

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY HYDERABAD**  
**B.TECH. II YEAR**  
**MECHANICAL ENGINEERING**

**III SEMESTER**

**R22**

Course Code	Title of the Course	L	T	P/D	CH	C
22BS1MT203	Partial Differential Equations, Probability and Statistics	2	1	0	3	3
22PC1ME201	Mechanics of Solids	3	0	0	3	3
22PC1ME202	Machine Tools and Metrology	3	0	0	3	3
22PC1ME203	Thermodynamics	3	1	0	4	4
22PC1ME204	Kinematics of Machinery	3	0	0	3	3
22SD5DS203	Python Programming and Practice	0	0	2	2	1
22PC2ME201	Mechanics of Solids Laboratory	0	0	2	2	1
22PC2ME202	Machine Tools and Metrology Laboratory	0	0	2	2	1
22SD5ME202	Field Project	0	0	2	2	1
22MN6HS102	Environmental Science	2	0	0	2	0
<b>Total</b>		<b>16</b>	<b>2</b>	<b>8</b>	<b>26</b>	<b>20</b>

**IV SEMESTER**

**R22**

Course Code	Title of the Course	L	T	P/D	CH	C
22PC1ME205	CAD/CAM	3	0	0	3	3
22PC1ME206	Dynamics of Machinery	3	0	0	3	3
22PC1ME207	Fluid Mechanics and Hydraulic Machines	3	0	0	3	3
22HS1MG201	Engineering Economics and Accountancy	3	0	0	3	3
22ES1EE103	Fundamentals of Electrical and Electronics Engineering	3	0	0	3	3
22PC2ME205	CAD/CAM Laboratory	0	0	2	2	1
22PC2ME206	Kinematics and Dynamics Laboratory	0	0	2	2	1
22PC2ME207	Fluid Mechanics and Machinery Laboratory	0	0	2	2	1
22PW4ME201	Design Thinking	1	0	2	3	2
22MN6HS201	Intellectual Property Rights	2	0	0	2	0
<b>Total</b>		<b>18</b>	<b>0</b>	<b>8</b>	<b>26</b>	<b>20</b>

L – Lecture      T – Tutorial      P – Practical      D – Drawing  
 C – Credits      SE – Sessional Examination      CA – Class Assessment  
 SEE – Semester End Examination      D-D – Day to Day Evaluation  
 CP – Course Project      PE – Practical Examination

CH – Contact Hours/Week  
 ELA – Experiential Learning Assessment  
 LR – Lab Record

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. III Semester

#### (22BS1MT203) PARTIAL DIFFERENTIAL EQUATIONS, PROBABILITY AND STATISTICS

TEACHING SCHEME		
L	T/P	C
2	1	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

**COURSE PRE-REQUISITES:** Ordinary Differential Calculus and Vector Calculus

#### COURSE OBJECTIVES:

- To learn methods of solving first order partial differential equations
- To learn method of separation of variables to solve second order partial differential equations
- To learn probability distribution functions and methods of calculating correlation coefficient
- To understand the concept of sampling distribution
- To learn the various methods to test the hypothesis for large and small samples

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Solve the first order linear partial differential equations

**CO-2:** Solve the second order linear partial differential equations

**CO-3:** Solve problems involving probability distributions and calculate coefficient of correlation

**CO-4:** Evaluate sampling distribution of means and variance

**CO-5:** Apply the knowledge to test the hypothesis for large and small samples

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	3	1	-	-	-	-	-	-	-	-	3	2
CO-2	3	3	2	1	-	-	-	-	-	-	-	-	3	2
CO-3	3	3	1	-	-	-	-	-	-	-	-	-	1	-
CO-4	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO-5	3	2	1	-	-	-	-	-	-	-	-	-	1	-

#### UNIT – I:

**Partial Differential Equations of First Order:** Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Solutions of first order linear (Lagrange's) equation and non-linear (standard type) first order equations, Charpit's method.

**UNIT – II:**

**Partial Differential Equations of Second Order:** Classifications of Second Order Partial Differential Equations, Method of separation of variables, Applications: Problems of vibrating string- wave equation, Problems of one-dimensional heat equation.

