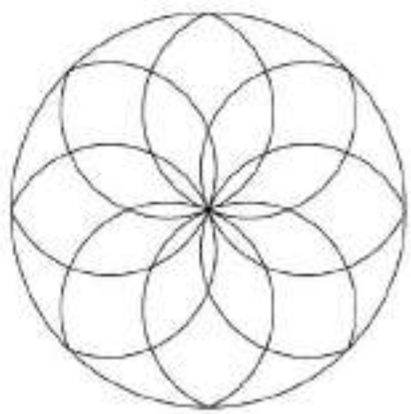


Exercise 2
BREAK
Break a line at five different places and then erase the alternate segments. Next, draw a circle and break it into four equal parts.

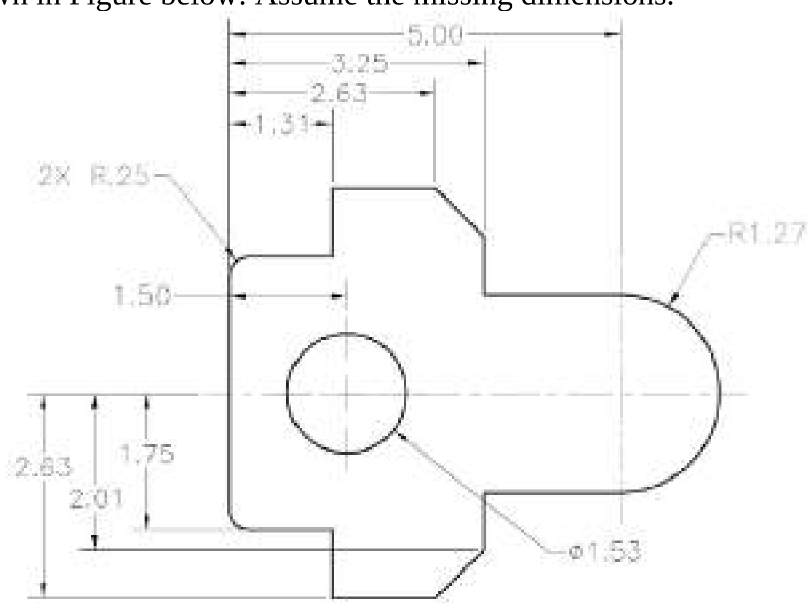
Exercise 3
RECTANGULAR AND POLAR ARRAYS
Create the drawing of an end plate. The dimensions of the end plate are shown in Figure below.



Exercise 4
DIVIDE
Create the drawing shown in Figure below. Use the **Divide** tool to divide the circle and use the **NODE** object snap to select the points. Assume the dimensions of the drawing.

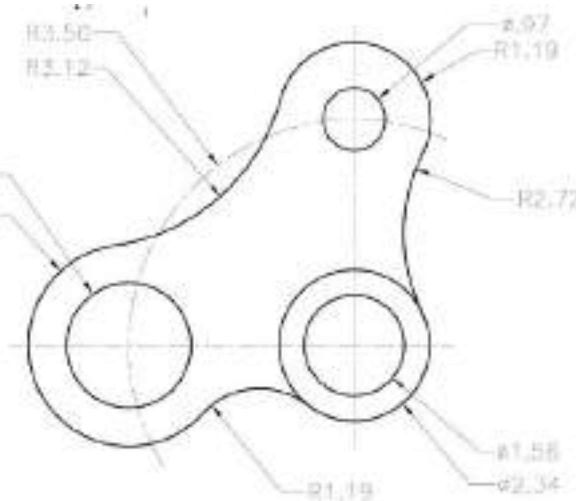


Exercise 5
Create the drawing shown in Figure below. Assume the missing dimensions.



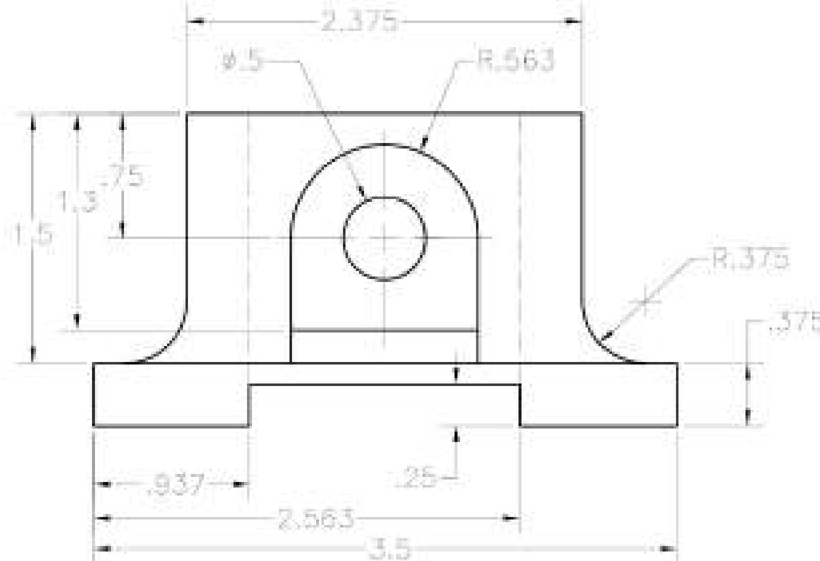
Exercise 6

Create the drawing shown in Figure below.



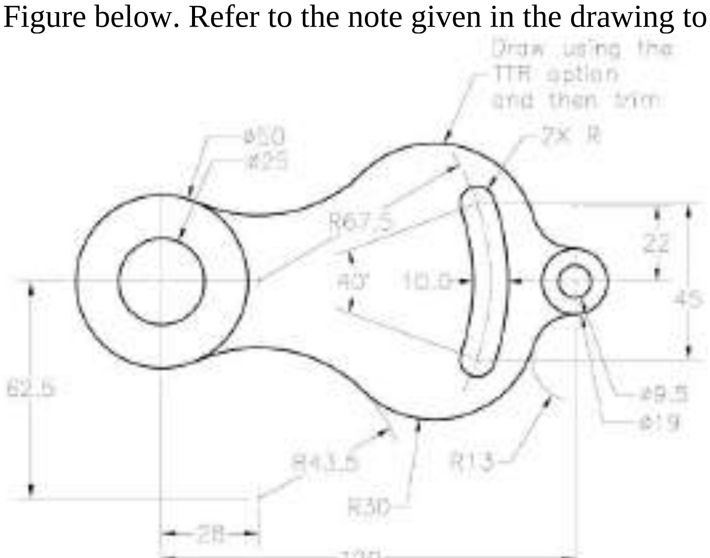
Exercise 7

Create the drawing shown in Figure below. Assume the missing dimensions.



Exercise 8

Create the drawing shown in Figure below. Refer to the note given in the drawing to create an arc of radius 30.

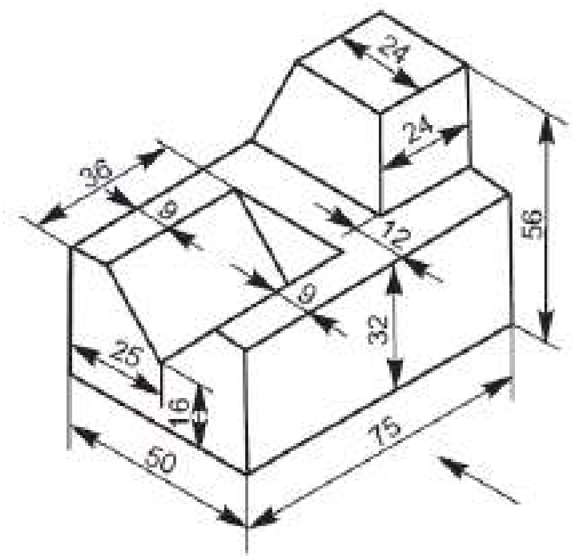


CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC VIEW

(To be drawn in AutoCAD)

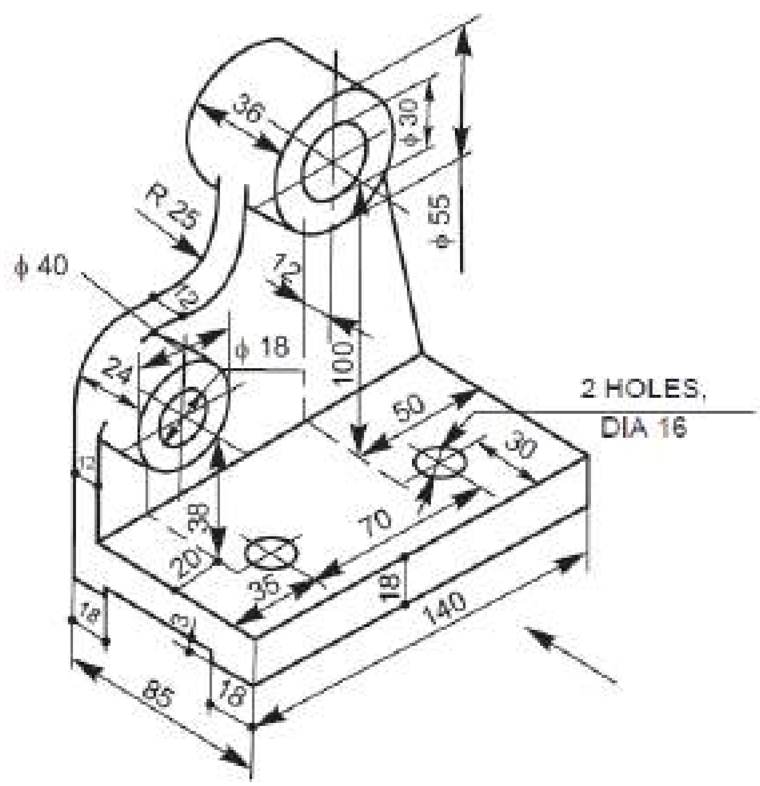
Exercise 1

Draw the orthographic view of the following object from the given Isometric View . All dimensions are in mm.



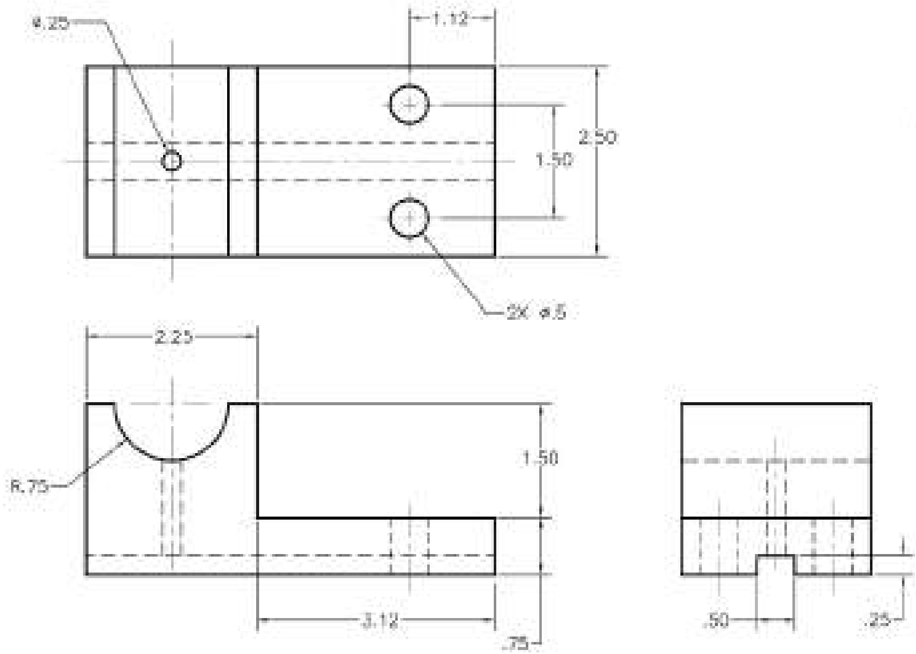
Exercise 2

Draw the orthographic view of the following object from the given Isometric View. All dimensions are in mm.

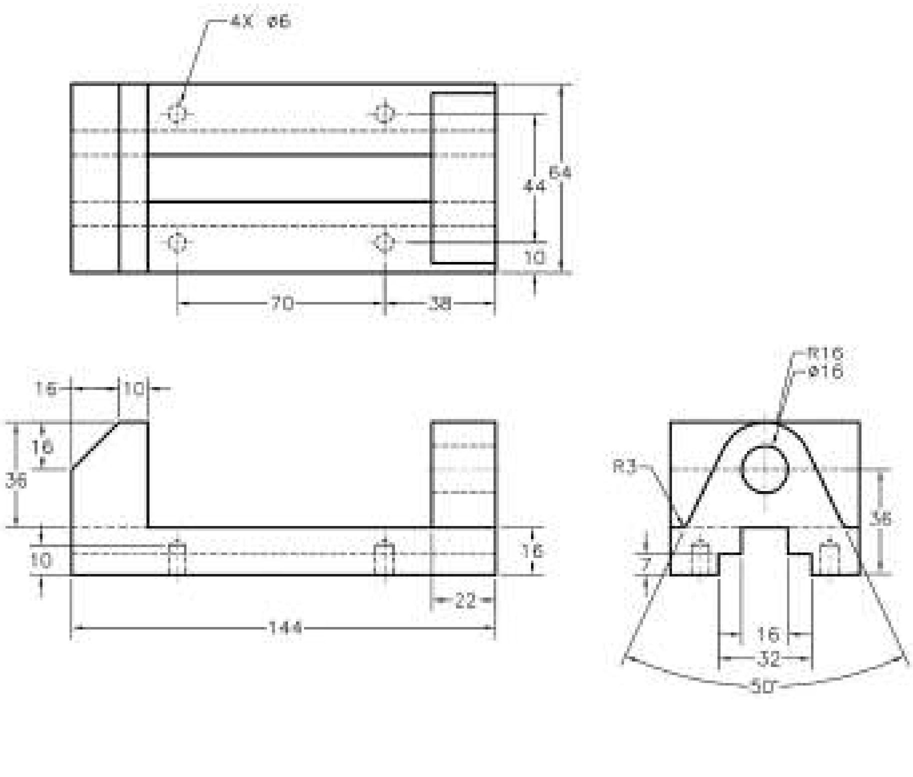


CONVERSION OF MULTI-VIEW TO ISOMETRIC VIEW
(To be drawn in AutoCAD)

Exercise 1
Draw the Isometric view of the following objects from their multi-view projections. Assume suitable dimensional units.



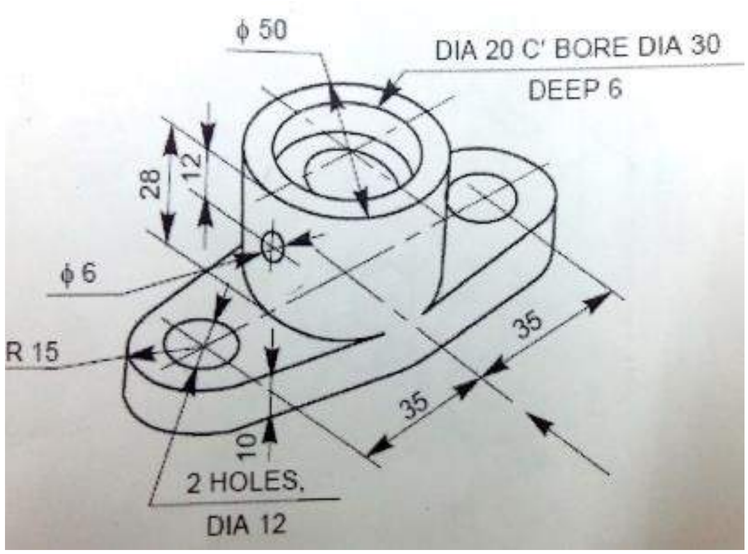
Exercise 2
Draw the Isometric view of the following objects from their multi-view projections. All dimensions are in mm.



ORTHOGHRAPHIC SECTIONAL VIEW
(To be drawn in AutoCAD)

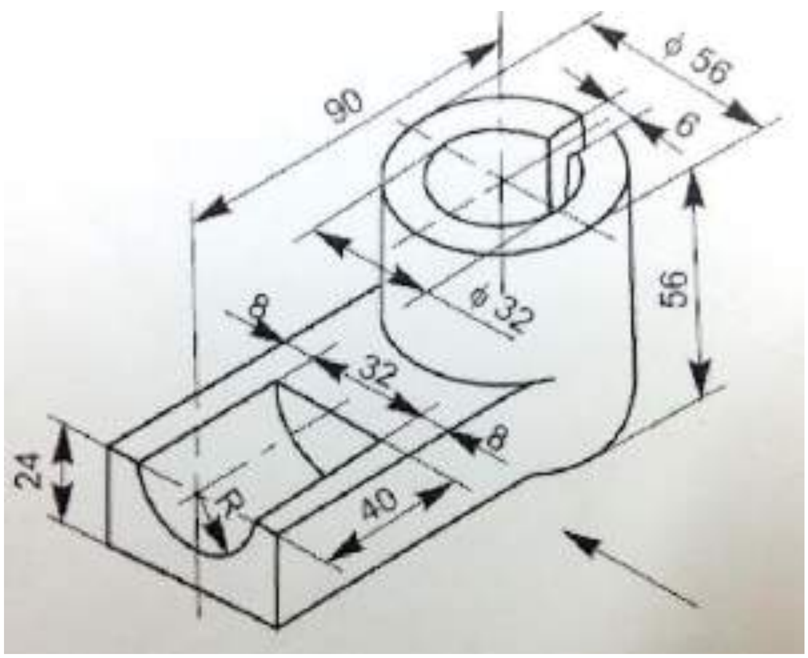
Exercise 1

Figure below shows the isometric view of a shaft support. Draw Full sectional view and half-sectional view in AutoCAD.



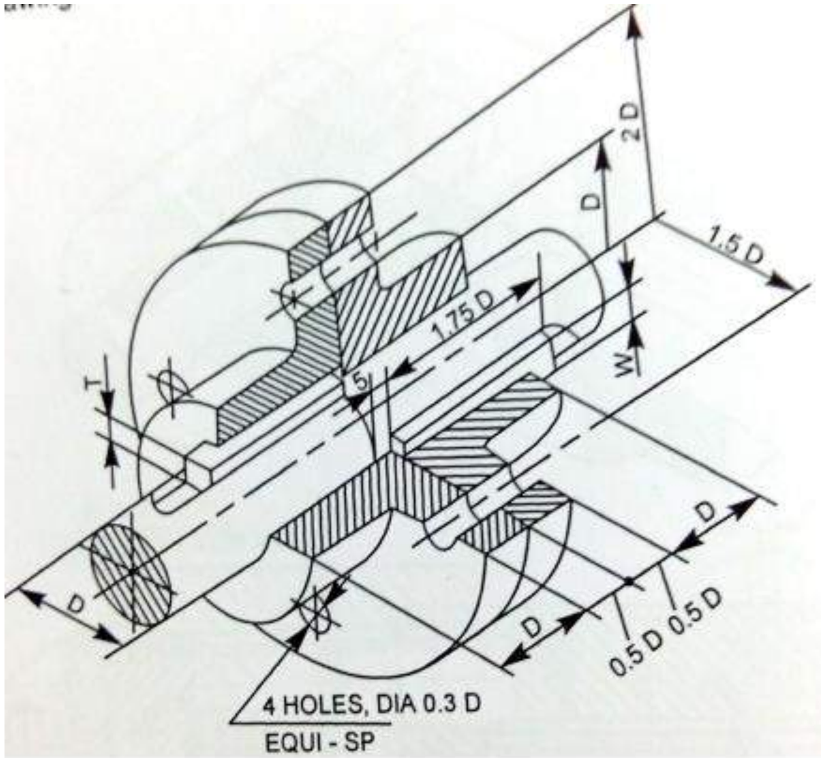
Exercise 2

Figure below shows the isometric view of a machine component. Draw its Full-sectional view from the front in AutoCAD.



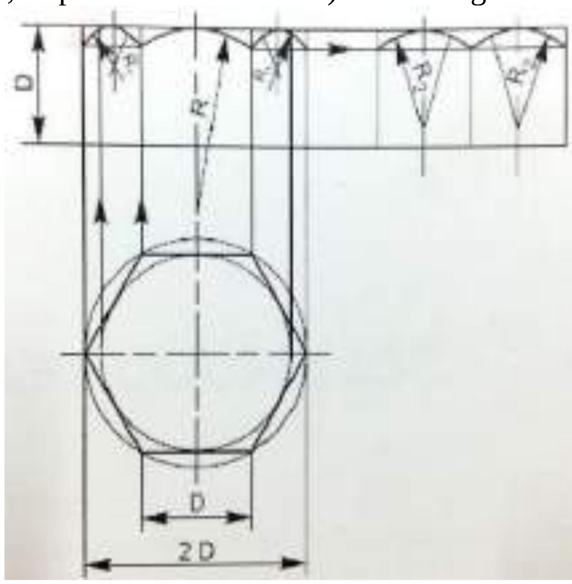
Exercise 3

Draw the half-sectional view in AutoCAD of rigid flank coupling shown below. Assume a suitable value of D



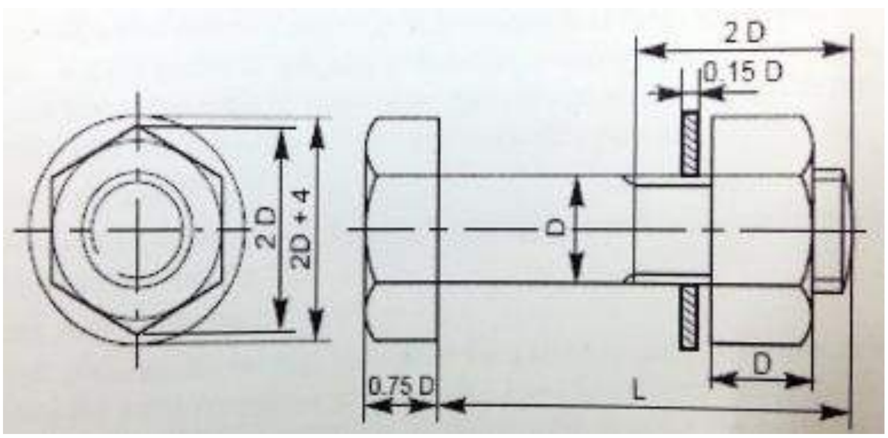
NUT & BOLT ASSEMBLY
(To be drawn in AutoCAD)

Exercise 1
Draw different views (Front View, Top View & Side View) of a Hexagonal Nut with all dimensional details.



Consider the following empirical relations
R= 1.732D, R_1 =0.433D, R_2 = 1.3D
Where D is the bolt diameter

Exercise 2
Draw an assembly of a hexagonal bolt along with nut and washer.



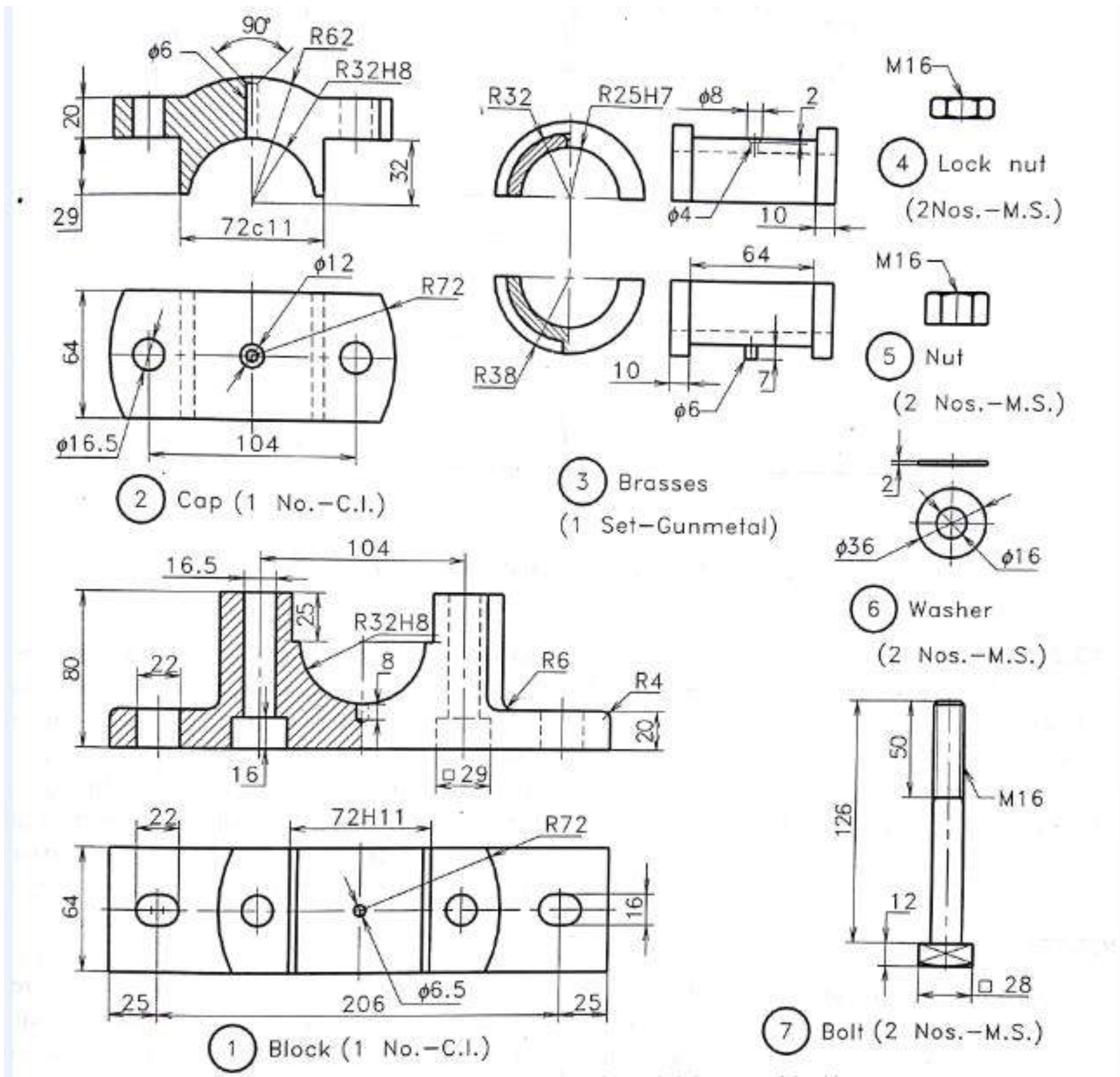
Where D is the bolt diameter.

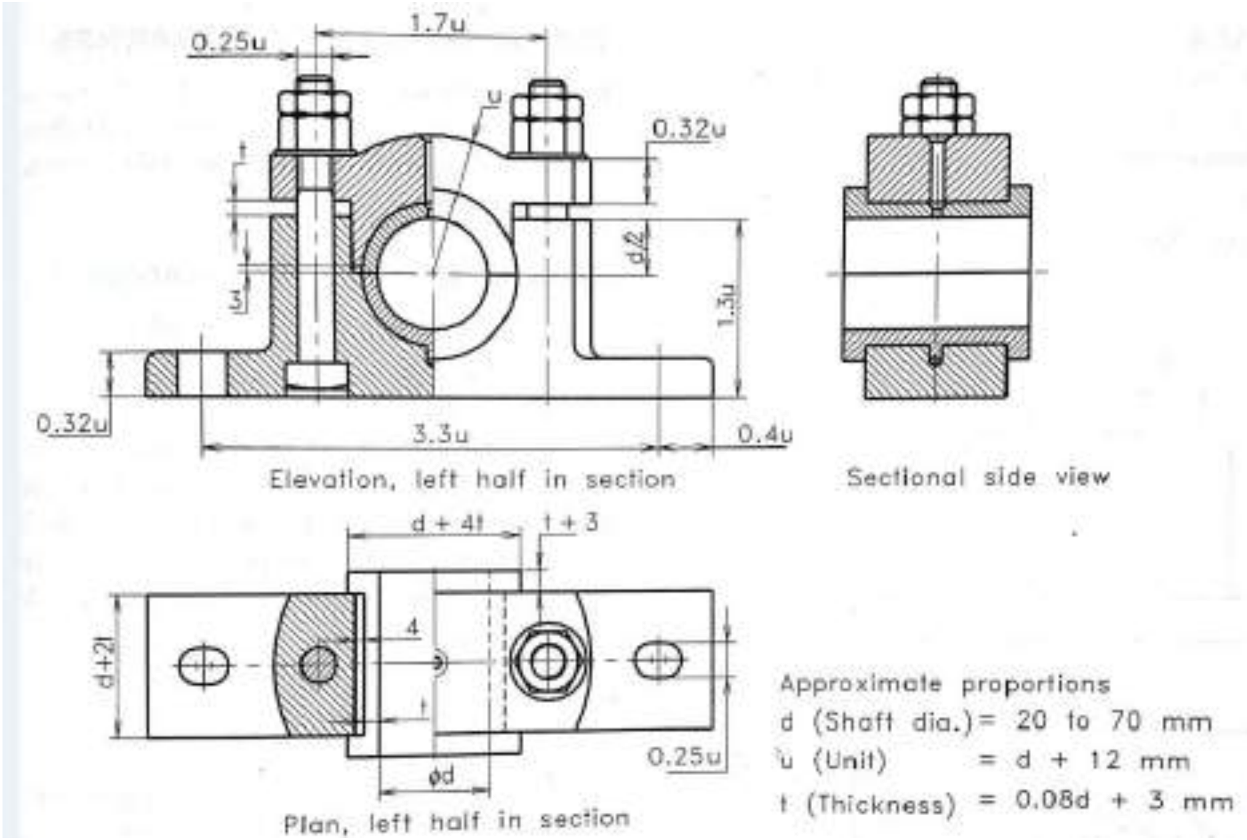
PLUMMER BLOCK ASSEMBLY

(To be drawn in AutoCAD)

Exercise 1

Draw the sectional Front view, Top View and Side View along with BOM of Plummer Block Assembly from the part drawing shown below





Half Sectional Front View, Top View & Side View of Plummer Block Assembly

HERITAGE INSTITUTE OF TECHNOLOGY

MECHANICAL ENGINEERING DEPARTMENT

LESSON PLAN

SUBJECT: MACHINE DRAWING I

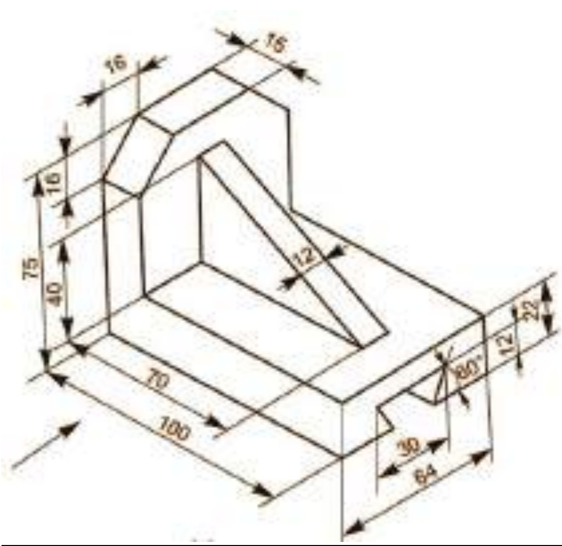
SUBJECT CODE: MECH2156

CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC VIEW

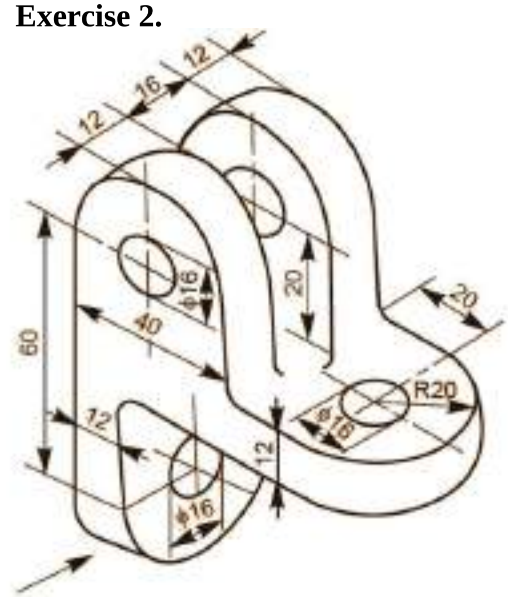
Sheet No: S1*(To be Hand Drawn)*

Draw the orthographic view of the following object from the given Isometric View. All dimensions are in mm.

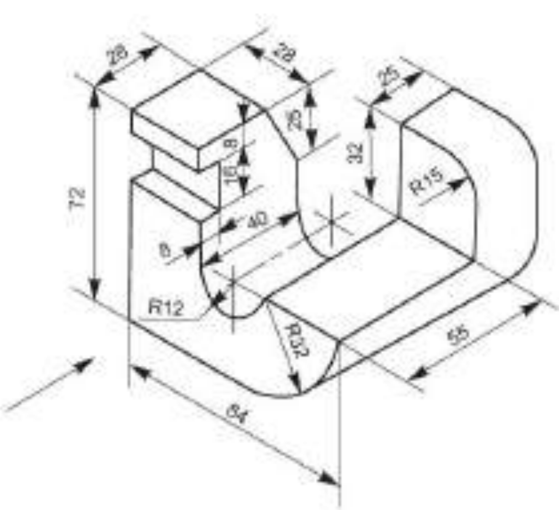
Exercise 1



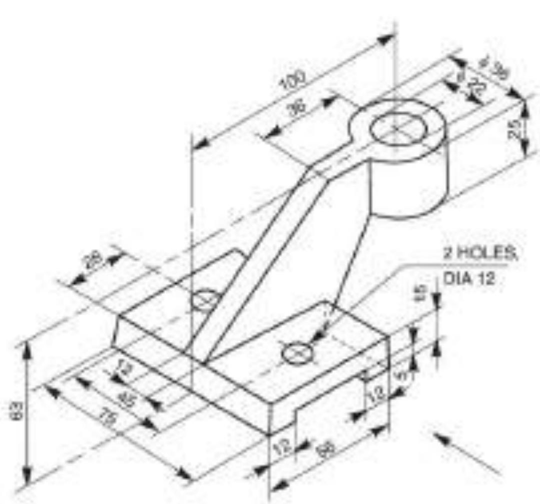
Exercise 2.



Exercise 3.



Exercise 4.

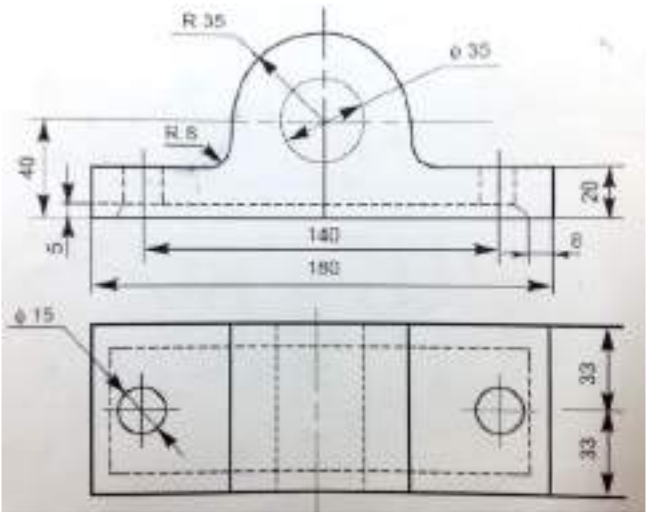


<u>CONVERSION OF MULTI-VIEW TO ISOMETRIC VIEW</u>

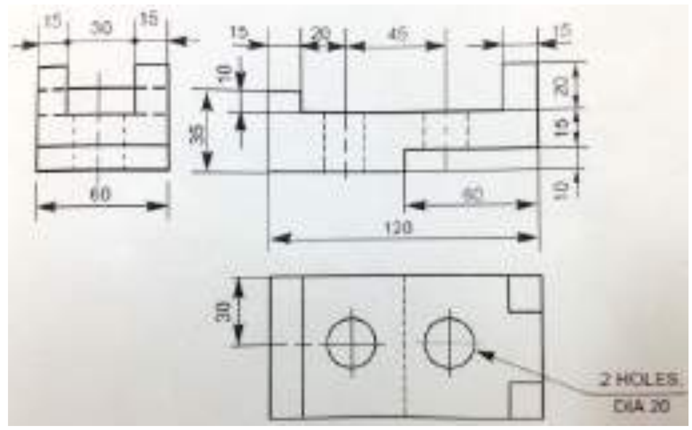
<u>Sheet No: 2</u> *(To be Hand Drawn)*

Draw the Isometric view of the following objects from their multi-view projections. All Dimensions are in mm

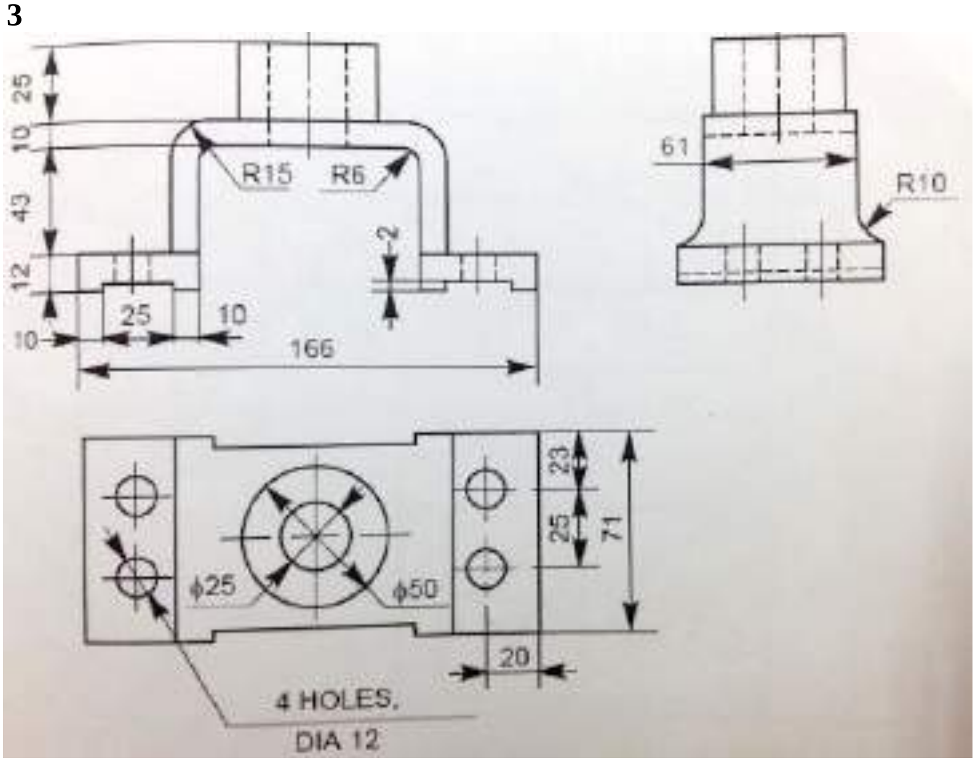
Exercise 1



Exercise 2



Exercise 3



INTRODUCTION TO AutoCAD

Tools to be discussed:

- **Dynamic Input**
- **Line**
- **Coordinate Systems**
- **Absolute Coordinate System**
- **Relative Coordinate System**
- **Erase**
- **Object Selection**
- **Circle**
- **Zoom**
- **Pan**
- **Units Format**
- **Limits**
- **Plot**

Exercise 1

RELATIVE RECTANGULAR & POLAR COORDINATES

Draw the profile in AutoCAD shown in Figure below by using the relative rectangular and relative polar coordinates of the points given in the following table. The distance between the dotted lines is 1 unit.

Point Coordinates

1 3.0, 1.0

2 ________

3 ________

4 ________

5 ________

6 ________

7 ________

8 ________

9 ________

10 ________

11 ________

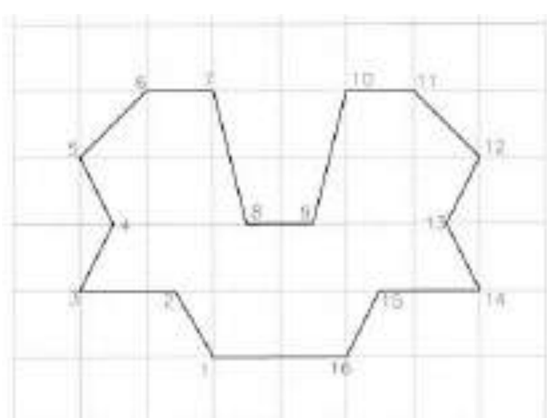
12 ________

13 ________

14 ________

15 ________

16 ________



Exercise 2

RELATIVE POLAR COORDINATES

For the drawing shown in Figure below, enter the relative polar coordinates of the points in the following table. Next, use these coordinates to create the drawing. Dimension the drawing assuming suitable units.

Point Coordinates

1 1.0, 1.0

2 _______

3 _______

4 _______

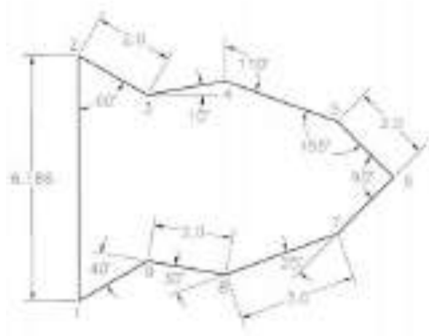
5 _______

6 _______

7 _______

8 _______

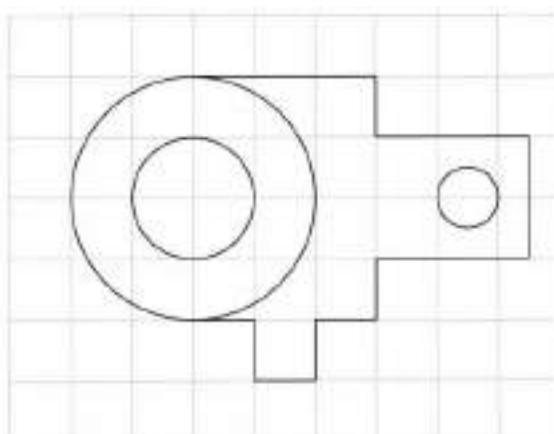
9 _______



Exercise 3

LINE AND CIRCLE

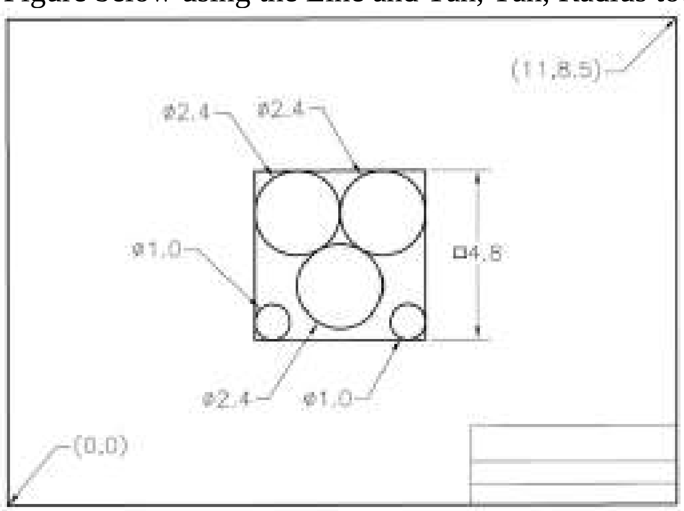
Draw the sketch shown in Figure below by using the Line and Center, Radius tools. The distance between the dotted lines is 1.0 unit.



Exercise 4

LINE AND CIRCLE TANGENT TO TWO OBJECTS

Draw the sketch shown in Figure below using the Line and Tan, Tan, Radius tools. Assume suitable units.



ADVANCED SKETCHING IN AutoCAD

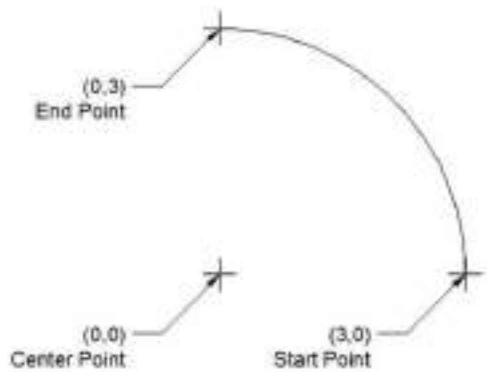
Tools to be discussed:

- **Arc**
- **Rectangles**
- **Explode**
- **Ellipse**
- **Elliptical Arc**
- **Polygon**
- **Poly lines**
- **Points**
- **Construction Line**
- **Text**

Exercise 1

3-POINT

Draw several arcs by using the 3-Point tool. The points can be selected by entering coordinates or by specifying points on the screen. Also, try to create a circle by drawing two separate arcs and a single arc and notice the limitations of the Arc tools.

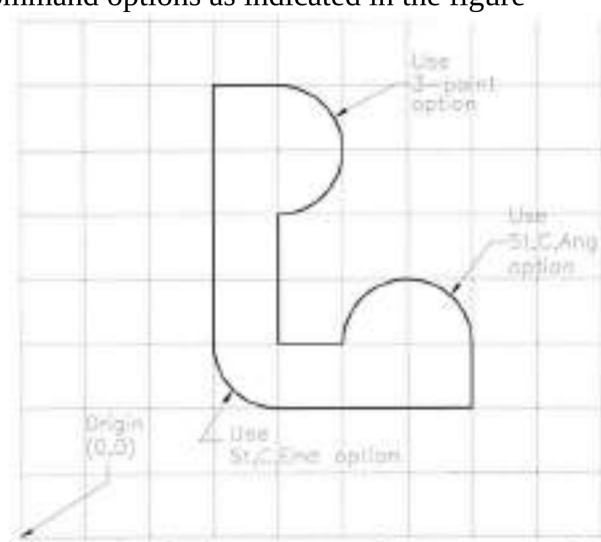


Exercise 2

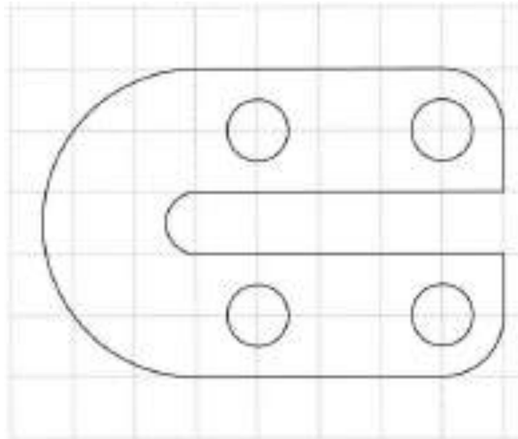
START, CENTER, ANGLE

a) Draw an arc whose start point is at 6,3, center point is at 3,3, and the included angle is 240 degrees.

b) Draw the profile shown in Figure below. The distance between the dotted lines is 1.0 unit. Create the arcs by using different arc command options as indicated in the figure

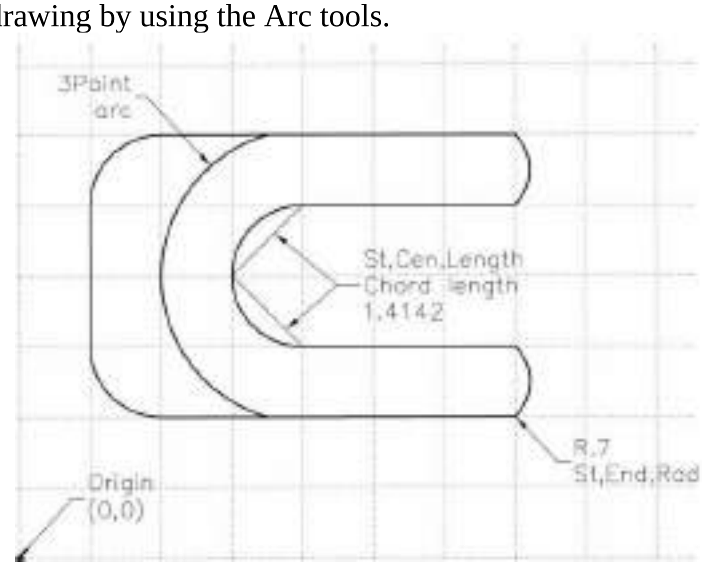


Exercise 3
START, END, DIRECTION
a) Specify the directions and coordinates of two arcs in such a way that they form a circular figure.
b) Draw the profile shown in Figure below. Create the curves by using the Start, End, Direction tool. The distance between the dotted lines is 1.0 unit and the diameter of the circles is 1 unit.



Exercise 4
CENTER, START, LENGTH
a. Use the Center, Start, Angle, and Continue tools to draw the profiles shown in Figure below.

b. Draw the profile shown in Figure below. The distance between the dotted lines is 1.0 unit. Create the radii as indicated in the drawing by using the Arc tools.



Exercise 5

DRAWING RECTANGLES

Draw a rectangle of length 4 units, width 3 units, and start point at (1,1). Draw another rectangle of length 2 units and width 1 units, with its first corner at 1.5,1.5, and which is at an angle of 65-degree.

Exercise 6

DRAWING ELLIPSES

Ribbon: Home > Draw > Ellipse drop-down Toolbar: Draw > Ellipse   Tool Palettes: Draw > Ellipse

Command: ELLIPSE

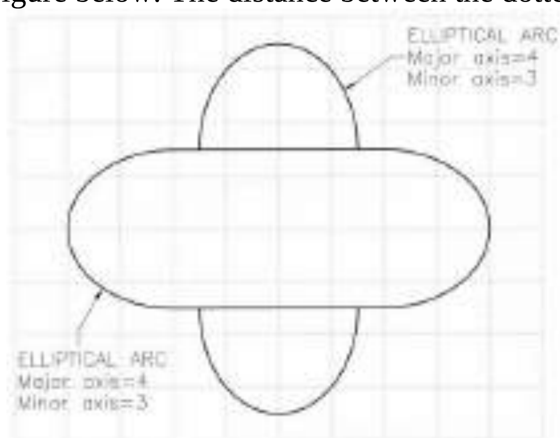
Draw an ellipse whose major axis is 4 units and the rotation around this axis is 60 degrees. Draw another ellipse whose rotation around the major axis is 15 degrees.

Exercise 7

ELLIPTICAL ARC

a) Construct an ellipse with center at (2,3), axis endpoint at (4,6), and the other axis endpoint at a distance of 0.75 unit from the midpoint of the first axis.

b) Draw the profile shown in Figure below. The distance between the dotted lines is 1.0 unit.



Exercise 8

DRAWING REGULAR POLYGONS

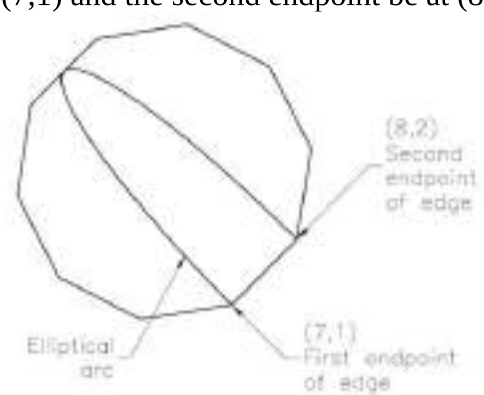
Ribbon: Home > Draw > Polygon Toolbar: Draw > Polygon Tool Palettes: Draw > Polygon

Command: POLYGON

Draw a circumscribed polygon of eight sides by using the Center of Polygon method.

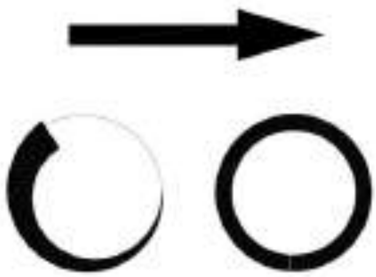
Exercise 9

Draw a polygon of ten sides by using the Edge option and an elliptical arc, as shown in Figure 3-35. Let the first endpoint of the edge be at (7,1) and the second endpoint be at (8,2).