**UNIT – III:**

**Probability Distributions and Correlation:** Basic probability, Random variables - discrete and continuous distributions - Expectation of Random Variables. Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions –related properties, Correlation - Coefficient of correlation, rank correlation

**UNIT – IV:**

**Sampling Distributions:** Definition of population, sampling, statistic, parameter, Types of sampling, sample mean and Variance, sampling distribution, standard error, sampling distributions of means and variance, Estimation, interval estimation, point estimation and confidence interval for the mean.

**UNIT – V:**

**Testing of Hypothesis for Large and Small Samples:** Central limit theorem, Tests of hypothesis - null hypothesis, alternate hypothesis, type I, type II errors, critical region. Large samples- test of hypothesis for single mean and difference between the means. Test of significance-t distribution, confidence interval for the t- distribution, F-distribution and Chi square distribution.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, B. V. Ramana, McGraw-Hill
2. Advanced Engineering Mathematics, Erwin Kreyszig, 8<sup>th</sup> Edition, John Wiley
3. Probability and Statistics for Engineers, Richard A. Johanson, 5<sup>th</sup> Edition, Prentice-Hall, 1995

**REFERENCES:**

1. Higher Engineering Mathematics, B. S. Grewal, 35<sup>th</sup> Edition, Khanna Publishers, 2000
2. Advanced Engineering Mathematics, R. K. Jain & Iyengar, Narosa Publications
3. Fundamentals of Mathematical Statistics, S. C. Gupta & V. K. Kapoor, S. Chand

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. III Semester

### (22PC1ME201) MECHANICS OF SOLIDS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

**COURSE PREREQUISITES:** Mathematics, Physics and Engineering Mechanics

#### COURSE OBJECTIVES:

- To list and define the material properties and show the relationships between them
- To describe principles of mechanics, stress and strain
- To demonstrate thoroughly the concepts of principal stresses applied to solid structural members and Mohr's circle diagram
- To analyze various types of mechanical engineering problems related to bending of beams, torsion of shafts etc.

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Apply concept of stress and strain in axially loaded members

**CO-2:** Analyze shear stress and bending moment diagrams for various beams

**CO-3:** Explore the concept of bending and shear stresses for various beams

**CO-4:** Analyze the principal stresses and principal planes subjected to biaxial stresses

**CO-5:** Evaluate the deflection for various load conditions of beams

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-2	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-3	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-4	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-5	3	3	2	1	1	-	-	-	-	-	-	2	3	1

#### UNIT – I:

**Tension, Compression, and Shear:** Introduction; State of Stress; Normal Stress and Strain; Stress-strain diagrams; Elasticity and plasticity; Linear elasticity and Hooke's law; Allowable stress and allowable loads.

**Axially Loaded Members:** Introduction; Deflections of axially loaded members; Strain energy; Dynamic loading. Thermal Stresses

#### UNIT – II:

**Shear Force and Bending Moment Diagrams:** Types of beams; Types of loading; Shear force and bending moment; Relationship between load, shear force and bending

moment; Shear force and bending moment diagrams for cantilever and simply supported beam with point and uniformly distributed load.

Torsion: Introduction; Torsion of circular bars; Non uniform torsion; Pure shear; Transmission of power by circular shafts.

### **UNIT – III:**

#### **Area Moment of Inertia of Composite Sections:**

**Stresses in Beams:** Introduction; Normal strains in beams; Normal stresses in beams; Cross-sectional shapes of beams-C, angular and semicircle structures;

**Shear Stresses in Rectangular Beams:** Shear stress in webs of beams with flanges; Shear stress in square and circular beams (solid and hollow sections); Concept of shear center and shear flow.

### **UNIT – IV:**

**Analysis of Stress and Strain:** Introduction; Plane stress; Principal stresses and maximum shear stresses; Mohr's circle for plane stress; Hooke's law for plane stress; Spherical and cylindrical pressure vessels (biaxial stress; Hoop and longitudinal stresses).