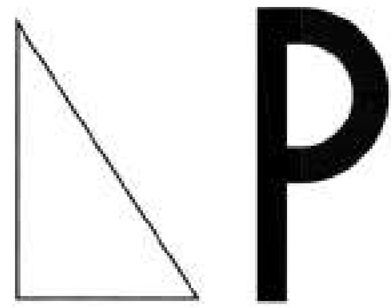


Exercise 10
DRAWING POLYLINES
Ribbon: Home > Draw > Polyline Toolbar: Draw > Polyline Tool Palettes: Draw > Polyline
Command: PLINE or PL
Draw the objects shown in Figures (a) and (b) by using the polylines of different width.

(a)



(b)



WORKING WITH DRAWING AIDS

Tools to be discussed:

- **Layer**
- **Freeze**
- **Plot Style**
- **Reconciling Layers**
- **Isolating Layers**
- **Quick Properties**
- **Global Line type scaling**
- **Current Line type scaling**
- **Design Center**
- **DSETTINGS**
- **OSNAP**

To be discussed

WORKING WITH LAYERS

Merging Layers, Deleting Layers, Managing the Display of Columns, Selective Display of Layers, Layer States, Isolating and Unisolating Layers, Controlling the Layer Settings

OBJECT PROPERTIES

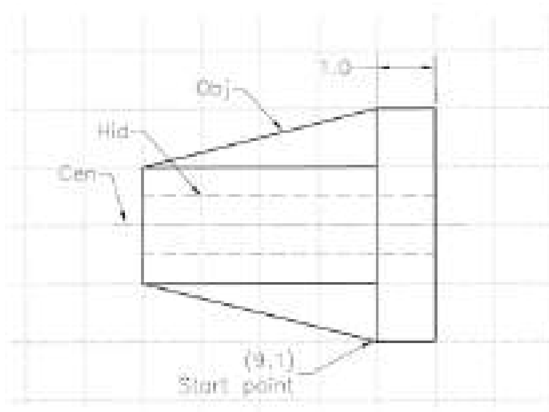
Changing the Color, Changing the Line type, Changing the Line weight, Changing the Plot Style, Changing Object Properties using the Properties Palette, Changing Object Properties using the Quick Properties Palette

Exercise 1

LAYERS

Set up three layers with the following line types and colors. Then, create the drawing shown in Figure below (without dimensions).

Layer Name	Color	Line Type	Line weight
Obj	Red	Continuous	0.012”
Hidden	Yellow	Hidden	0.008”
Centre	Green	Center	0.006”



Exercise 2

OBJECT PROPERTIES

Draw a hexagon on the **Obj** layer in red. Keep the line type hidden. Now, use the **Properties** palette to change the layer, the color to yellow, and the line type to continuous.

To be discussed

DRAFTING SETTINGS DIALOG BOX

Setting Grid

Snap Type

Isometric Snap, Polar Snap

DRAWING STRAIGHT LINES USING THE ORTHO MODE

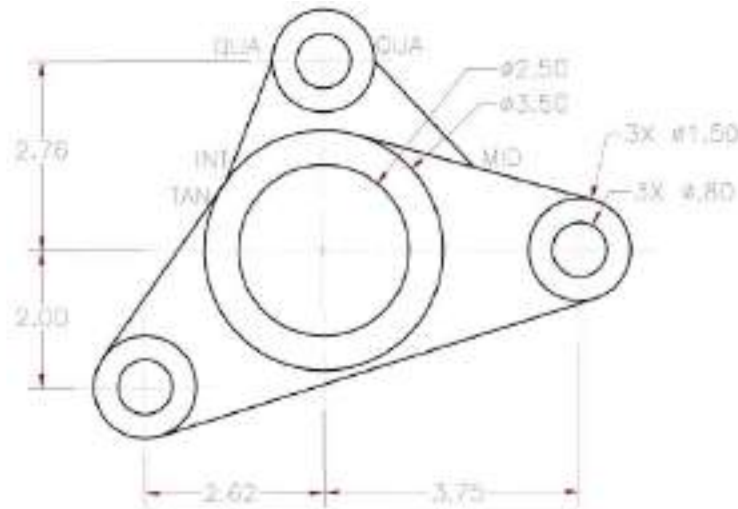
WORKING WITH OBJECT SNAPS

Toolbar: Object Snap

BASIC DIMENSIONING

Exercise 3

Set up layers, line types, and colors and then make the drawing shown in Figure below. Use the object snaps as indicated.

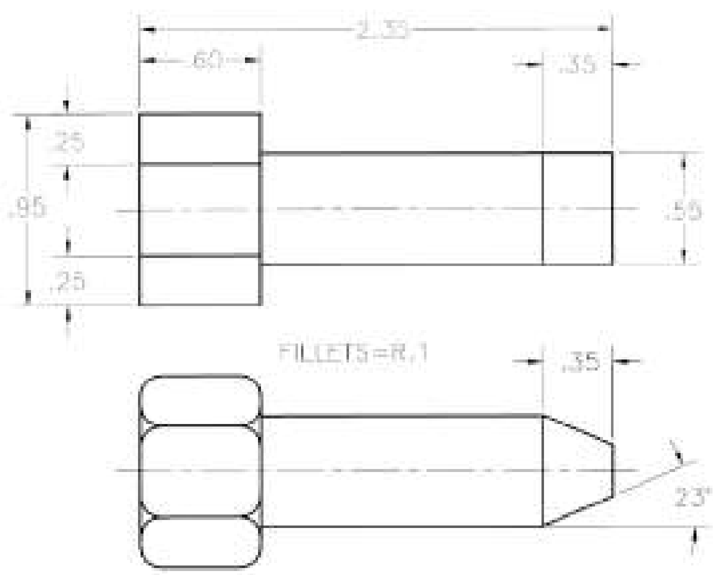


EDITING SKETCHED OBJECTS

Tools to be discussed:

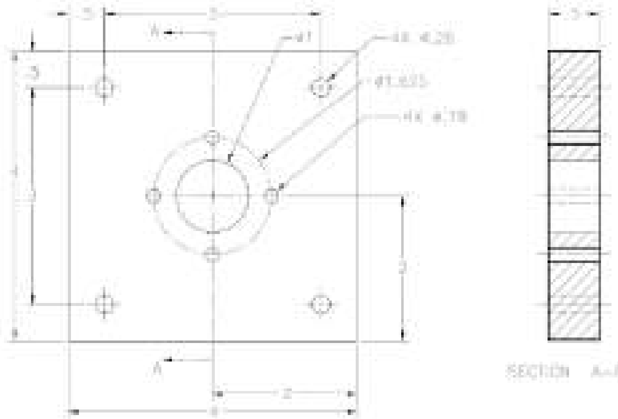
- **Move**
- **Copy**
- **Break**
- **Offset**
- **Chamfer**
- **Trim**
- **Extend**
- **Stretch**
- **Array**
- **Rotate**
- **Mirror**
- **Scale**
- **Lengthen**
- **Measure**
- **Divide**

Exercise 1
FILLET, CHAMFER, AND TRIM
Draw the top illustration shown in Figure below and then use the **Fillet**, **Chamfer**, and **Trim** tools to obtain the next illustration given in the same figure. Assume the missing dimensions.

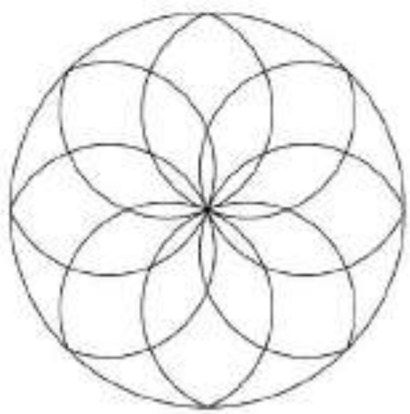


Exercise 2
BREAK
Break a line at five different places and then erase the alternate segments. Next, draw a circle and break it into four equal parts.

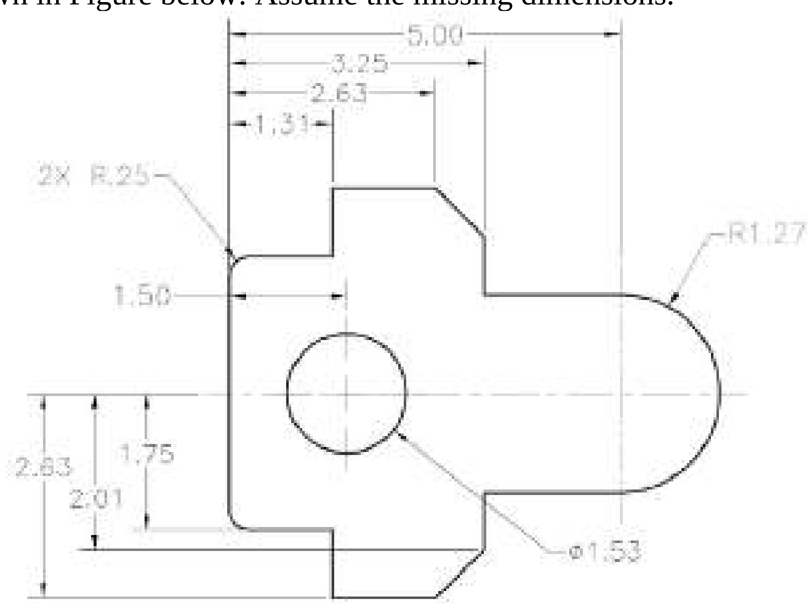
Exercise 3
RECTANGULAR AND POLAR ARRAYS
Create the drawing of an end plate. The dimensions of the end plate are shown in Figure below.



Exercise 4
DIVIDE
Create the drawing shown in Figure below. Use the **Divide** tool to divide the circle and use the **NODE** object snap to select the points. Assume the dimensions of the drawing.

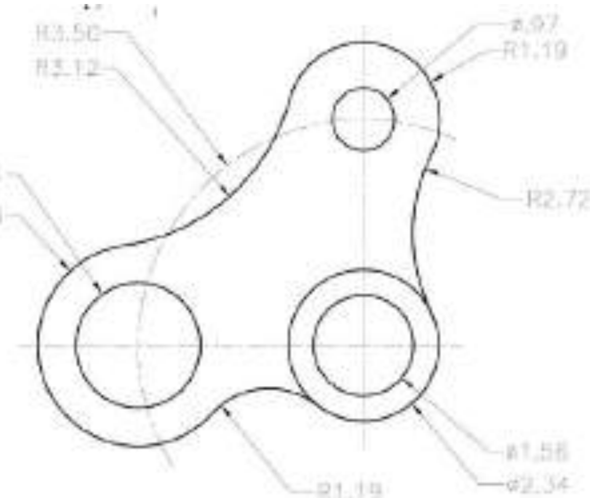


Exercise 5
Create the drawing shown in Figure below. Assume the missing dimensions.



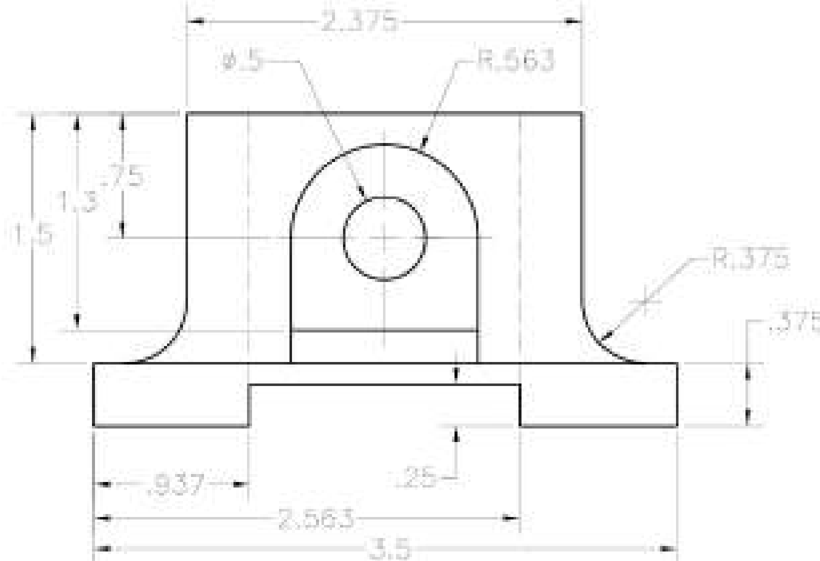
Exercise 6

Create the drawing shown in Figure below.



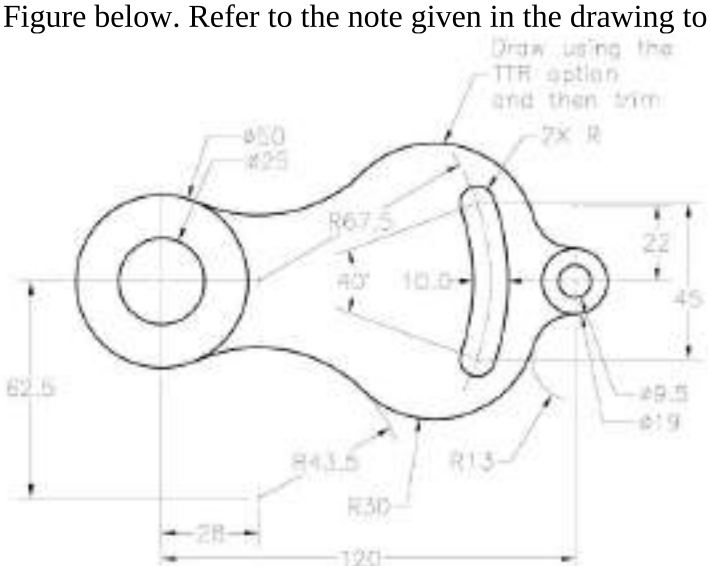
Exercise 7

Create the drawing shown in Figure below. Assume the missing dimensions.



Exercise 8

Create the drawing shown in Figure below. Refer to the note given in the drawing to create an arc of radius 30.

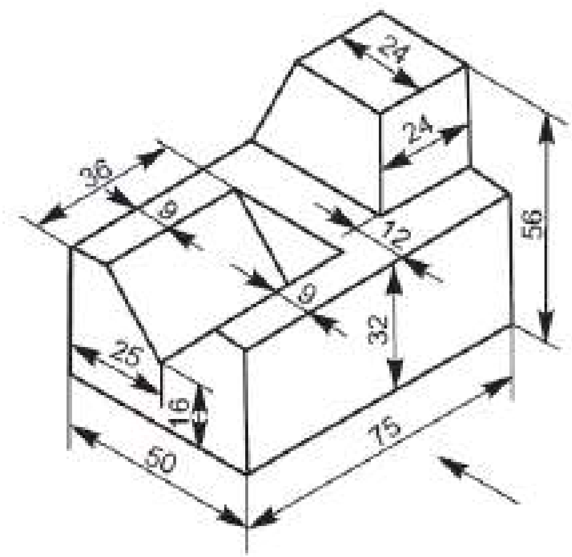


CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC VIEW

(To be drawn in AutoCAD)

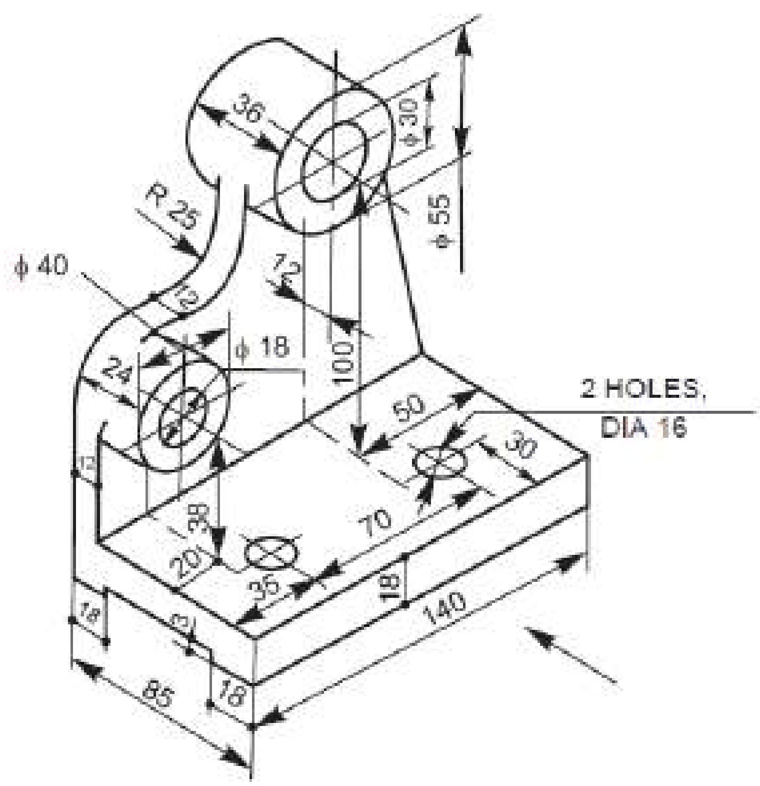
Exercise 1

Draw the orthographic view of the following object from the given Isometric View . All dimensions are in mm.



Exercise 2

Draw the orthographic view of the following object from the given Isometric View. All dimensions are in mm.

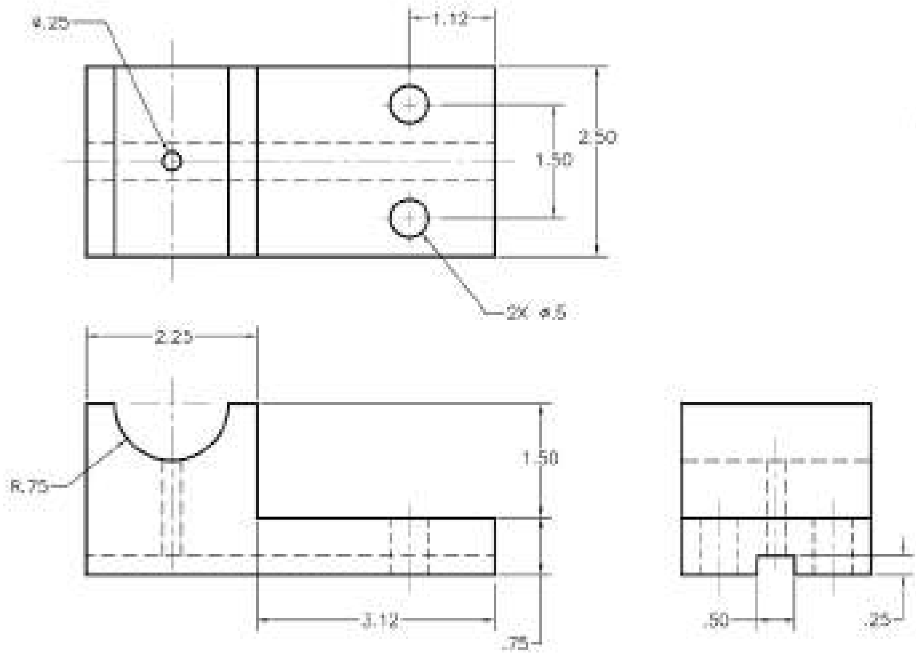


CONVERSION OF MULTI-VIEW TO ISOMETRIC VIEW

(To be drawn in AutoCAD)

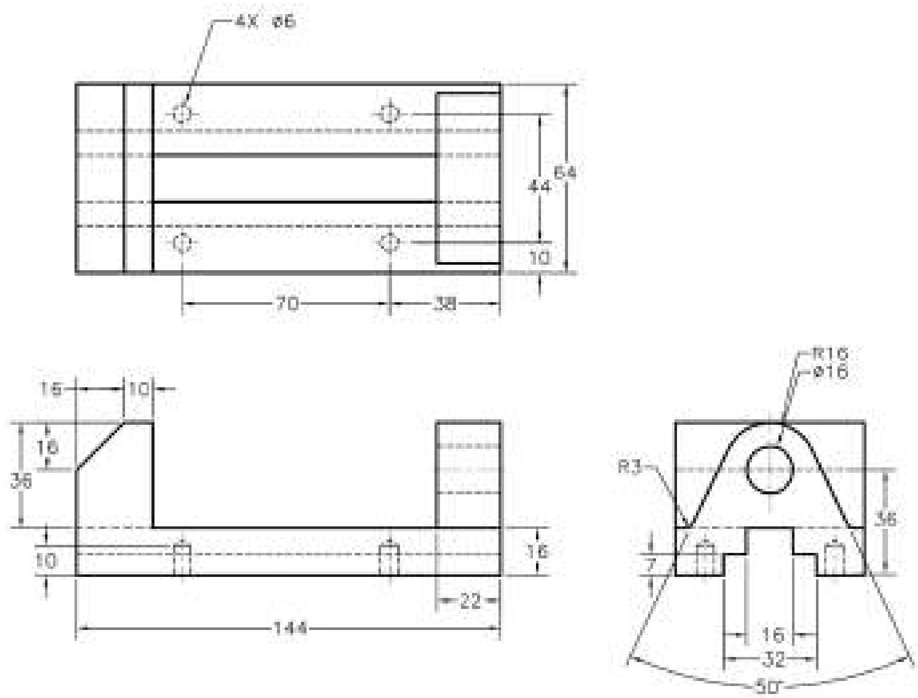
Exercise 1

Draw the Isometric view of the following objects from their multi-view projections. Assume suitable dimensional units.



Exercise 2

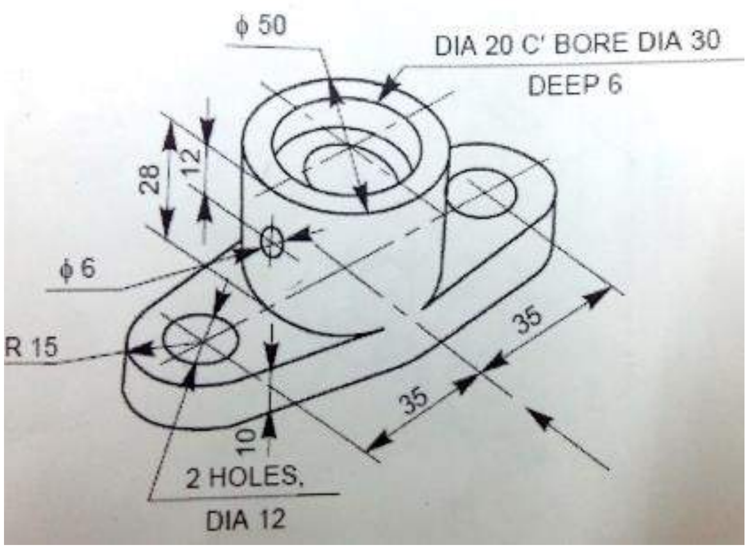
Draw the Isometric view of the following objects from their multi-view projections. All dimensions are in mm.



<u>**ORTHOGHRAPHIC SECTIONAL VIEW**</u>
<u>***(To be drawn in AutoCAD)***</u>

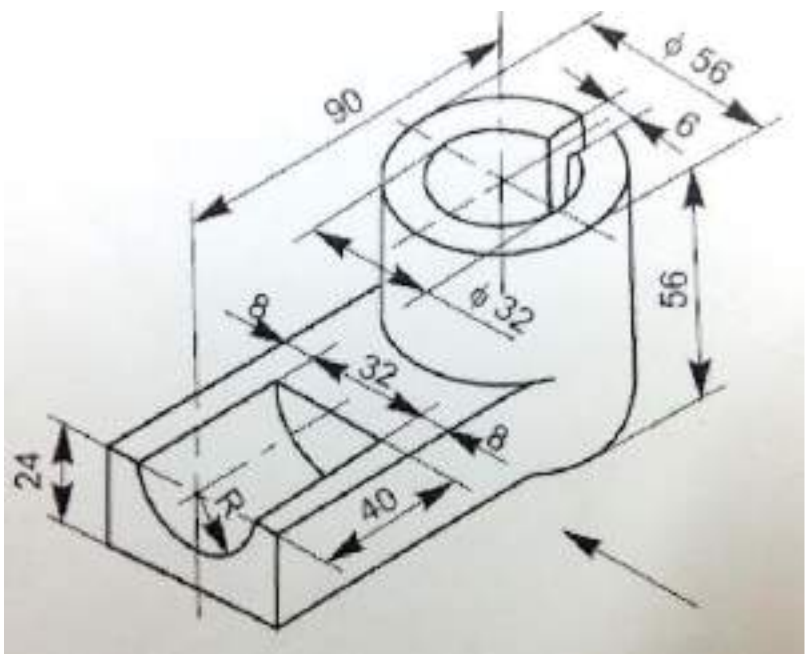
Exercise 1

Figure below shows the isometric view of a shaft support. Draw Full sectional view and half-sectional view in AutoCAD.



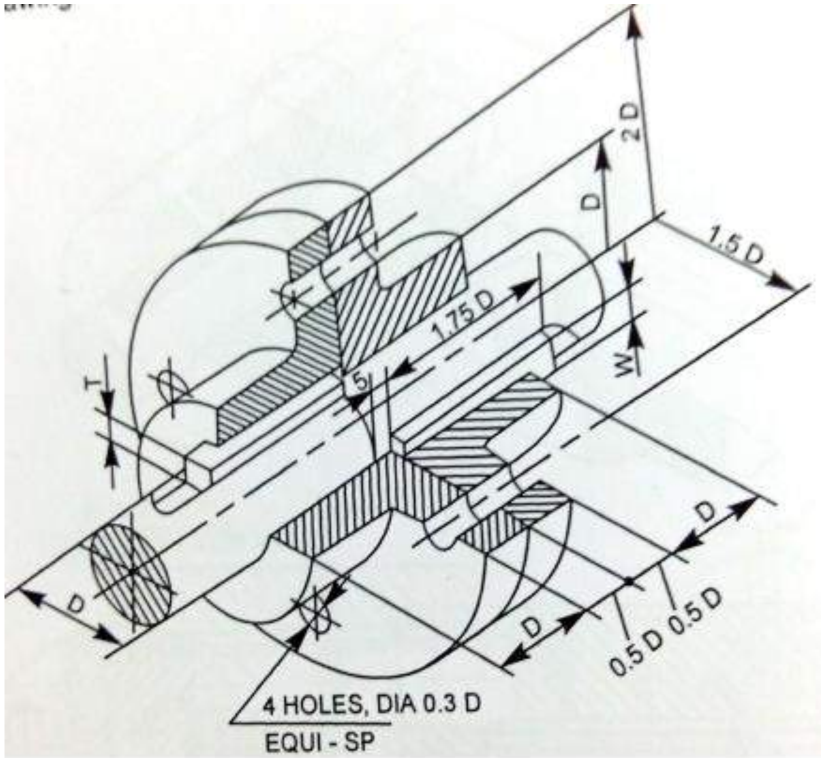
Exercise 2

Figure below shows the isometric view of a machine component. Draw its Full-sectional view from the front in AutoCAD.



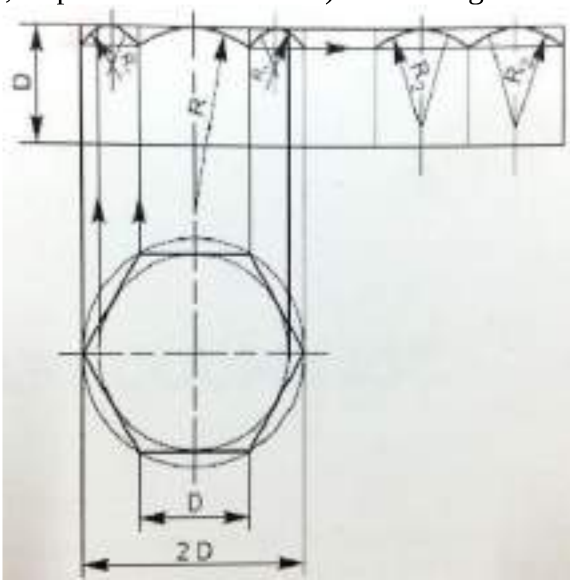
Exercise 3

Draw the half-sectional view in AutoCAD of rigid flank coupling shown below. Assume a suitable value of D



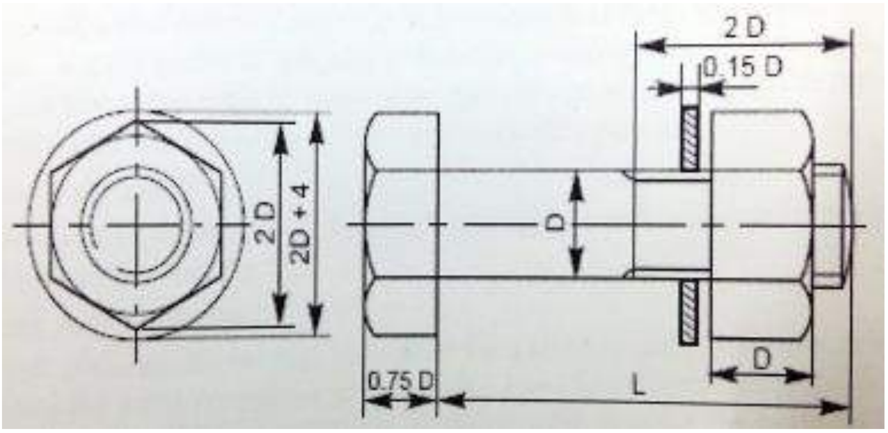
NUT & BOLT ASSEMBLY
(To be drawn in AutoCAD)

Exercise 1
Draw different views (Front View, Top View & Side View) of a Hexagonal Nut with all dimensional details.



Consider the following empirical relations
$R = 1.732D$, $R_1 = 0.433D$, $R_2 = 1.3D$
Where D is the bolt diameter

Exercise 2
Draw an assembly of a hexagonal bolt along with nut and washer.



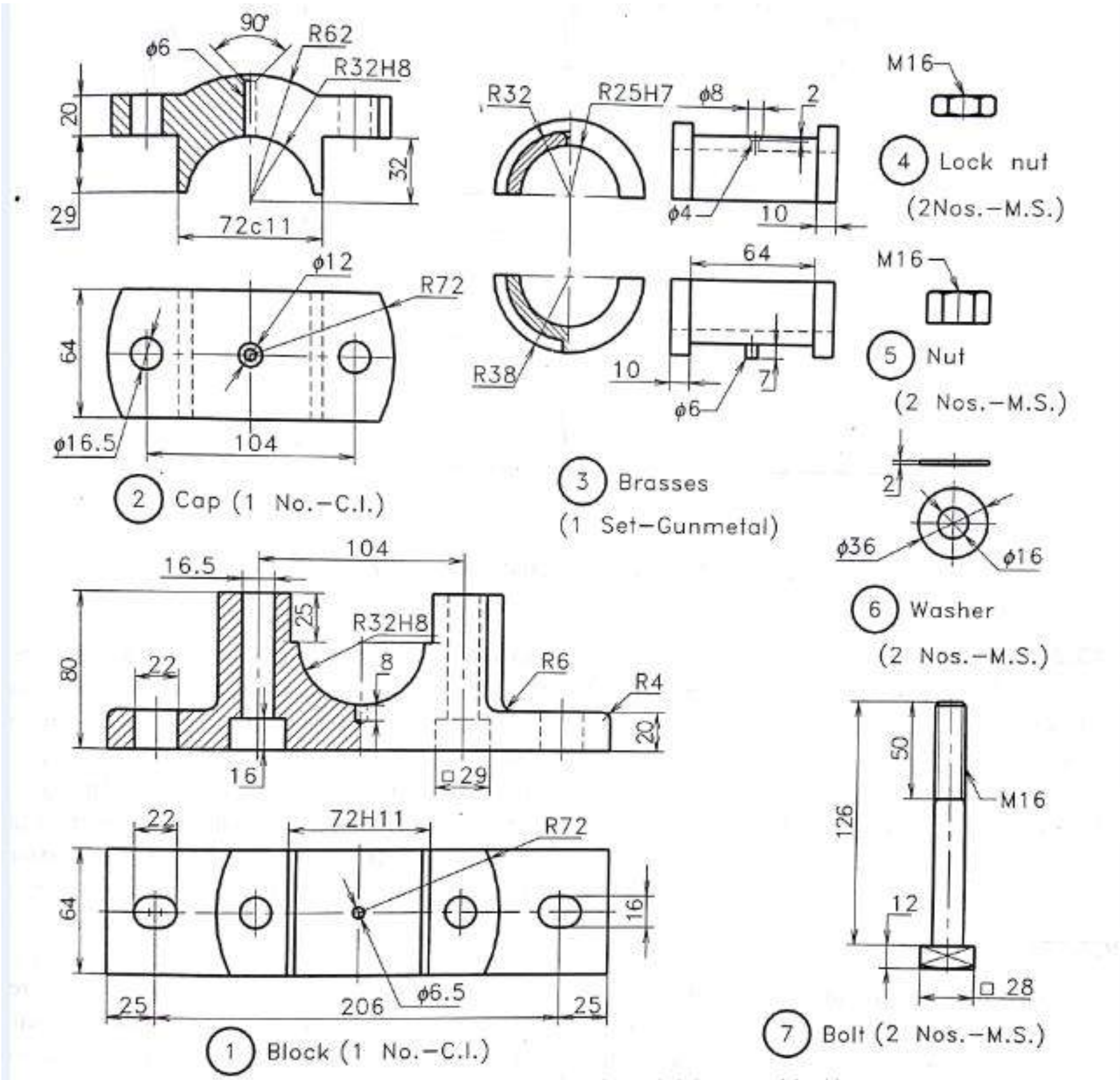
Where D is the bolt diameter.

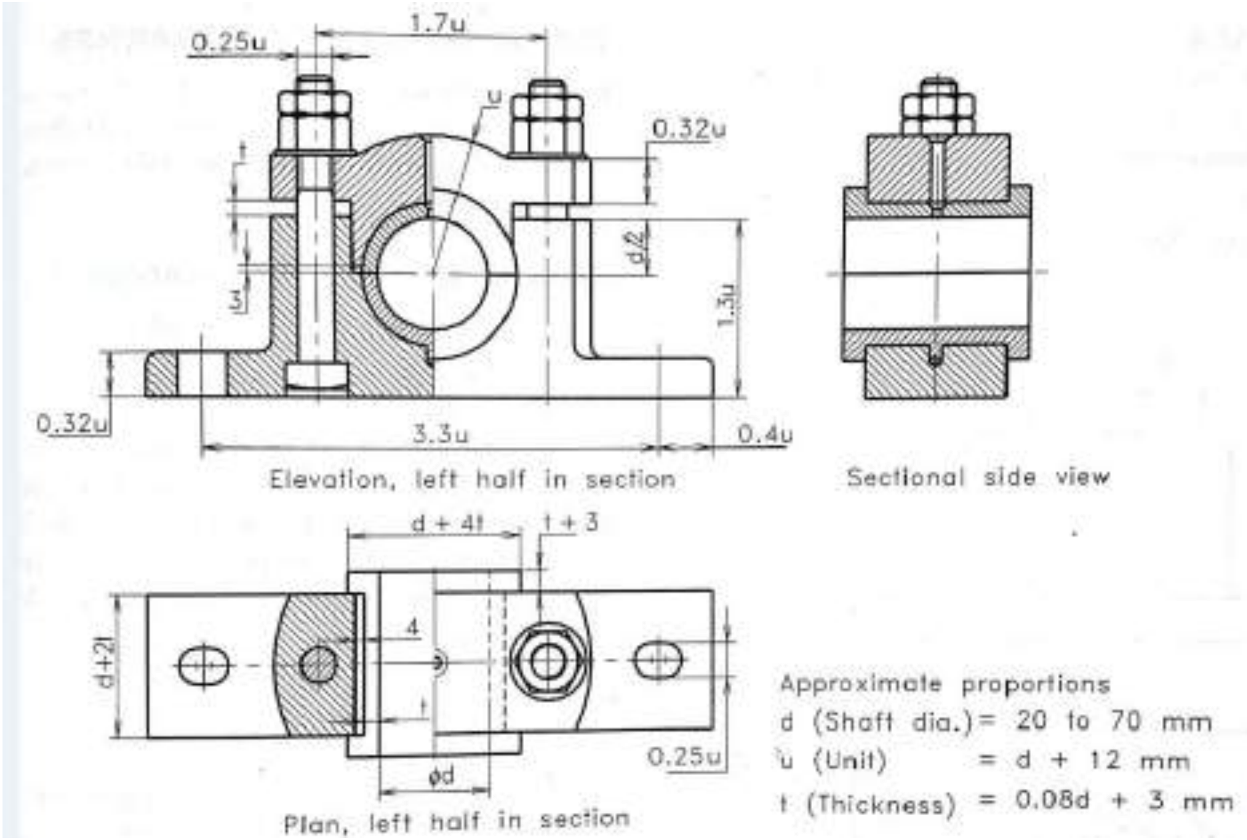
PLUMMER BLOCK ASSEMBLY

(To be drawn in AutoCAD)

Exercise 1

Draw the sectional Front view, Top View and Side View along with BOM of Plummer Block Assembly from the part drawing shown below





Half Sectional Front View, Top View & Side View of Plummer Block Assembly

Department of Mechanical Engineering

Lesson Plan

Paper Name: Kinematics of Machines   Paper Code: MECH2205

Class No	Module	Topic	Remark
1	1	❖ Definition of Kinematics, Kinetics and Dynamics ❖ Definition of Mechanism and Machine and their physical interpretation. ❖ Detailed discussion on Link, Joint and their types	
2		❖ Discussion on Degree of Freedom ❖ Definition of Kinematic Pair and their detailed classification correlating with DOF	
3		❖ Discussion on Mobility of a Mechanism and its DOF ❖ Mathematical exploration of Gruebler's Criterion and Kutzback's criterion to find out DOF of a spatial and planner mechanism. ❖ Solving few problems on the determination of DOF of different mechanisms	
4		❖ Discussion on the inequality to find out DOF of a mechanism containing links and loops. ❖ Solving various problems on determination of DOF of different mechanisms containing binary and ternary links.	
5		❖ Discussion on Equivalent Mechanisms. ❖ A detailed discussion on Grashof's Law and its implementation to find out class and inversions of a four-bar mechanism.	
6		❖ Discussion on 'Mechanical Advantages' and 'Transmission Angle'. ❖ Solving problem to determine Class, Inversion, Mechanical Advantage and Transmission Angle of a four-bar mechanism.	
7		❖ A detailed discussion on different inversions of a slider cranks mechanism.	
8		❖ Solving Different problems	
9		❖ Solving Different problems and Doubt Clearance.	
10	2A	❖ An overview about absolute and relative motions, types of vectors, vector addition and subtraction. ❖ Discussion on different type of motions of a link.	
11		❖ Construction of Velocity Diagram for a Four-Link mechanism ❖ Discussion on Velocity Images.	
12		❖ Discussion on Angular Velocity of Links and Velocity of Rubbing ❖ Solving few problems on Velocity Analysis of different type of mechanisms.	
13		❖ Construction of velocity diagram for a slider crank mechanism and Crank Slotted Mechanism. ❖ Solving problems on velocity analysis of different slider crank mechanisms	
14		❖ Discussion on I-Centre method. ❖ Solving various problems on velocity analysis of different mechanisms and doubt clearance.	
15	2B	❖ An overview on different components of acceleration of a rotational motion. ❖ Construction of Acceleration Diagram of a Four-Link Mechanism	

Department of Mechanical Engineering

Lesson Plan

Paper Name: Kinematics of Machines Paper Code: MECH2205

Class No	Module	Topic	Remark
16		❖ Acceleration of intermediate and offset point on any link of a four-bar mechanism. ❖ Solving various problems on acceleration analysis of a four-bar mechanism	
17		❖ Construction of acceleration diagram of a slider crank mechanism. ❖ Detailed discussion on Coriolis Acceleration Component. ❖ Problem solving on acceleration analysis of different types of slider crank mechanism and slotted crank mechanisms	
18		❖ Detailed Discussion on Klein's Construction ❖ Analytical Expressions for Velocity and Acceleration analysis.	
19		❖ Solving different problems	
20	3A	❖ Synthesis ❖ Introduction, Analytical derivation of four bar mechanism: ❖	
21		❖ Displacement function, velocity function and acceleration function.	
22		❖ Analytical and Graphical process of synthesis (basic discussion) ❖ Analytical synthesis of mechanism: Function generation	
23	3B	❖ Introduction ❖ Classification of gear ❖ Gear terminologies	
24		❖ Law of gearing ❖ Forms of teeth ❖ Path of contact	
25		❖ Arc of contact ❖ Number of pairs of teeth in contact ❖ Minimum No of teeth	
26		❖ Introduction to gear train ❖ Simple gear train ❖ Compound gear train	
27		❖ Reverted gear train ❖ Epicyclic gear train	
28		❖ Problem Discussion	
29	4A	❖ Introduction to cams ❖ Application of cam ❖ Types of cams and followers	
30		❖ Terminologies: Angle of ascent ❖ Angle of descent ❖ Angle of dwell ❖ Angle of action ❖ Base circle ❖ Follower motion programming.	
31		❖ Continuation of follower motion programming ❖ Types of follower motions: SHM, constant acceleration and deceleration, constant velocity, cycloidal motion.	

Department of Mechanical Engineering
Lesson Plan
Paper Name: Kinematics of Machines   Paper Code: MECH2205

Class No	Module	Topic	Remark
32		❖ Pressure angle, method to control pressure angle ❖ Layout of cam profile, with knife-edge, roller and flat face follower (along with concept of offset follower).	
33		❖ Examples on layout of cam profile.	
34		❖ Analysis of cams with specified contours: Tangent cam, Circular arc (convex), Eccentric cams: rigid and elastic.	
35		❖ Problem discussion.	
36	4B	❖ A detailed discussion on Peaucellier's and Hart's mechanism	
37		❖ A detailed discussion on Watt's, Grasshopper and Tchebicheff's mechanism	
38		❖ A detailed discussion on Pantograph and Hook joint	
39		❖ A detailed discussion on Ackerman and Davis Mechanism.	

Text Books:

1. Theory of Machines – S S Rattan, Tata McGraw Hill, 4e, 2014
2. Theory of Machines – R. S. Khurmi and J. K. Gupta, S. Chand Technical, 14e, 2005

Reference Books:

1. Theory of Machines and Mechanisms – Uicker, Pennock and Shigley, Oxford University Press, 3e, 2009
2. Kinematics and Dynamics of Machinery – R. L. Norton, McGraw Hill Education, 1e, 2009
3. The Theory of Machines through Solved Problems – J. S. Rao, New Age International Publication, 1e, 2012
4. Mechanism and Machine Theory – Ashok G. Ambekar, PHI Learning, 1e, 2007
5. Theory of Mechanisms & Machines (3rd edition) By Ghosh and Mallik; East West Press, 3e, 2006

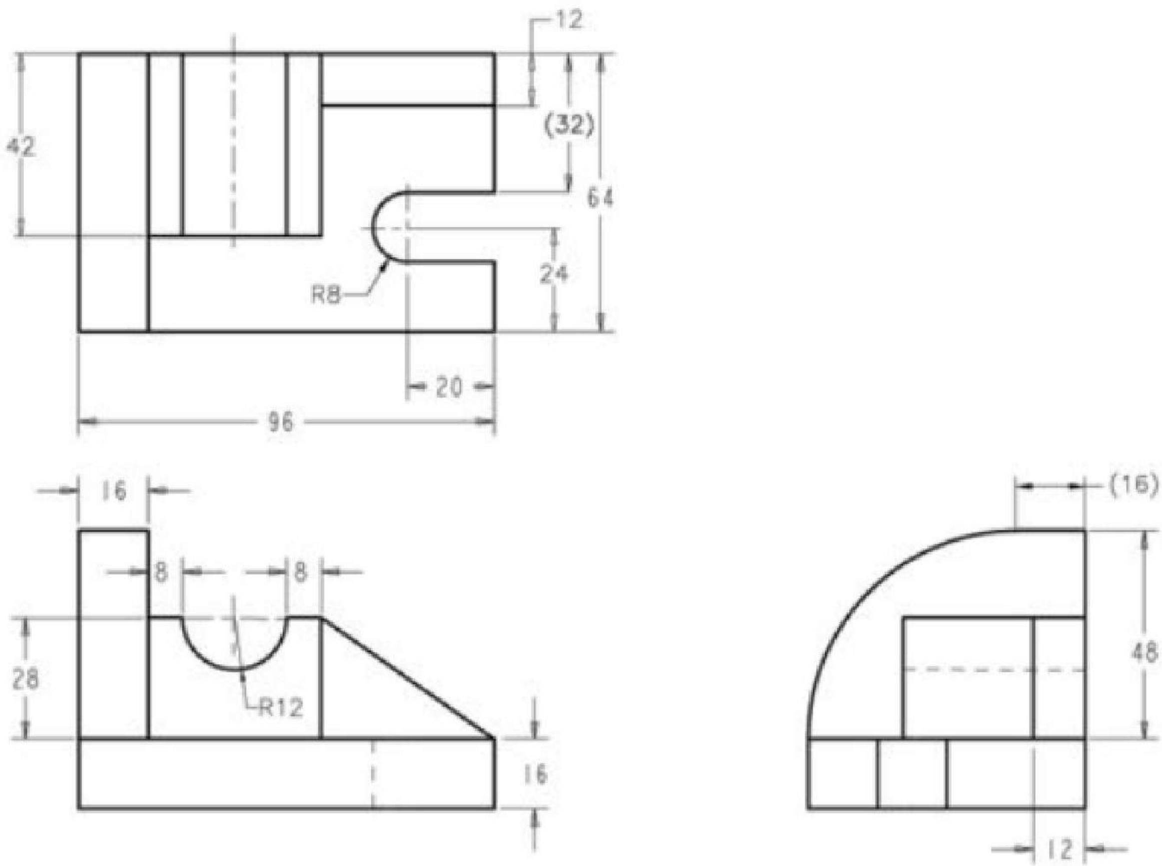
Heritage Institute of Technology

Mechanical Engineering Department

Subject: Machine Drawing II Subject Code: MECH2256

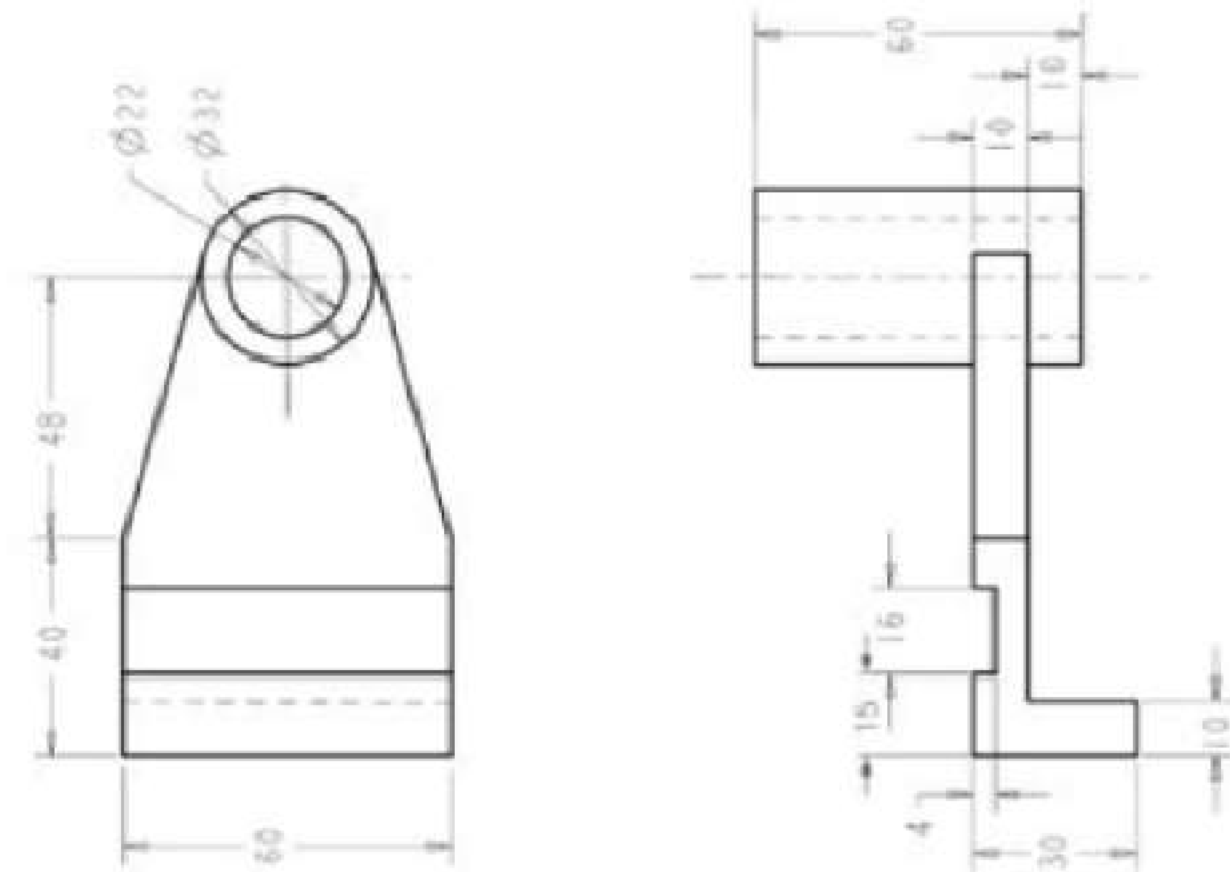
Exercise 1

AIM : To draw the given solid model by using CREO



Exercise 2

AIM : To draw the given solid model by using CREO



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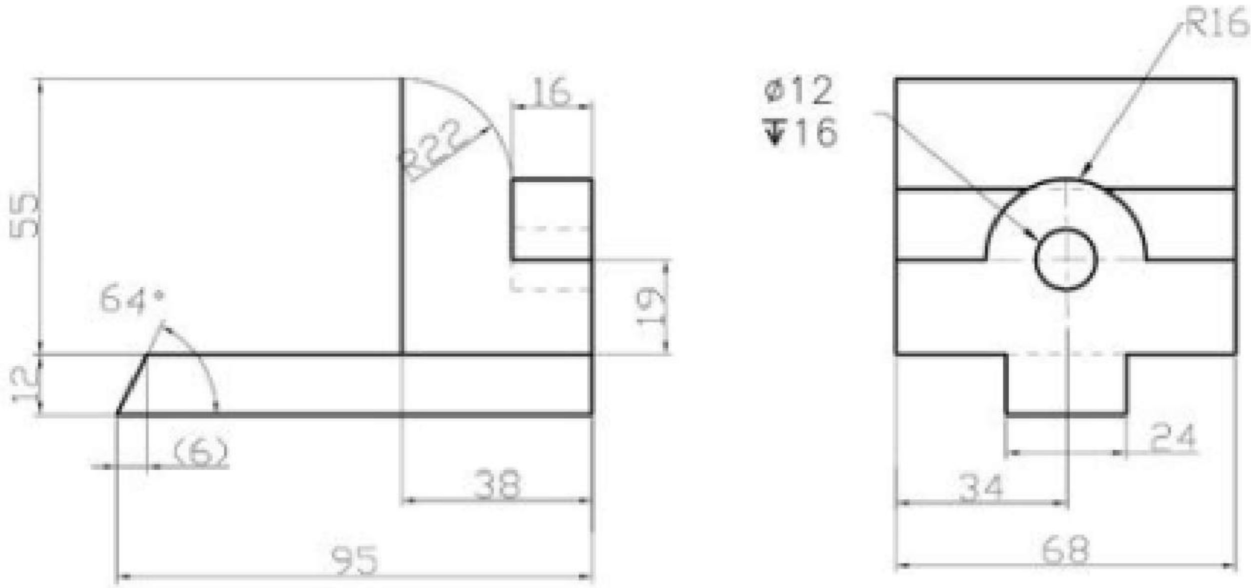
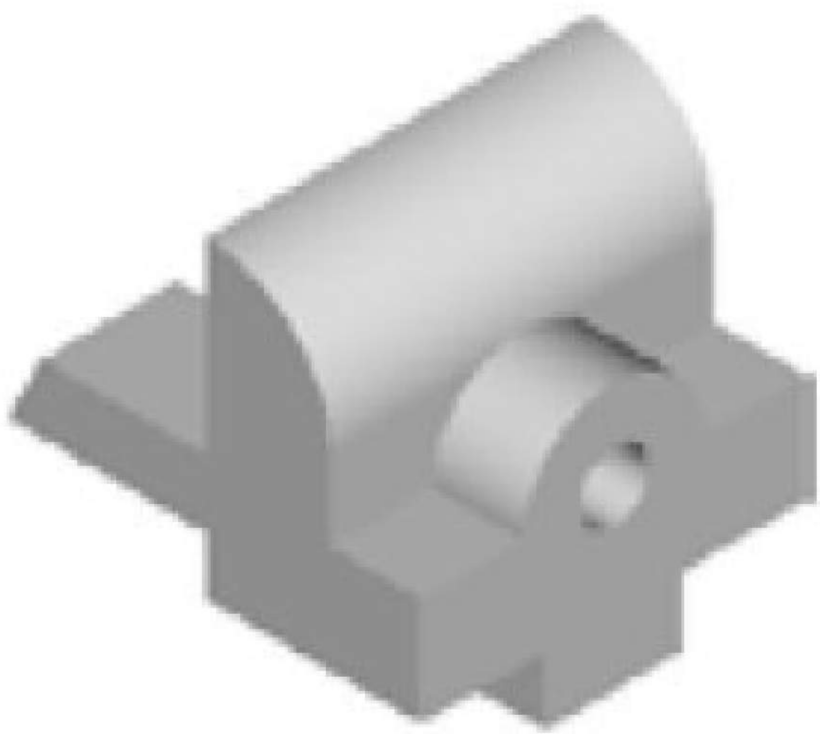
Mechanical Engineering Department

Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 3

AIM : To draw the given solid model by using CREO





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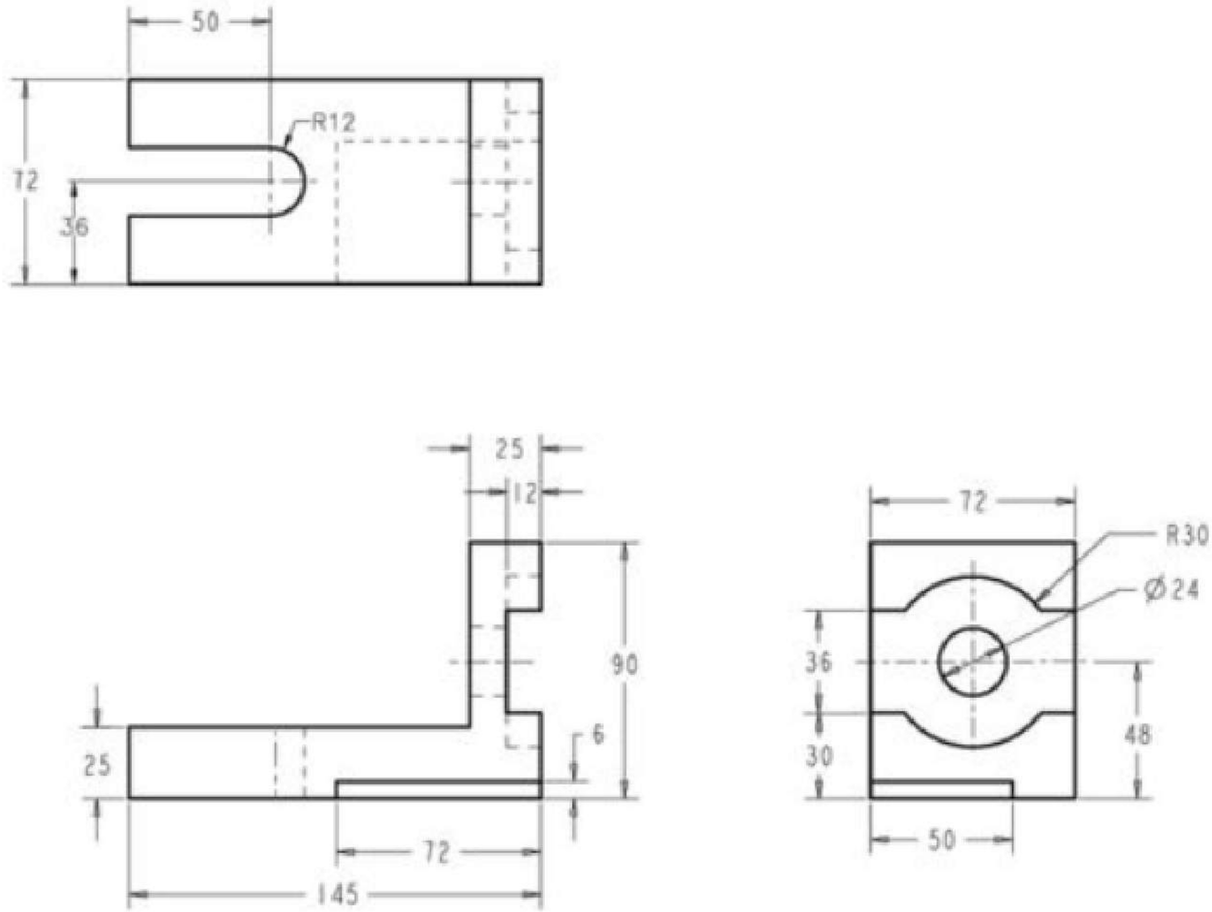
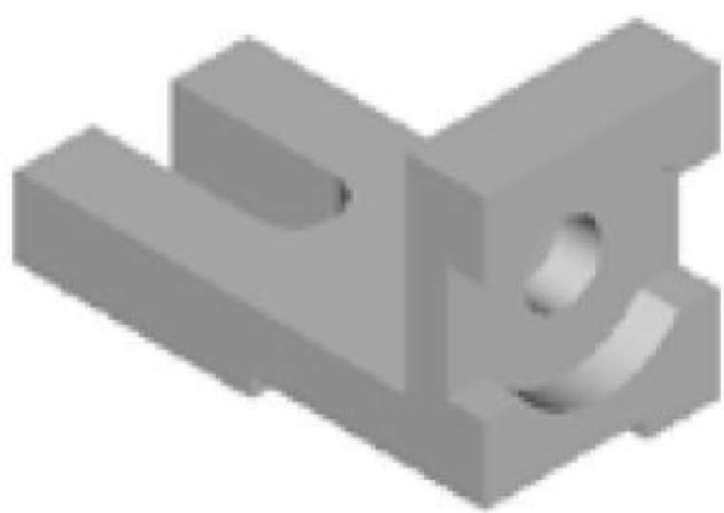
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 4

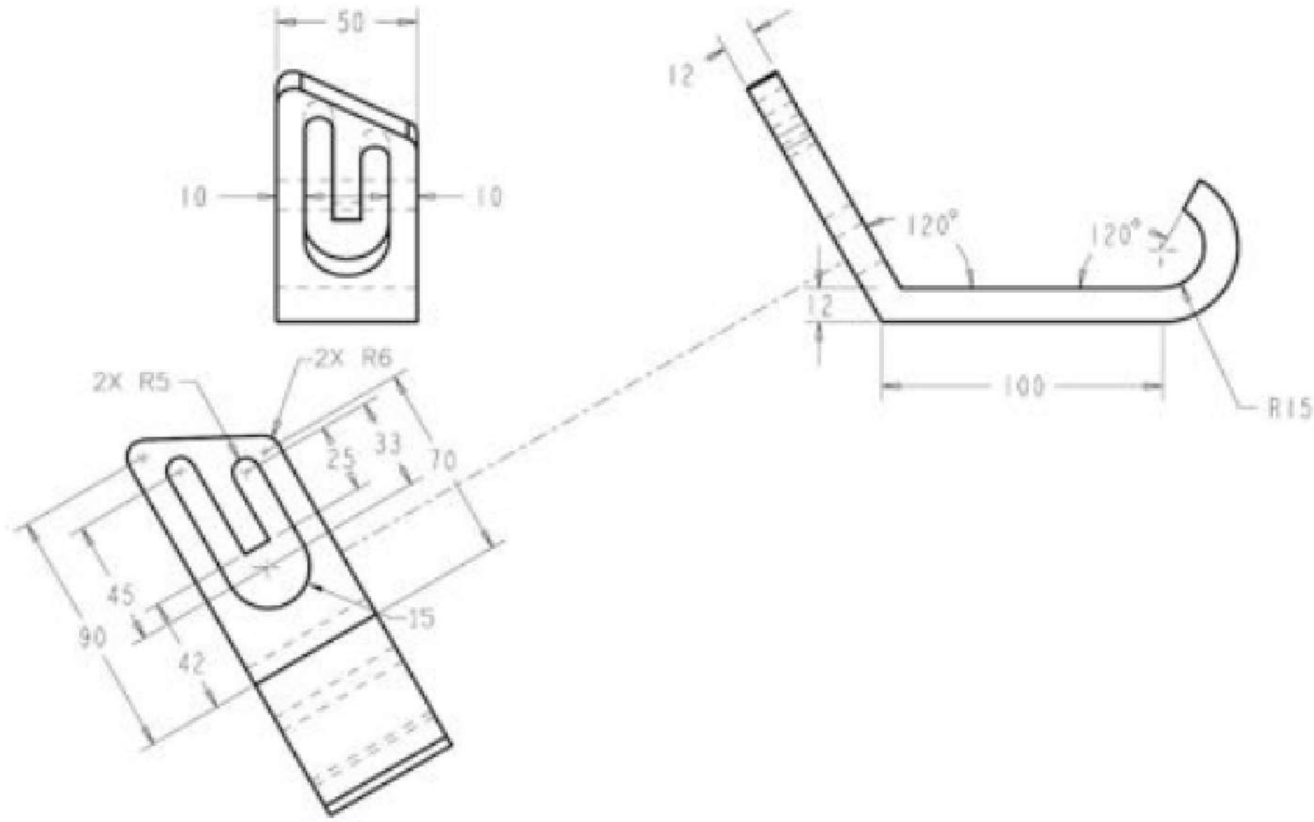
AIM : To draw the given solid model by using CREO





Exercise 5

AIM : To draw the given solid model by using CREO



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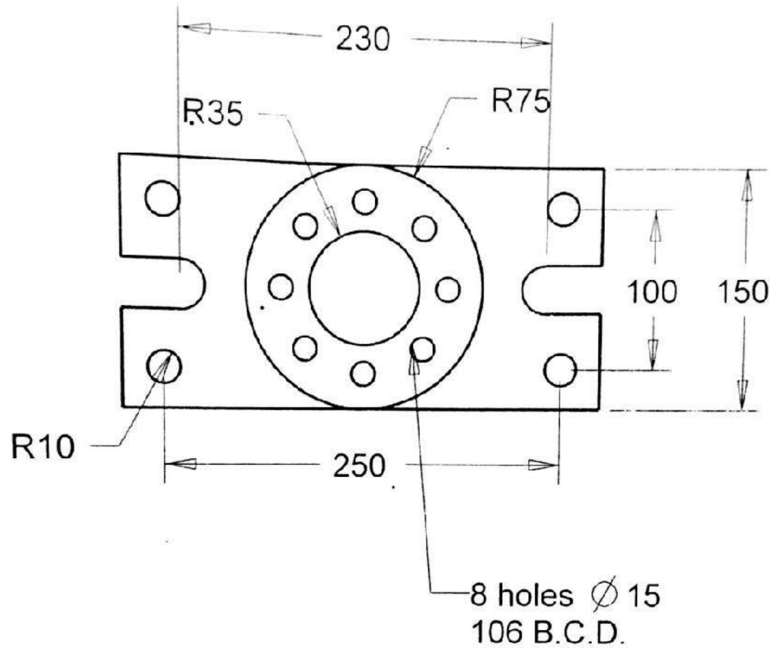
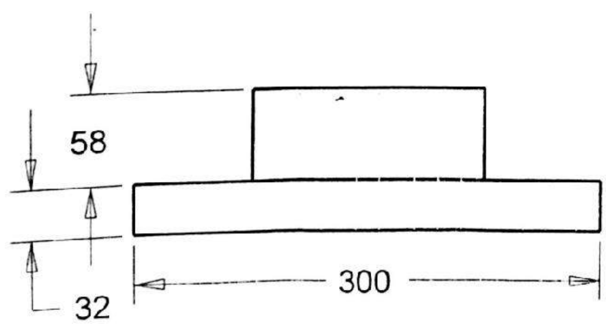
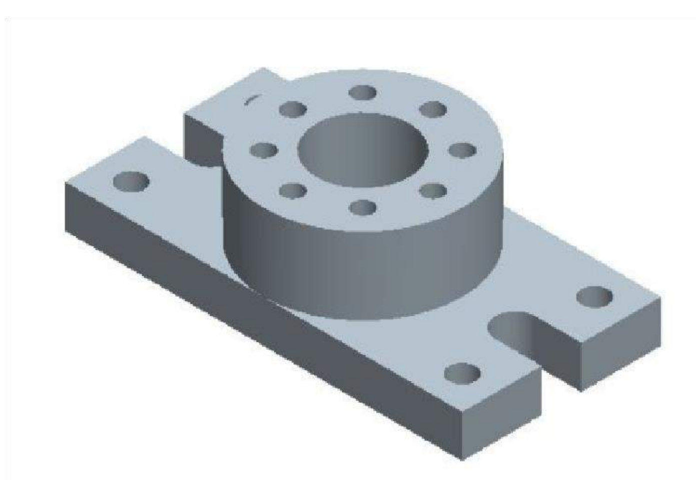
Exercise 6

AIM : To draw the given solid model by using CREO







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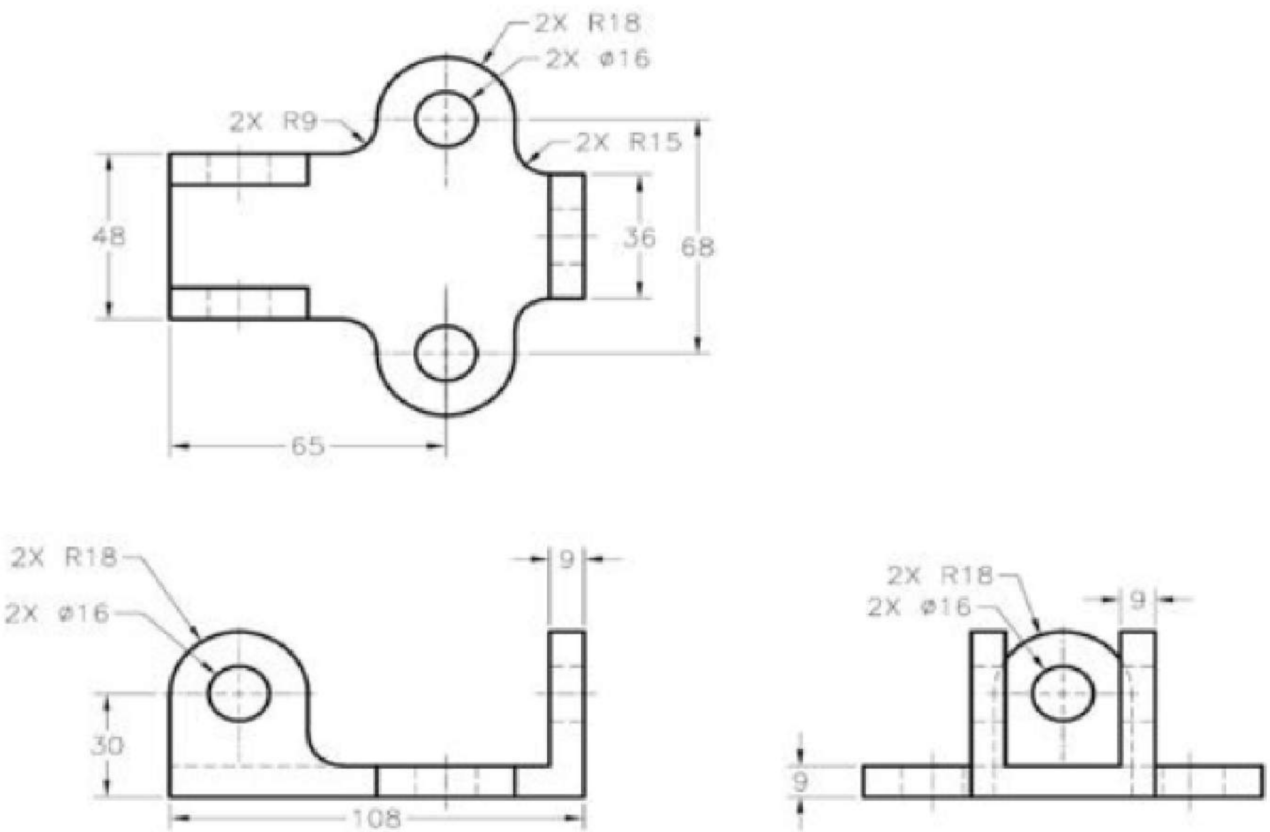
Exercise 7

AIM : To draw the given solid model by using CREO



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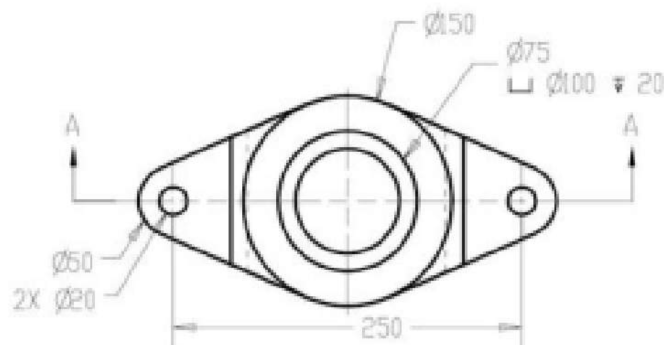
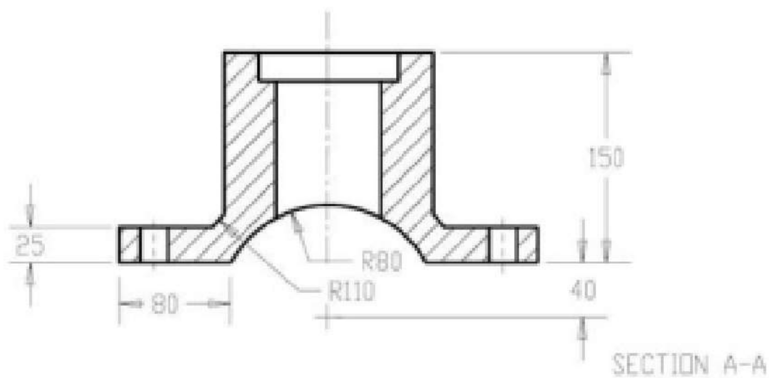
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 8

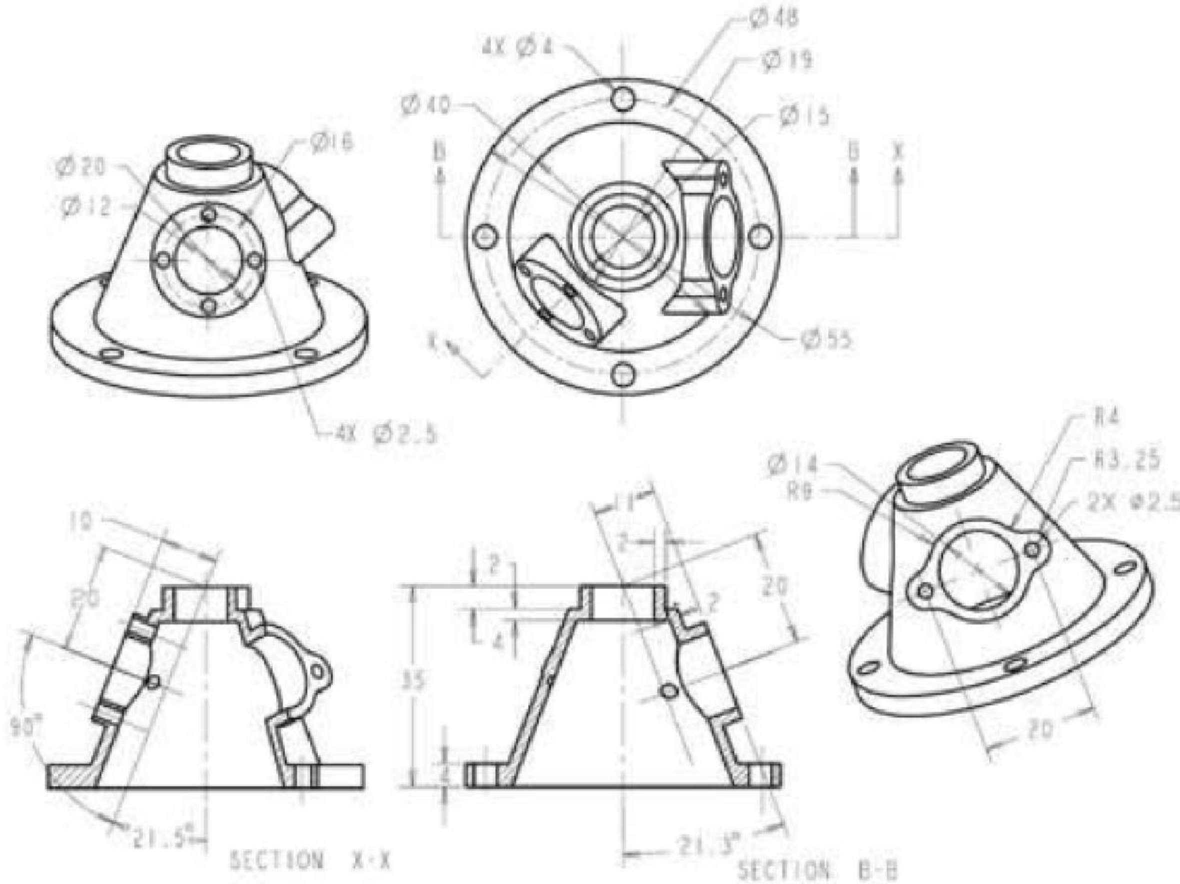
AIM : To draw the given solid model by using CREO

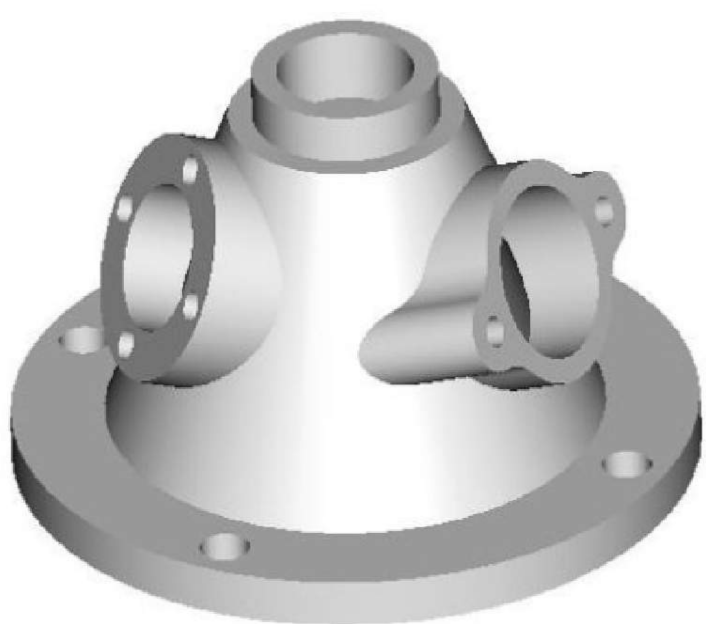




Exercise 9

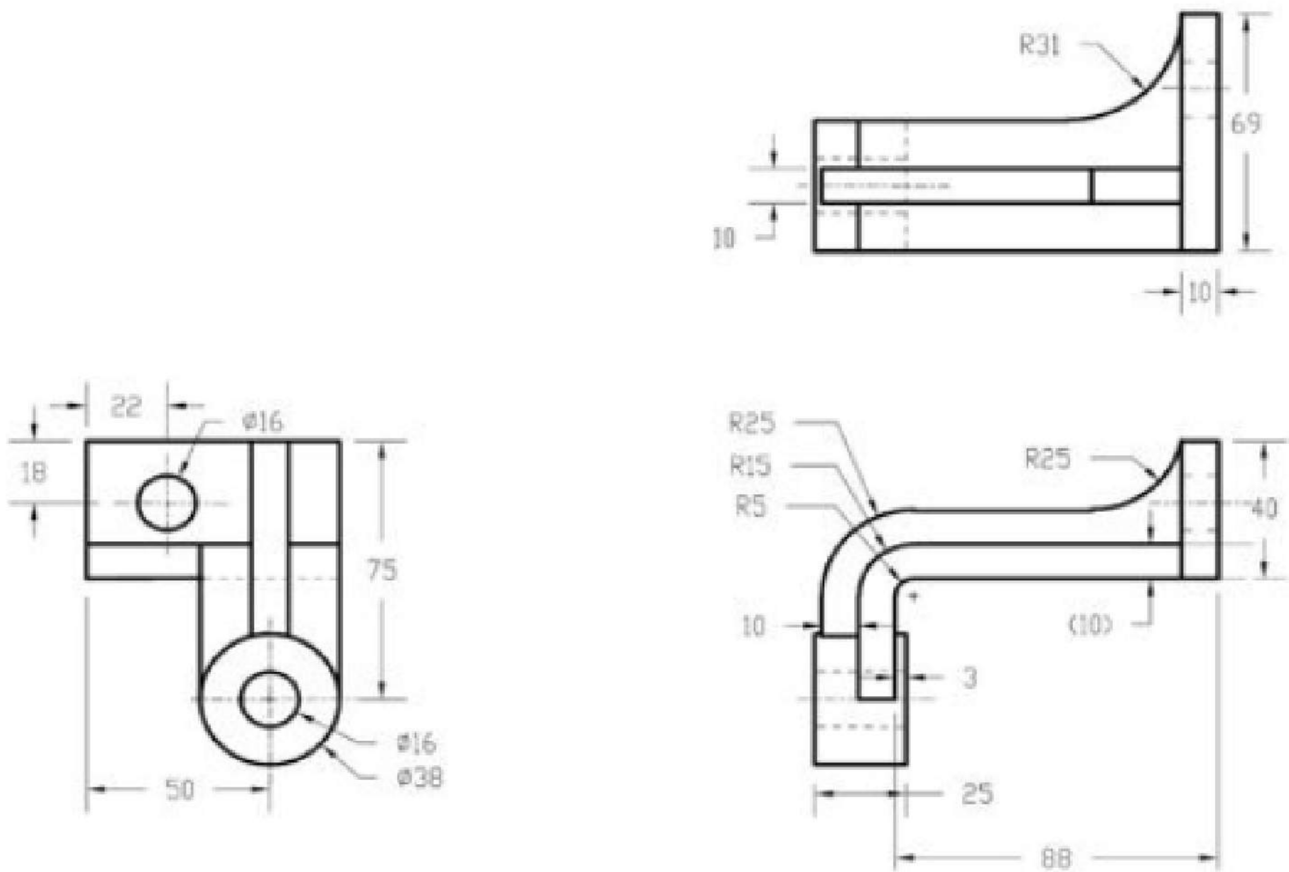
AIM : To draw the given solid model by using CREO