### **UNIT – V:**

**Deflections of Beams:** Introduction; Differential equations of the deflection curve; Deflections by integration of the bending moment equation; Deflections by integration of the shear-force and load equations; Macaulay's method; Moment area method; Method of superposition.

### **TEXT BOOKS:**

1. Mechanics of Materials (SI units), Gere J. M., Goodno B. J., Cengage Learning, 2012
2. Mechanics of Materials, Beer F. P., Johnson E. R., and DeWolf J. T. Tata McGraw-Hill, 2004

### **REFERENCES:**

1. Engineering Mechanics of Solids, Popov E. P., Prentice Hall of India, 2004
2. Strength of Materials, S. S. Rattan, 2<sup>nd</sup> Edition, Tata McGraw-Hill, 2011
3. Strength of Materials, Schaum's Series, 6<sup>th</sup> Edition, McGraw-Hill, 2013

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. III Semester

### (22PC1ME202) MACHINE TOOLS AND METROLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

**COURSEPREREQUISITES:** Production Technology and Engineering Materials

#### COURSE OBJECTIVES:

- To understand about the importance of metal cutting and cutting tools
- To understand lathe and reciprocating machine tools and their operations
- To learn about milling, drilling and grinding
- To learn the measurement standards and methods of measurement

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Acquire basic knowledge on metal cutting, tools and its materials in machining

**CO-2:** Know about lathe and reciprocating machine tool and their operations

**CO-3:** Gain knowledge on Milling, Drilling and Grinding machines

**CO-4:** Understand the metrology principles and methods

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	2	2	2	1	1	1	1	1	1	1	2	2
CO-2	2	2	2	2	2	1	1	1	1	1	1	1	2	2
CO-3	3	2	2	2	2	1	1	1	1	1	1	1	2	2
CO-4	2	2	2	2	2	1	1	1	1	1	1	1	2	2

#### UNIT-I:

**Introduction:** Classification of Material removal processes, Machine Tools, cutting tools (Single and multi-point) and Nomenclature of Single point cutting tool.

Mechanics of metal cutting: Metal Cutting: Chip formation and types of chips, Orthogonal & oblique Cutting, Tool Wear and Tool Life; Surface Finish; types of Cutting Tool Materials.

#### UNIT-II:

**Centre Lathe:** Constructional Features of a Centre Lathe, Operations Performed on Centre Lathe. Capstan and Turret Lathes construction and differences.

Reciprocating Machine Tools: Introduction of Shaper, Slotter and Planer machines.

#### UNIT-III:

**Milling:** Classification of Milling Machines and Milling Operations.

**Hole Making Operations:** Types of hole-making operations (basic), Drilling machines, Boring machines, Broaching operation.

**Grinding:** Principle and Classification of Grinding Machines, Superfinishing operations.

**UNIT –IV:**

**Systems of Limits and Fits:** Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly.

**Linear Measurement:** Limit Gauges; Go and No go gauges- plug, ring, snap, gap, taper, profile position gauges and slip gauges;

**Angular Measurement:** sine bar, spirit level, angle slip gages and sine plate.

**UNIT-V:**

**Screw Thread Measurement:** Elements of measurement; Measurement of- effective diameter, angle of thread and thread pitch.

**Gear Measurement:** Gear measuring instruments, Gear tooth profile measurement.

**Optical Measuring Instruments:** Tool maker's microscope and its uses; optical projector

**Surface Roughness Measurement:** Differences between surface roughness and surface waviness; Numerical assessment of surface finish, Measurement of surface finish.

**TEXT BOOKS:**

1. Manufacturing Technology, Vol. 2, Metal Cutting and Machine Tools, P. N. Rao, Tata McGraw-Hill, 2013
2. Engineering Metrology, R. K. Jain, Khanna, 1984

**REFERENCES:**

1. Manufacturing Engineering and Technology, Serope Kalpakjian, Pearson Learning, 2018
2. A Textbook of Manufacturing Technology (Manufacturing Processes), R. K. Rajput, Laxmi Publications, 2019
3. Principles of Modern Manufacturing, Mikell P. Groover, John Wiley, 2014
4. Production Technology, R. K. Jain, S. C. Gupta, Khanna, 2014
5. BIS standards on Limits and Fits, Surface Finish, Machine Tool Alignment etc., 1996