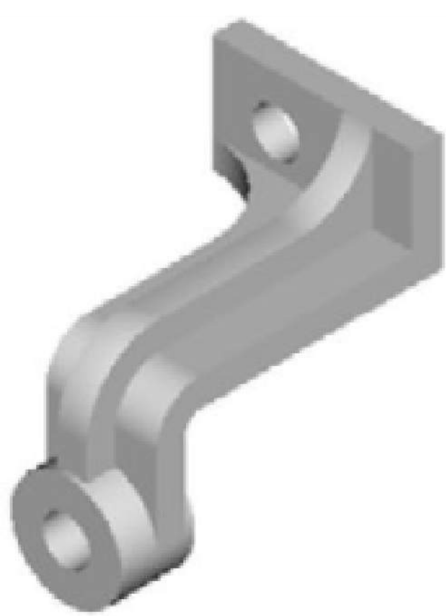




Exercise 10

AIM : To draw the given solid model by using CREO





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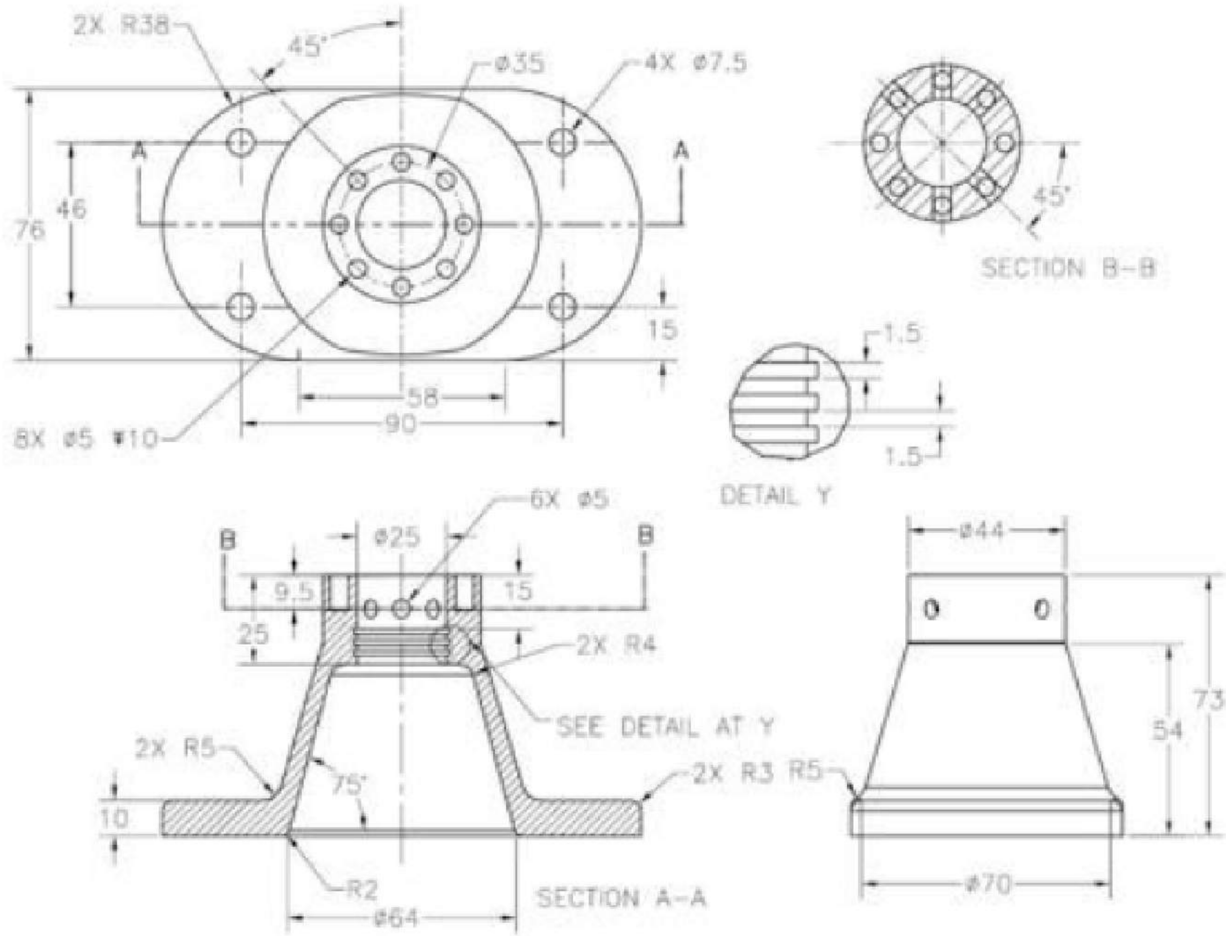
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 11

AIM : To draw the given solid model by using CREO



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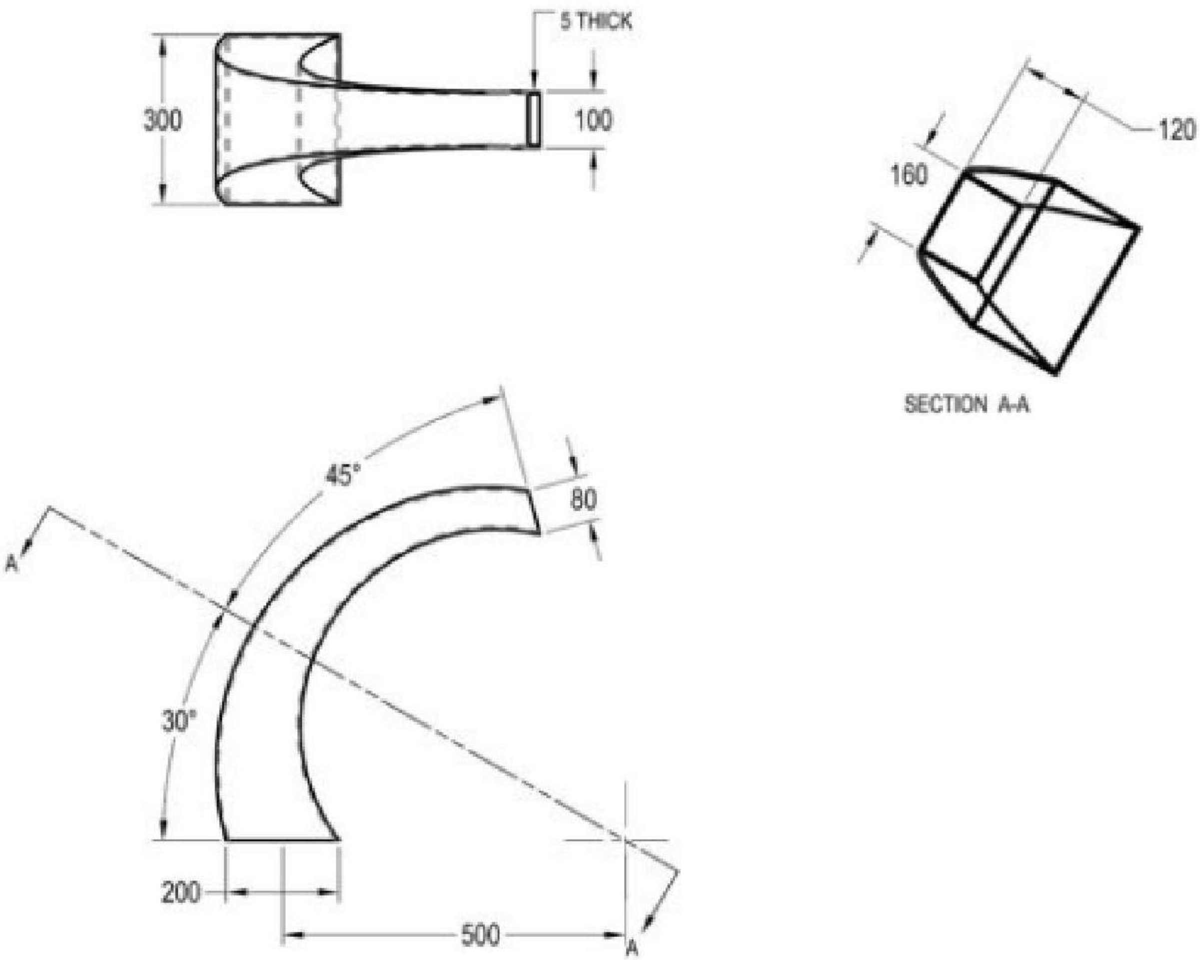
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 12

AIM : To draw the given solid model by using CREO



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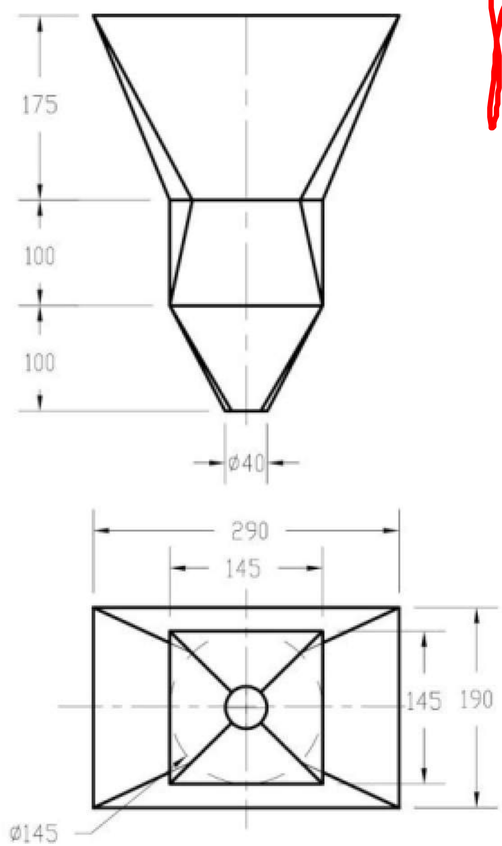
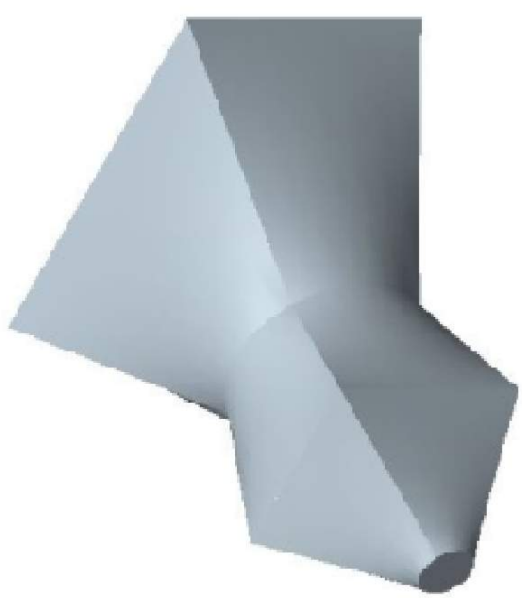
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 13

AIM : To draw the given solid model by using CREO

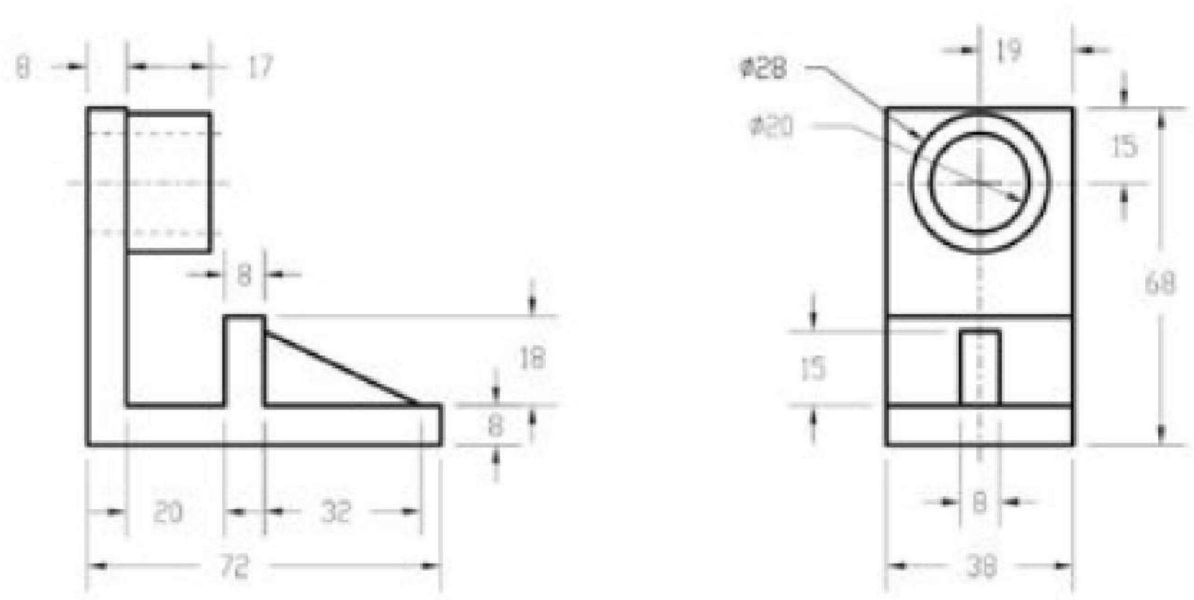
Blend

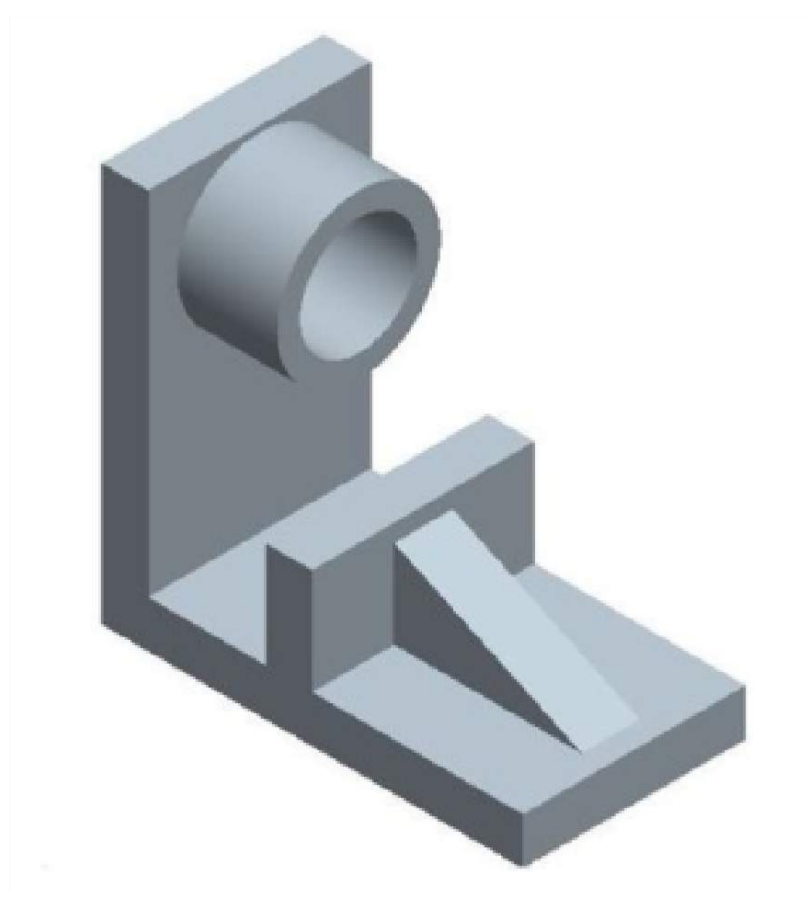




Exercise 14

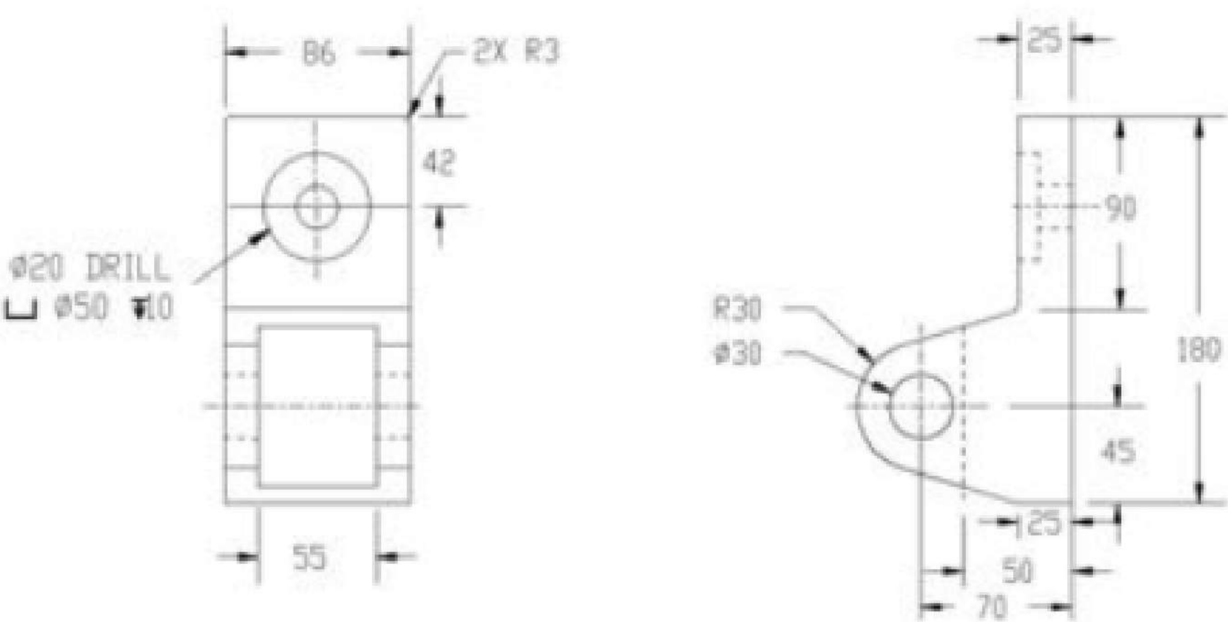
AIM : To draw the given solid model by using CREO





Exercise 15

AIM : To draw the given solid model by using CREO



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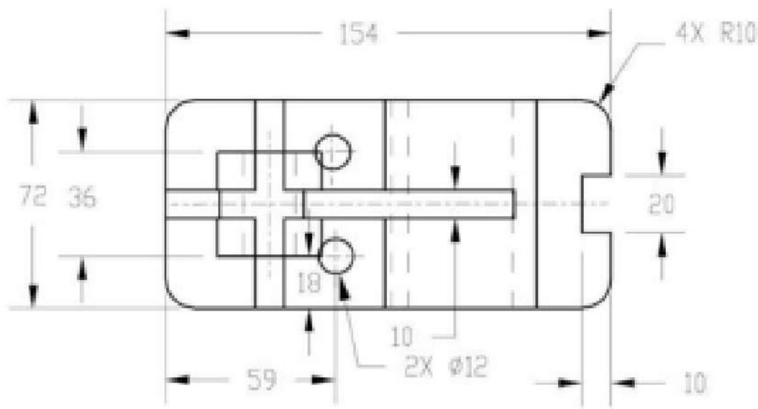
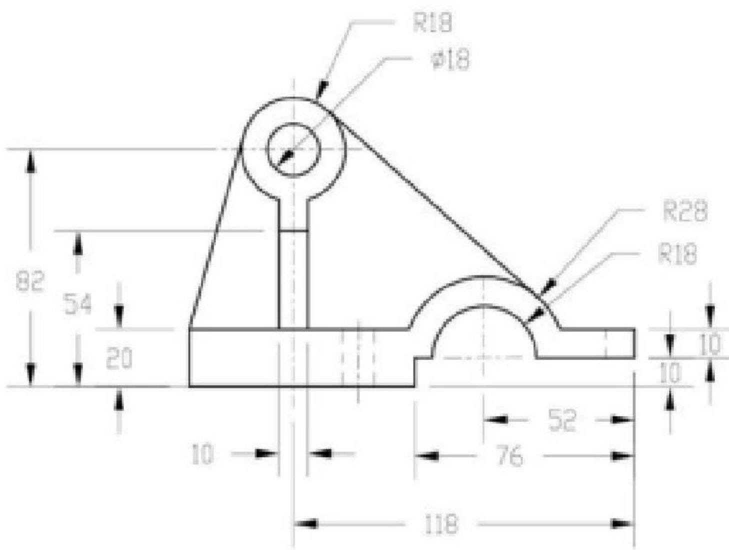
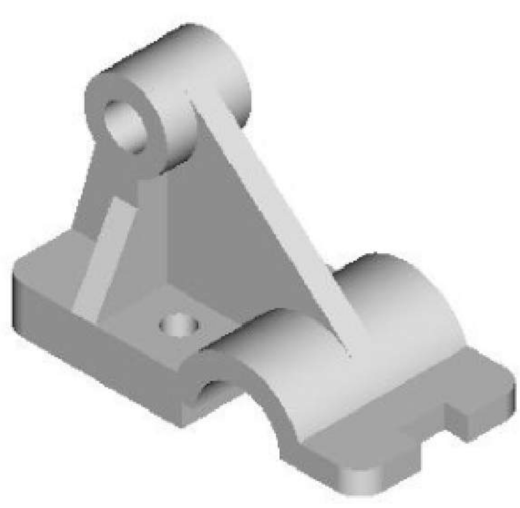
Subject: Machine Drawing II   **Subject Code: MECH2256**

Exercise 16

AIM : To draw the given solid model by using CREO

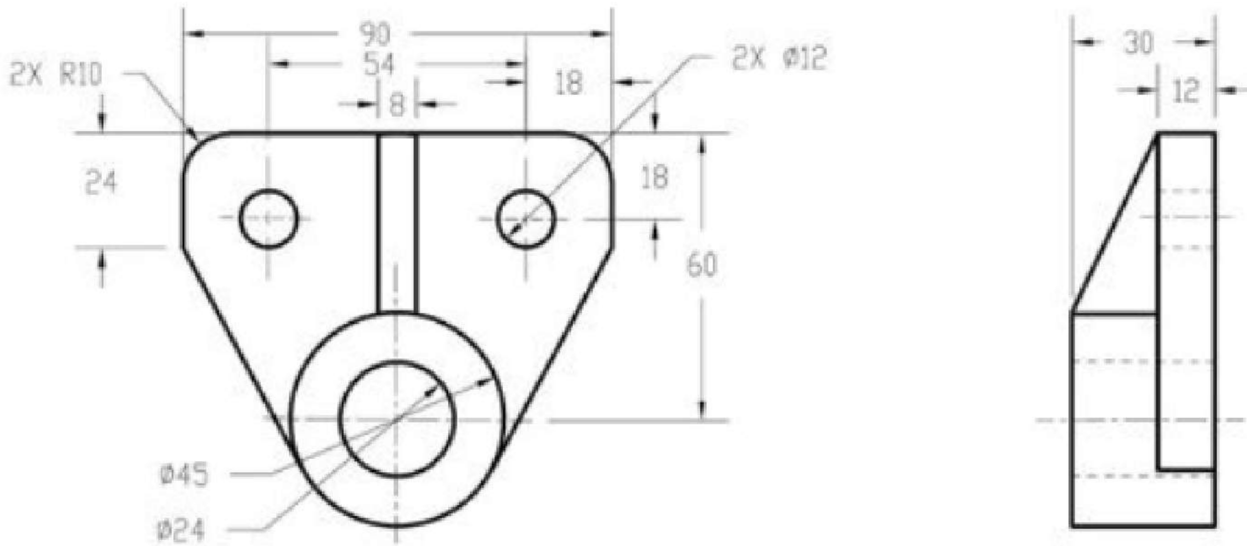


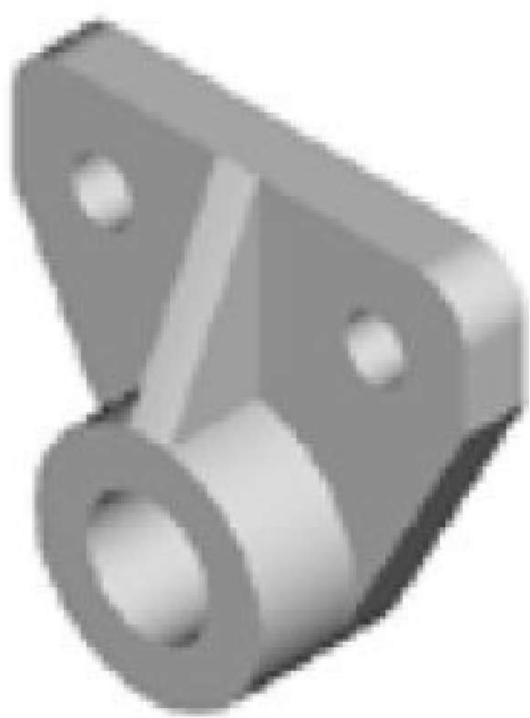




Exercise 17

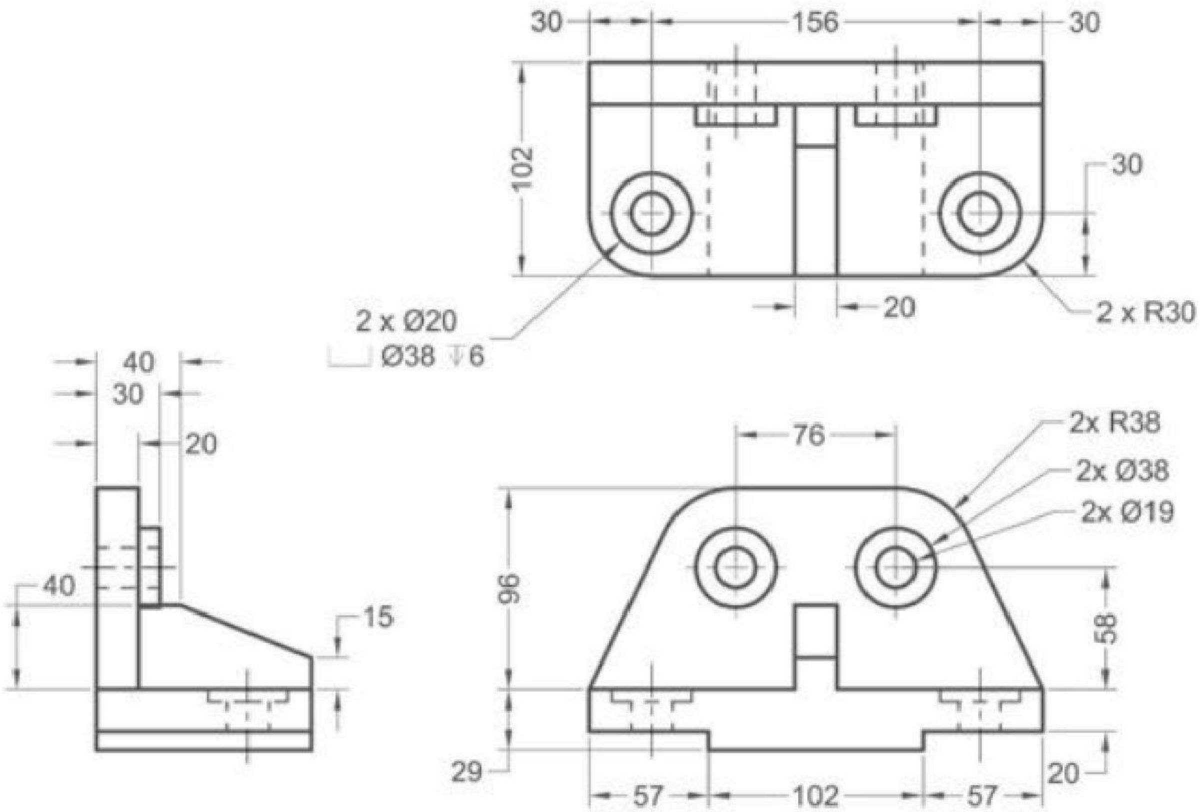
AIM : To draw the given solid model by using CREO

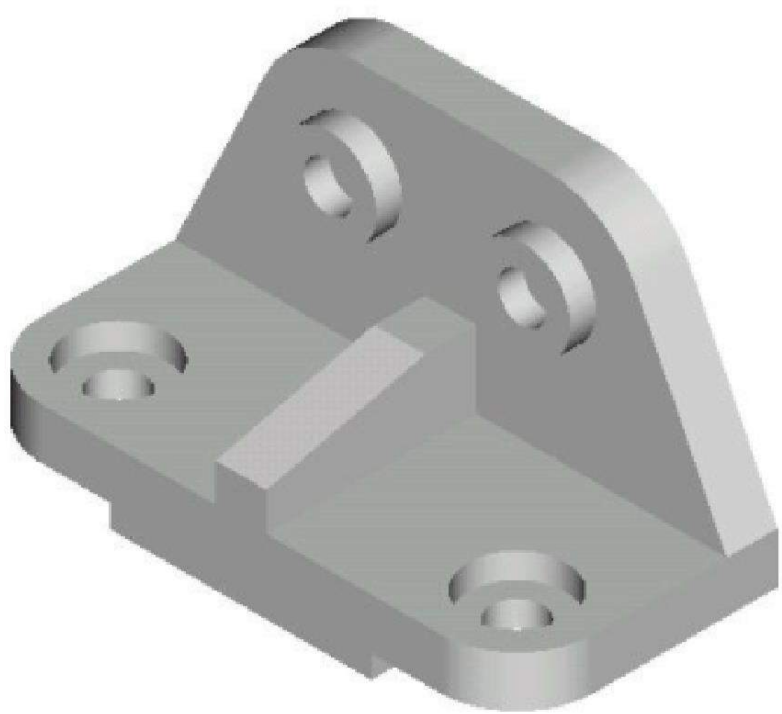




Exercise 18

AIM : To draw the given solid model by using CREO





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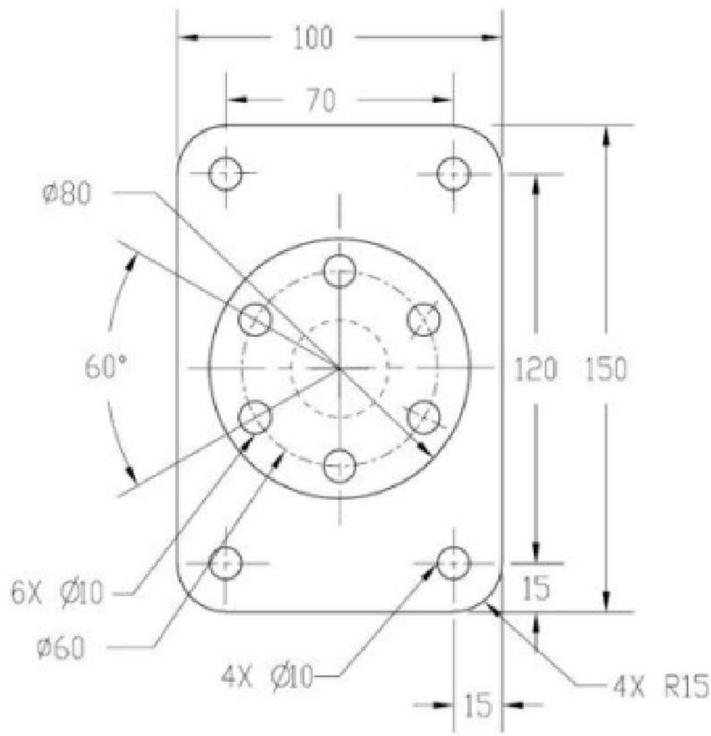
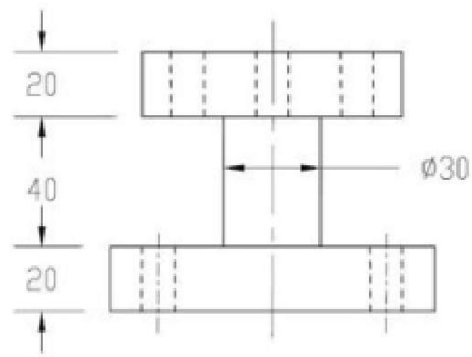
Mechanical Engineering Department

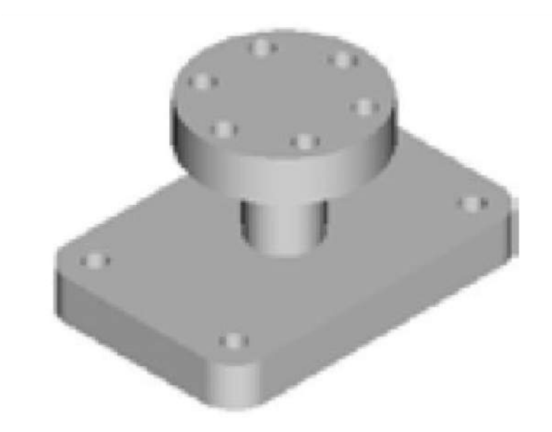
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 19

AIM : To draw the given solid model by using CREO







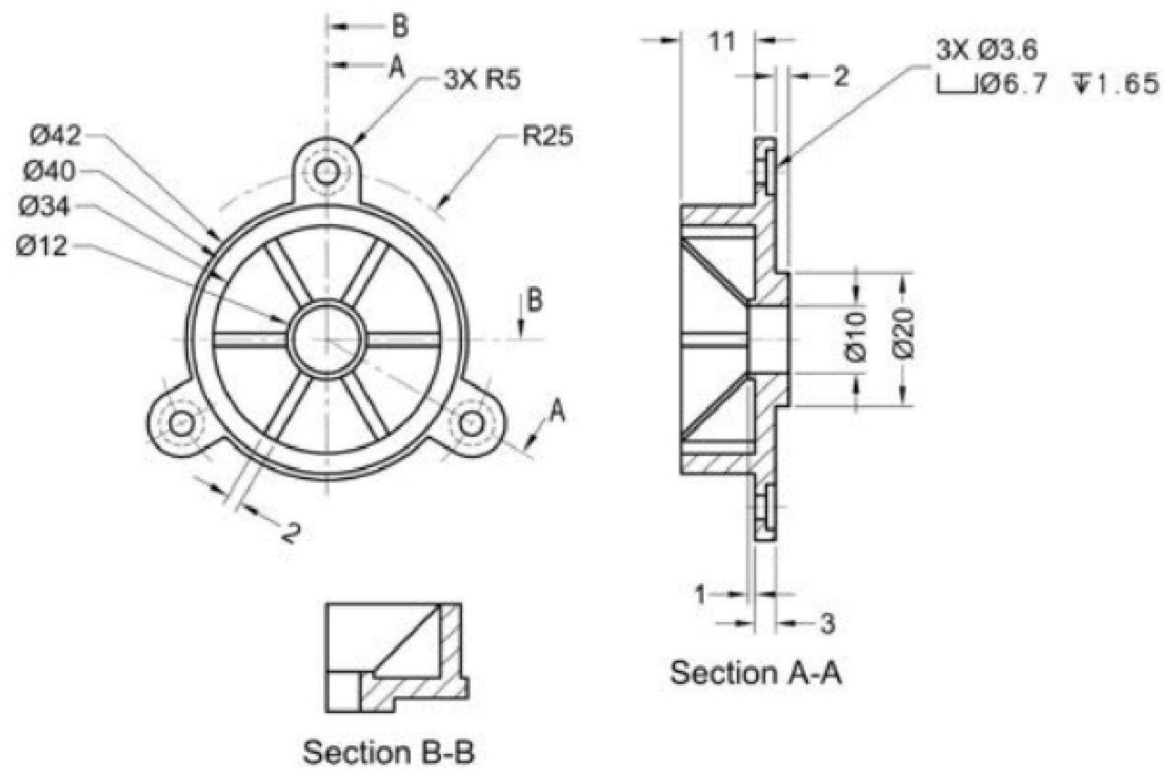
Heritage Institute of Technology

Mechanical Engineering Department

Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 20

AIM : To draw the given solid model by using CREO



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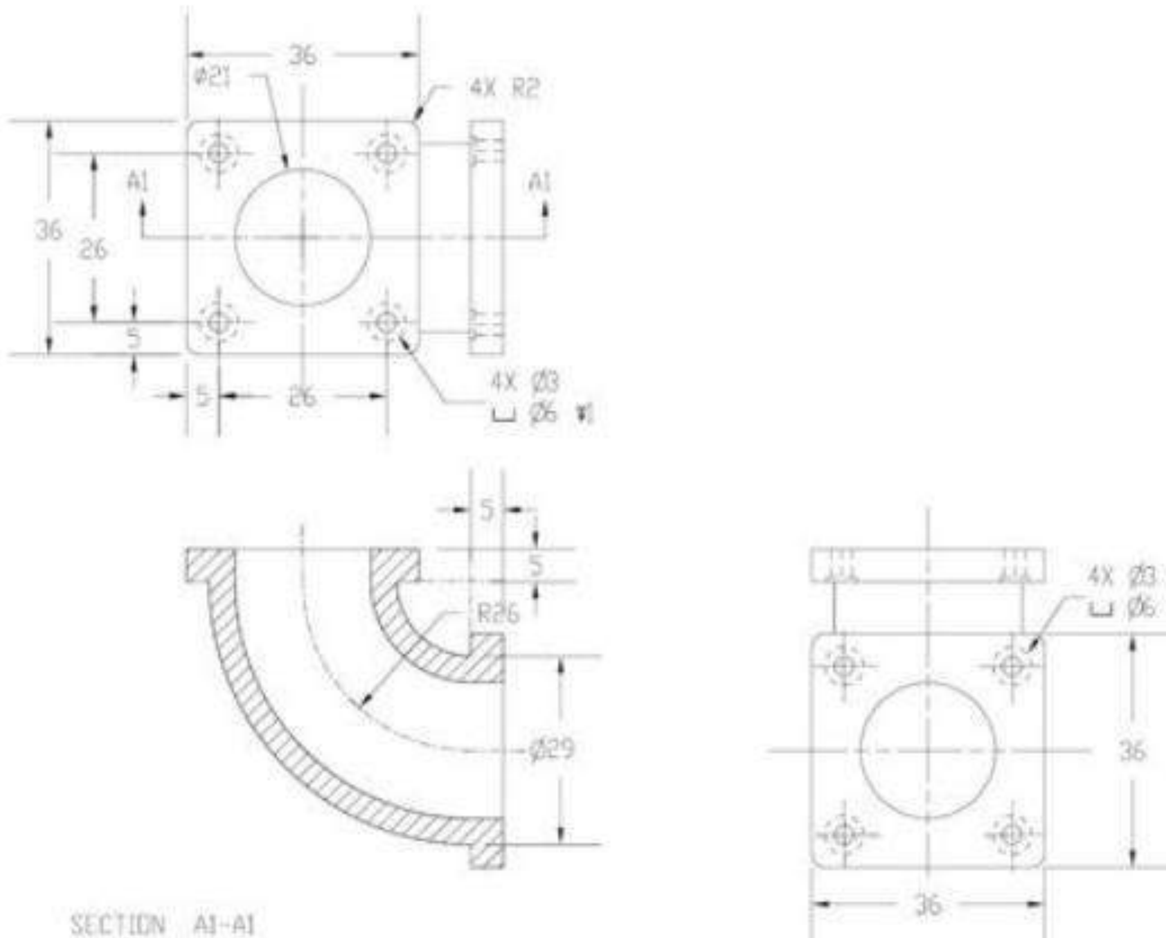
Mechanical Engineering Department

Subject: Machine Drawing II **Subject Code: MECH2256**

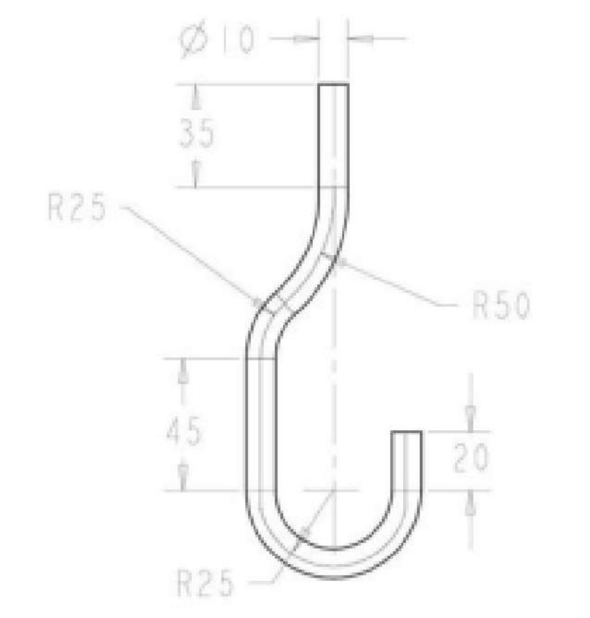
Exercise 21

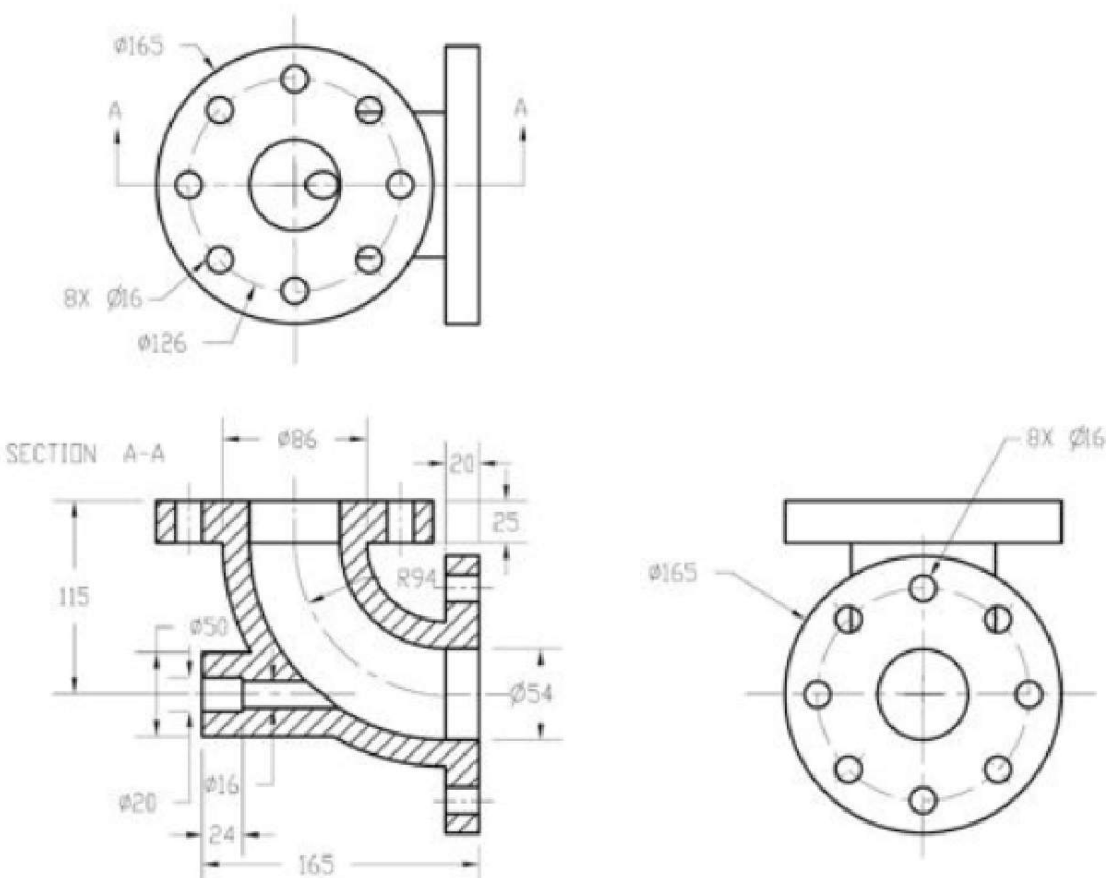
AIM : To draw the given solid model by using CREO



Exercise 22

AIM : To draw the given solid model by using CREO





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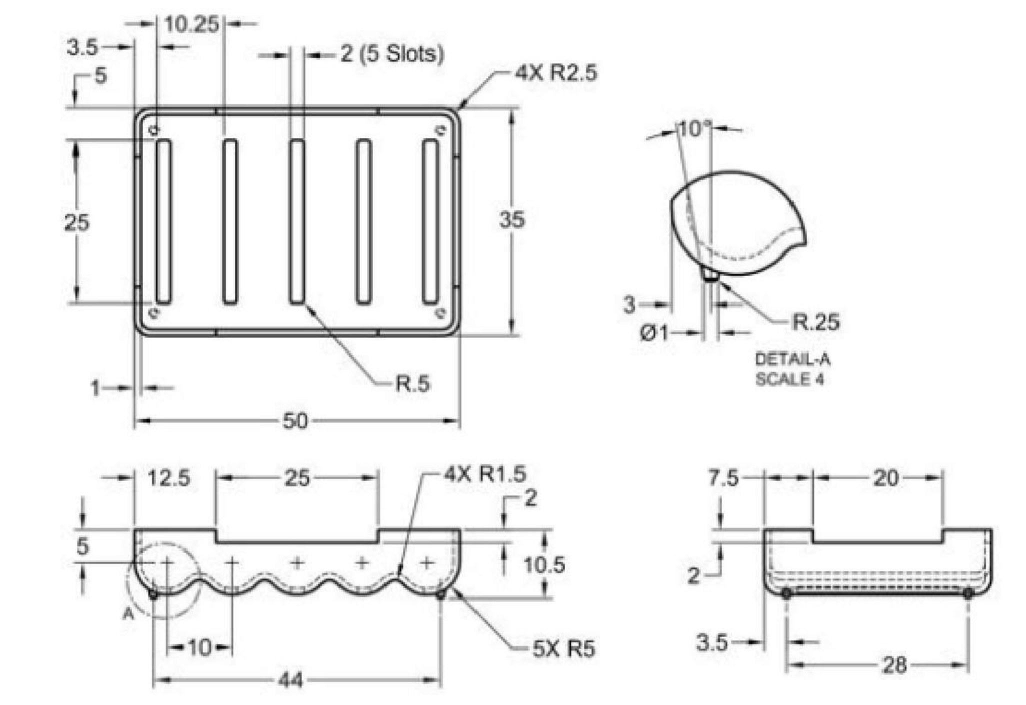
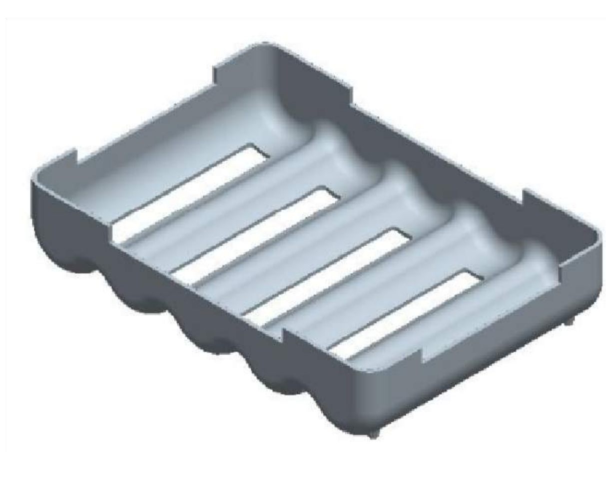
Mechanical Engineering Department

Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 23

AIM : To draw the given solid model by using CREO





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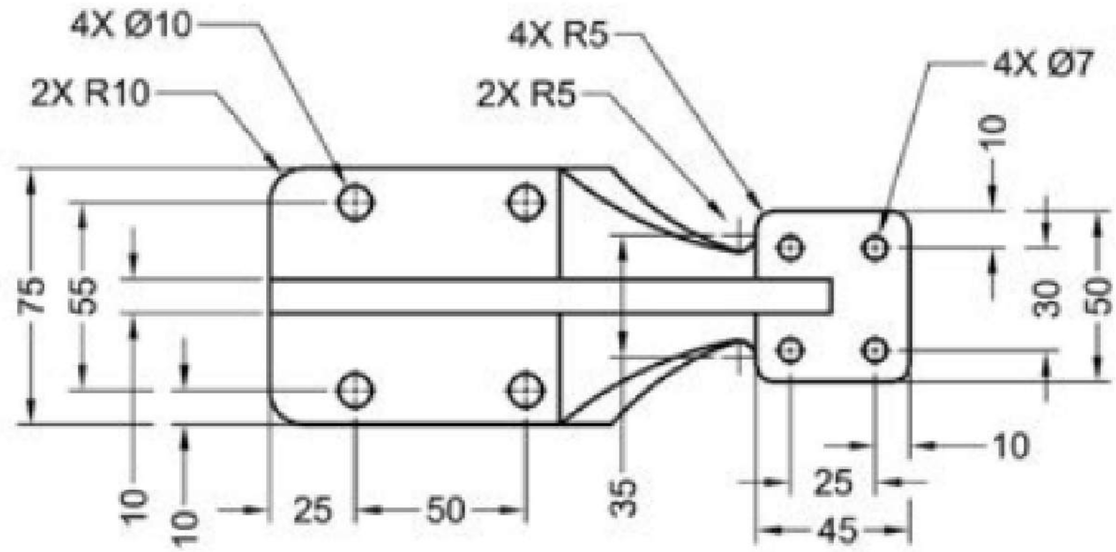
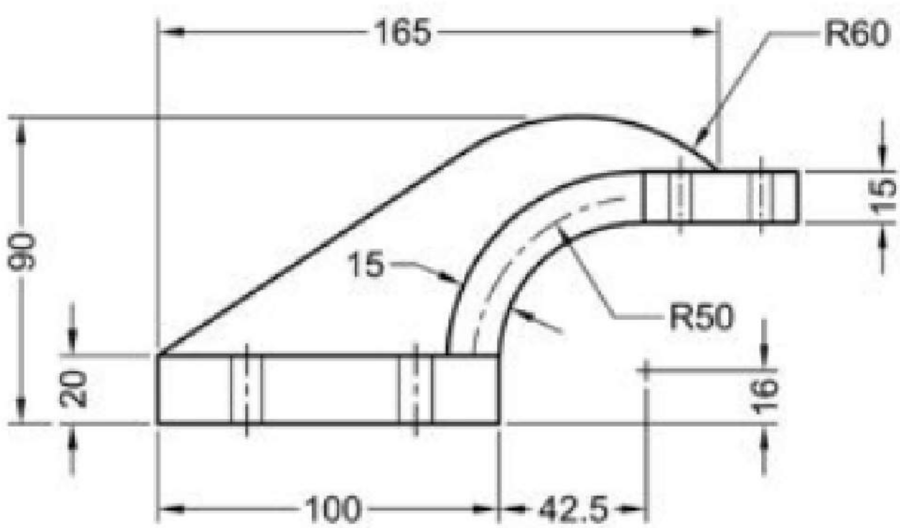
Mechanical Engineering Department