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. III Semester

### (22PC1ME203) THERMODYNAMICS

TEACHING SCHEME		
L	T/P	C
3	1	4

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

**COURSE PREREQUISITES:** Physics, Mathematics

#### COURSE OBJECTIVES:

- To apply the basic concepts of thermodynamics, heat and work done on the system
- To apply the basic concepts of Thermodynamic Laws for various thermodynamic systems
- To evaluate the properties of pure substance and to analyze the concept of irreversibility and availability
- To apply the basic concept of power cycles for External combustion engines and internal combustion engines
- To evaluate the behaviour of ideal gas mixtures and thermodynamic properties

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Analyse the given thermal systems

**CO-2:** Analyse the properties of pure substances and power cycles.

**CO-3:** Evaluate the properties of gas mixtures

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	1	-	-	-	-	-	-	-	-	-	2	-
CO-2	3	2	1	-	-	-	-	-	-	-	-	-	2	-
CO-3	3	2	1	-	-	-	-	-	-	-	-	-	2	-

#### UNIT – I:

**Concepts and Definitions:** Thermodynamic system and control volume; Macroscopic versus microscopic point of view; Properties and state of a substance; Processes and cycles, Energy, Specific volume and density, The Zeroth law of thermodynamics; Temperature scales.

**Work and Heat:** Work transfer; displacement work; path and point function; pdv work in various Quasi-Static processes; Free expansion with zero work transfer, Heat transfer, Heat transfer a path function; specific and latent heat; Comparison of heat and work.

#### UNIT – II:

**The First Law of Thermodynamics:** The first law of thermodynamics for a closed system undergoing a cycle; First law for a closed system undergoing a change of state; Energy-a property of system; Different forms of stored energy; Specific heat at



constant volume; Enthalpy; Specific heat at constant pressure; Perpetual motion machine of the first kind-PMM1

**First Law Analysis for a Control Volume:** Conversion of mass and the control volume, the first law of thermodynamics for a control volume, The steady-state process; Examples of steady-state processes.

**Irreversibility and Availability:** Available energy; Available energy Referred to a cycle; Dead state; Availability in steady flow process; Availability in non flow process; second law efficiency.

### **UNIT – III:**

**The Second Law of Thermodynamics:** Heat engines and refrigerators; The second law of thermodynamics; The reversible process; Factors that render processes irreversible; The Carnot cycle; Two propositions regarding the efficiency of a Carnot cycle; The thermodynamic temperature scale; The ideal-gas temperature scale; Ideal versus real machines.

**Entropy for a Control Mass:** Clausius theorem; Entropy — a property of a system; Temperature entropy plot; The inequality of Clausius; Entropy change in irreversible process, Entropy principle; Transfer of heat through finite temperature difference; Mixing of two fluids; Entropy generation in closed system. Entropy and direction.

### **UNIT – IV:**

**Properties of a Pure Substance:** P-V diagram for a pure substance; P-T diagram for a pure substance; T-S diagram for a pure substance; Mollier diagram for a pure substance; Dryness fraction; Steam tables; saturated state; Liquid- vapor state; Superheated state; Measurement of steam quality.

**Power Cycles:** Rankine cycle; simple Brayton cycle; Otto cycle; Diesel cycle; Dual cycle; Atkinson cycle.

### **UNIT – V:**

**Properties of Gases and Gas Mixtures:** Avogadro's Law; Ideal Gas; Equation of State; Properties of Mixture of Gases-Dalton's Law of Partial Pressures; Internal Energy, Enthalpy, and Specific Heats of Gas Mixtures; Entropy of Gas Mixtures; The Maxwell relations; Tds equations; The Clapeyron equation; Joule-Thompson coefficient.