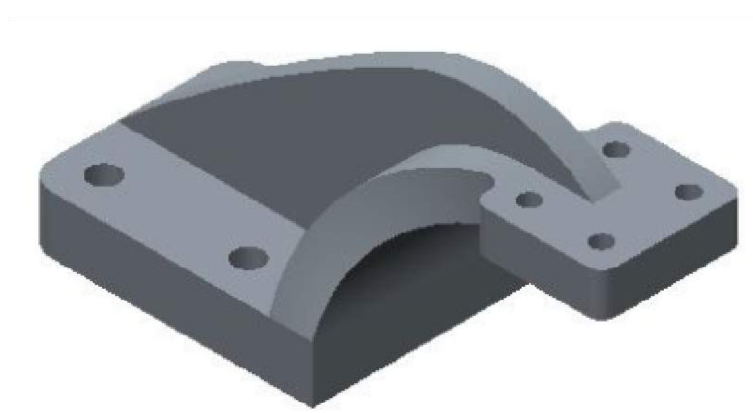
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 24

AIM : To draw the given solid model by using CREO







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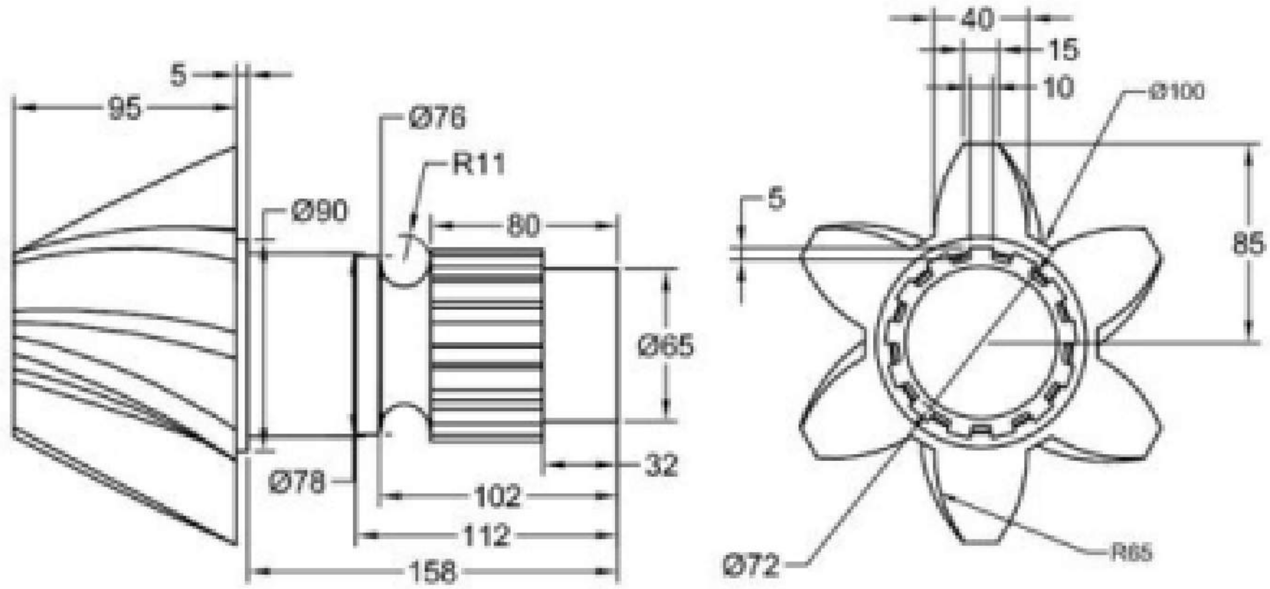
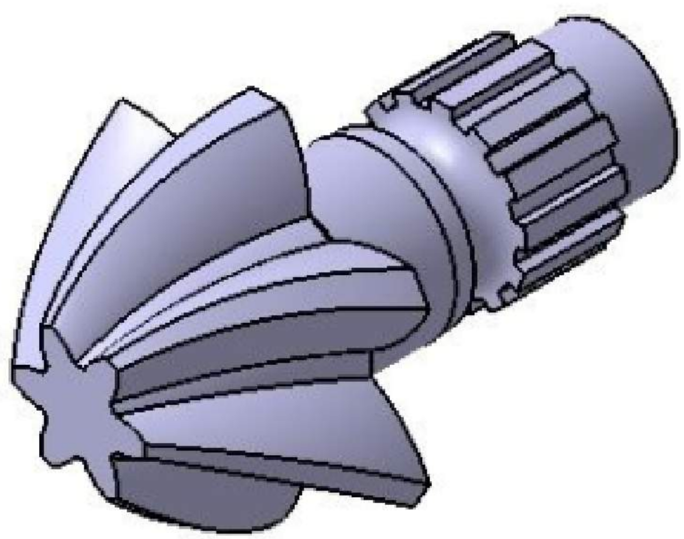
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 25

AIM : To draw the given solid model by using CREO





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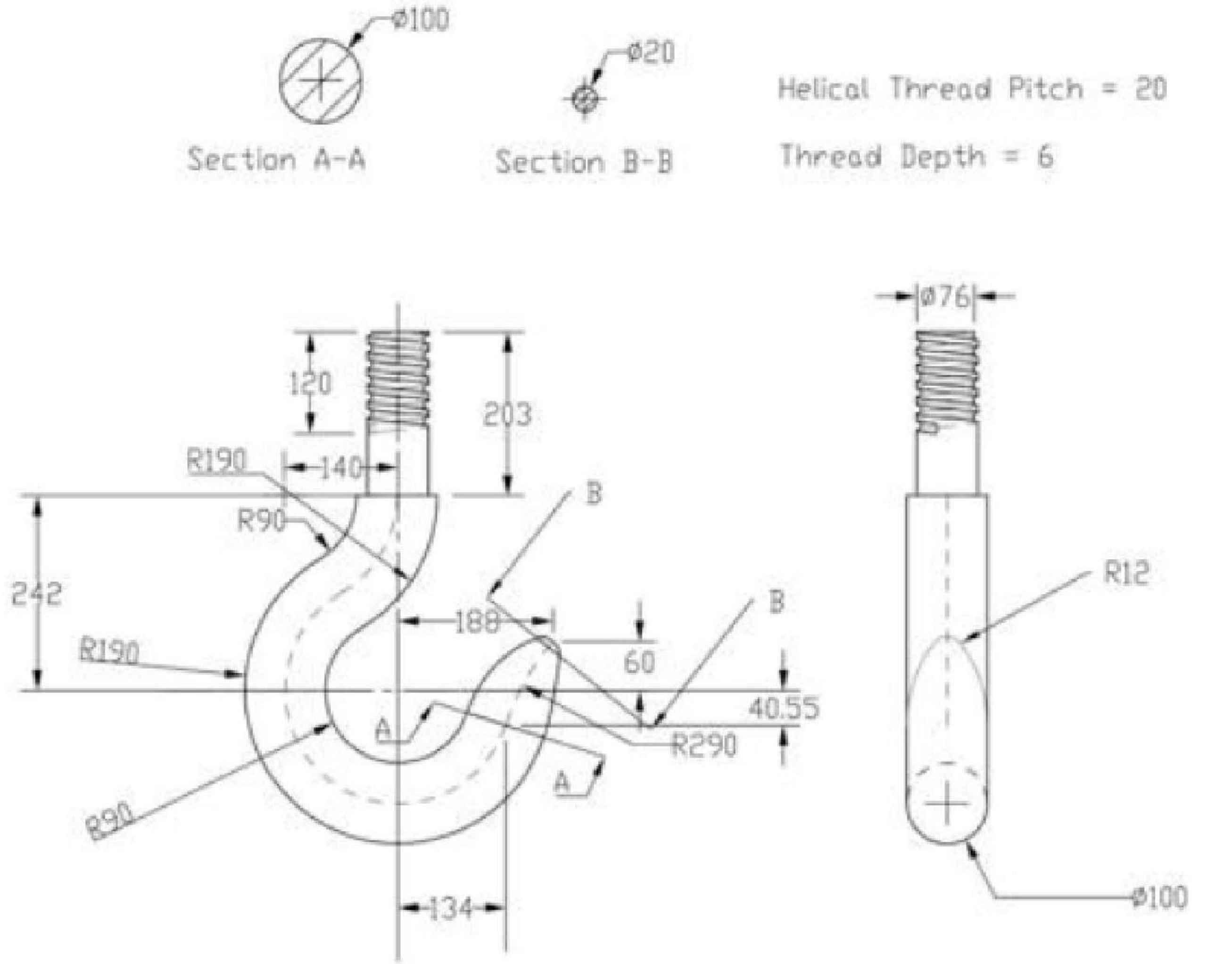
Exercise 26

AIM : To draw the given solid model by using CREO



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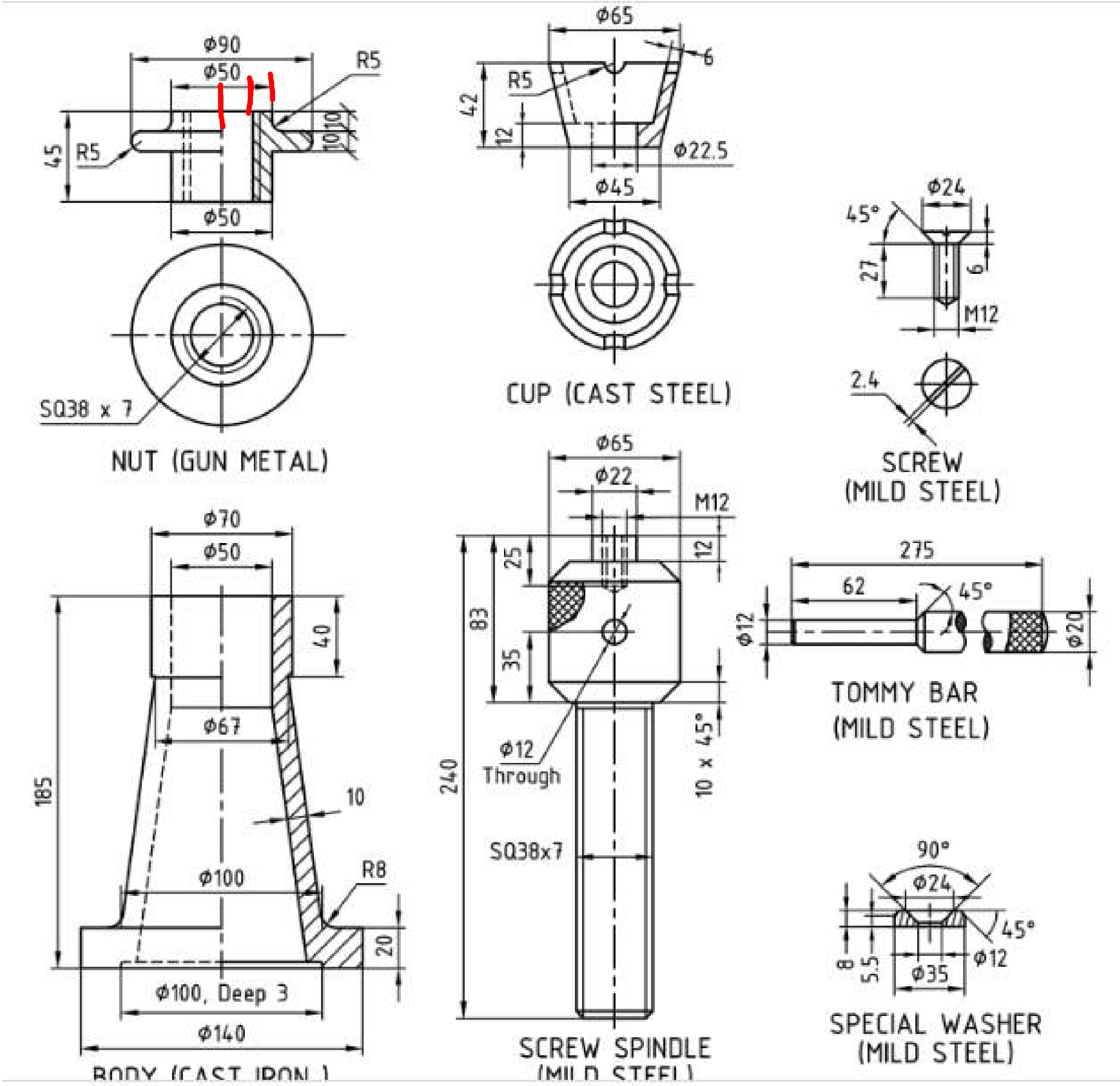
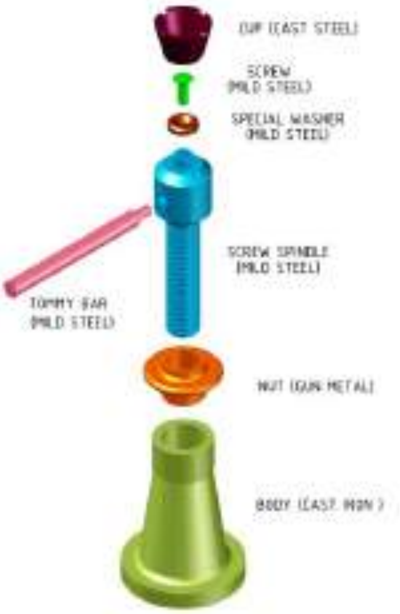
Exercise 27

AIM : To create components and preparation of assembly model of screw jack by using CREO





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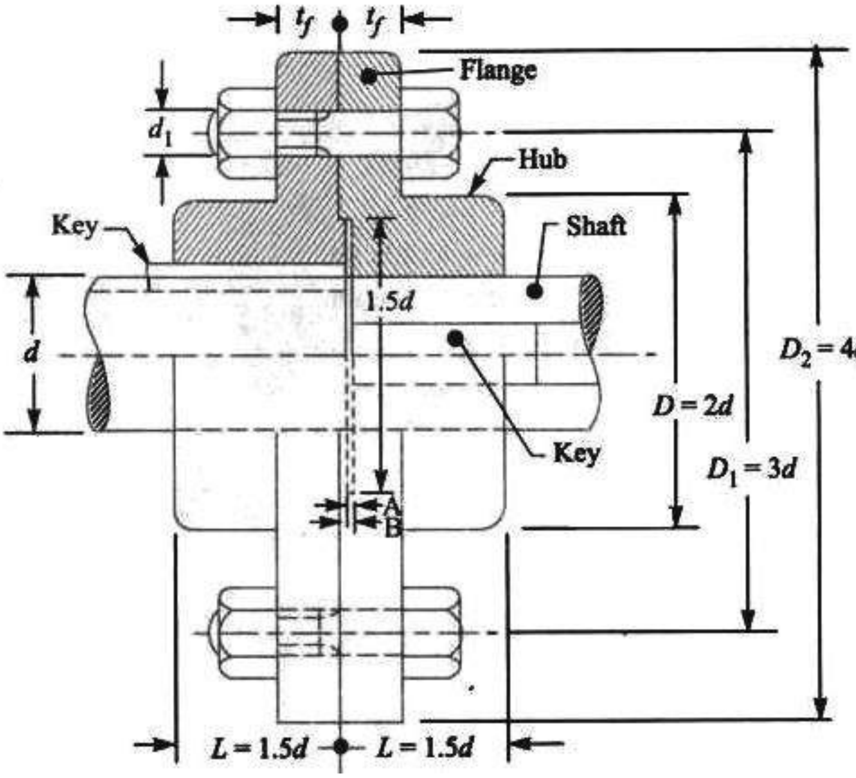
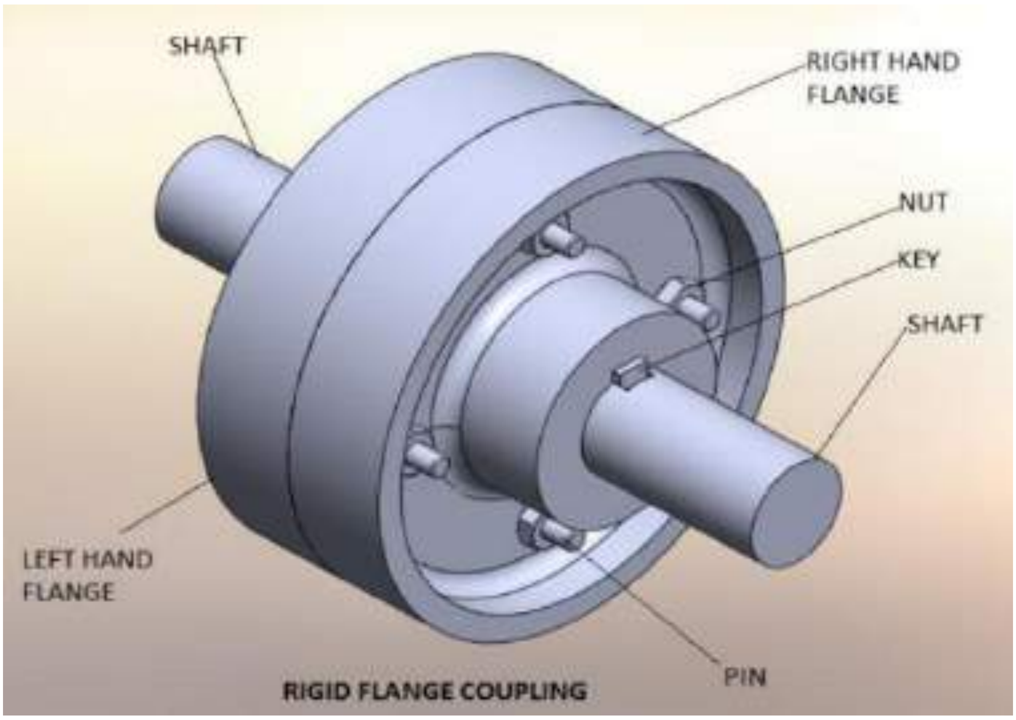
Subject: Machine Drawing II **Subject Code: MECH2256**

Exercise 28

AIM : To create components and preparation of assembly model of shaft coupling by using CREO





System of Limits, Fits, Tolerance

Aim: To understand the basics of limit, fit, and tolerance.

- Understanding symbols of manufacturing drawing on limit, fit, tolerance.

Procedure:

- Drawing of fundamental deviations.
- Solving a problem on limit fit tolerance and showing it in enlarged scale.
- Drawing of basic symbols of limit, fit, tolerance. I.e. straightness, flatness, roundness, cylindricity, parallelism, squareness etc.

Outline of Basics of limit, fit, tolerance.

- **Limits & Fits:** Why study Limits & Fits?
  - Exact size is impossible to achieve.
  - Establish boundaries within which deviation from perfect form is allowed but still the design intent is fulfilled.
  - Enable interchangeability of components during assembly

Definition of Limits:

- The maximum and minimum permissible sizes within which the actual size of a component lies are called Limits.

Tolerance:

- It is impossible to make anything to an exact size, therefore it is essential to allow a definite tolerance or permissible variation on every specified dimension.

Why Tolerances are specified?

- Variations in properties of the material being machined introduce errors.
- The production machines themselves may have some inherent inaccuracies.
- It is impossible for an operator to make perfect settings. While setting up the tools and workpiece on the machine, some errors are likely to creep in.

Compound Tolerances:

- A compound tolerance is one which is derived by considering the effect of tolerances on more than one dimension.

ISO Tolerances for Shaft Holes:

- The system lists a full range of 28 holes and 28 shafts. These ranges cover all sizes of shafts and holes. Due to this, this system is more effective and useful than other systems of fundamental tolerance. In numerical form, the tolerance size is defined by its basic value followed by a symbol. The symbol is composed of a letter and a number as well. A fit is designated by basic size which is common to both component, i.e. shafts and holes. That basic size for fit is represented by a symbol corresponding to each component, with the hole being placed first.

- **Fundamental Tolerance:**

  The tolerance unit is divided into two parts denoted by two symbols, which consist of a letter symbol and a number symbol. This symbol is also known as the Grade.

- **Features of Letter Symbol:**

  The letter symbol denotes the deviation of actual size from the basic size. The deviation designated by the letter is also known as fundamental deviation. The letter symbol shows the closeness of the tolerance zone to the basic size.

- **Features of Number Symbol:**

  The number symbol represents the zone of tolerance with respect to the grade of manufacture. This symbol is responsible for the grade of manufacture designed by International Grade, IT, and the tolerance represented by the number symbol is known as fundamental tolerance.

- **Calculation of Fundamental Tolerance:**

  In the way of calculation of fundamental tolerance and fundamental deviation, this system specifies 13 main diameter systems and 22 intermediate steps. The entire calculation is totally dependent upon the geometric mean D of the extreme diameter of each step.

- It provides 18 grades of tolerance IT01, IT0, IT1, IT2, IT3, to IT16. The value of standard tolerance for grades 5 to 16 are determined from the tolerance unit 'i' and formula is given.----- $i = 0.433\sqrt{D} + 0.001D$ mm,Where, D is in mm.

- The standard tolerance corresponding to IT01, IT0 and IT1 are calculated by formula given below-

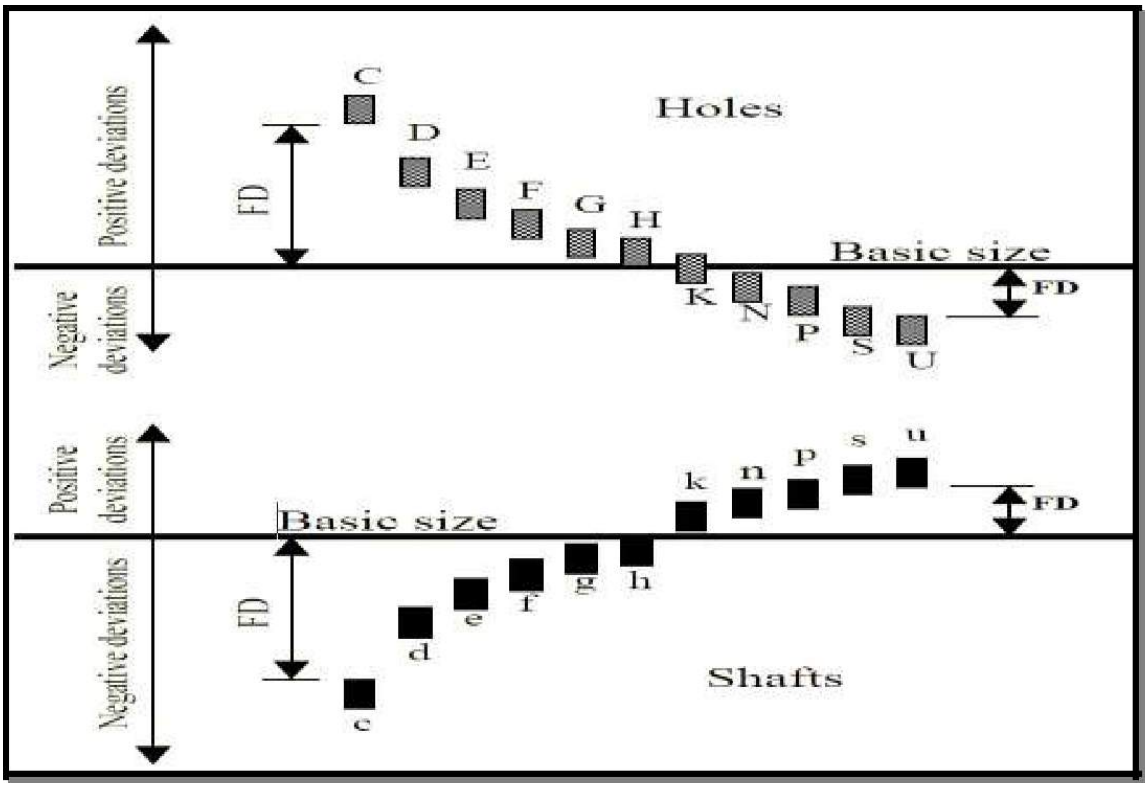
  IT01=0.3 + 0.008D, IT0 = 0.5 + 0.0012D and IT1 = 0.8 + 0.20D

- The value of IT2, IT4 are determined between IT1 and IT5 values, geometrically.

- **Concept of Fundamental Deviation** : The symbols of fundamental deviation for holes are A, B, C, D, E, F, G, H, J_S,J, K , L, M, N, P, R, S, T, U, V, X, Y, Z, ZA, ZB, ZC. The rest of the letters, i.e. I, L , O, Q, and W, are not used. For shafts the same symbols are used but in lower-case letters.

- **Fundamental deviation for holes** : For holes of symbol among A to H, the lower deviation is above zero line, with lower deviation for hole H being zero. For holes having symbol among J to ZC, it is below zero line. In simple words, we can say that the lower deviation for holes A to H is the fundamental deviation and for holes J to ZC the fundamental deviation is the upper deviation.

- **Fundamental deviation for shafts** : For shafts, the concept of fundamental deviation is opposite to holes. For shafts a to h, the upper deviation is below zero line and having the upper deviation being zero for shaft h. For, shafts having symbol in between j and zc, it is above zero line, i.e. the fundamental deviation for shafts a to h is the upper deviation and for shafts j to zc, it is lower deviation.



Let me show you a few examples of these symbols: 50H8/g7 or 50H8-g7, 40H7-g6

In these examples, 50 and 40 are the basic sizes. The symbol represents the fundamental deviation for holes and small letter 'g' represents the fundamental deviation for shaft. The numeric symbols represent the fundamental tolerance. You can get the table of ISO tolerance on the web as well as in the market and in some books, too. You just find the values of fundamental deviation and fundamental tolerance using those tables according to the symbol given. Now, we can easily calculate the actual size of shaft and hole only by small addition and subtraction.

- There are a number of combinations of shafts and holes that may be used for a fit. It is better to select hole basis fit. Because it is better as the production of shafts to the required size is easier. But, the shaft basis system is very good for manufacturing bright drawn bars.

Exercise 29

AIM: To create components and preparation of assembly model of Journal Bearing, Bush and Shaft by using CREO

A journal bearing consists of a bronze bush of diameter 100 mm fitted into a housing and a steel shaft of 50 mm diameter, running in the bush, with oil as lubricant. Determine the working dimensions of (a) bore of the housing, (b) bush and (c) shaft. Calculate the maximum and minimum interference or clearance.