### **TEXT BOOKS:**

1. Engineering Thermodynamics, P. K. Nag, McGraw-Hill, 2014
2. Fundamentals of Thermodynamics, C. Borgnakke, R. E. Sonntag, and G. J. Van Wylen, 5<sup>th</sup> Edition, John Wiley, 2012

### **REFERENCES:**

1. Engineering Thermodynamics, Burgadt, Harper & Row Publication, 1993
2. Thermodynamics - An Engineering Approach, Yunus Cengel and Boles, Tata McGraw-Hill, 2019
3. Engineering Thermodynamics, P. Chattopadhyay, Oxford University Press, 2011

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. III Semester

### (22PC1ME204) KINEMATICS OF MACHINERY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

#### COURSE OBJECTIVES:

- To understand mechanisms for motion of power transmission
- To understand the construction and methods for drawing velocity and acceleration diagrams
- To analyze the mechanisms of gears, gear trains, cams
- To understand the mechanism for creating straight-line motions

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Analyze the type of mechanism required for the given application

**CO-2:** Draw velocity and acceleration diagrams for different mechanisms

**CO-3:** Design the cams, gears, and gear trains for kinematic motion

**CO-4:** Analyze the straight-line motion mechanisms, Hooke's joint and steering mechanisms

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	2	2	2	1	1	3	1	2	-	3	3	-
CO-2	2	3	3	2	2	1	1	2	1	1	-	3	3	-
CO-3	2	2	2	2	1	1	2	1	1	2	-	3	2	-
CO-4	3	2	2	2	2	1	2	1	1	2	-	3	2	-

#### UNIT – I:

**Mechanisms:** Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained.

**Mechanism and Machines – Mobility of Mechanisms:** Grubler's criterion and Kutzbach Criterion classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains.

#### UNIT – II:

**Kinematics:** Velocity and acceleration-motion of link in machine-Construction of velocity and acceleration diagrams-graphical method- Application of relative velocity method- four bar chain.

**Analysis of Mechanisms:** Analysis of slider crank chain for displacement, velocity and acceleration of slider acceleration diagram for a given mechanism, Klein's

construction, Coriolis acceleration, determination of Coriolis component of acceleration.

**Plane Motion of Body:** Instantaneous center of rotation, centroids and axodes - relative motion between two bodies-Three centers in line theorem-Graphical determination of instantaneous Centre, analysis of simple mechanisms and determination of linear velocity and angular velocity of links.

#### **UNIT – III:**

**Straight-line Motion Mechanisms:** Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs

**Steering Gears:** Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

**Hooke's Joint:** Single and double Hooke's joint –velocity ratio –application.

#### **UNIT – IV:**

**Cams:** Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion, uniform acceleration and retardation and cycloid Motion. Maximum velocity and maximum acceleration during outward and return strokes in the above four cases.

#### **UNIT – V:**

**Higher Pair:** Friction wheels and toothed gears-types-law of gearing, condition for constant velocity ratio for transmission of motion, forms of teeth- Cycloidal and Involute profiles. Velocity of sliding-phenomena of interference-methods of interference, condition for minimum number of teeth to avoid interference, expression for arc of contact and path of contact introduction to helical, bevel and worm gearing.

**Gear Trains:** Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Working of differential gear for an automobile.

#### **TEXT BOOKS:**

1. Theory of Machines and Mechanisms, J. E. Shigley, Tata McGraw-Hill, 1995
2. Theory of Machines, S. S. Ratan, Tata McGraw-Hill, 2017

#### **REFERENCES:**

1. Theory of Machines and Mechanisms, P. L. Ballaney, Khanna, 1995
2. Theory of Machines, Thomas Bevan, Pearson Education, 2017
3. Theory of Machines / Thomas Bevan, 3<sup>rd</sup> Edition, Pearson
4. Theory of Machines, R. S. Kurmi, J. K. Gupta, S. Chand, 2015

#### **ONLINE RESOURCES:**

1. <https://archive.nptel.ac.in/courses/112/106/112106270/>
2. <https://archive.nptel.ac.in/courses/112/104/112104114/>

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. III Semester

### (22SD5DS203) PYTHON PROGRAMMING AND PRACTICE

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

#### COURSE OBJECTIVES:

- To install and run the Python interpreter
- To learn control structures
- To understand Lists, Dictionaries in Python
- To handle Strings and Files in Python

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Develop application specific codes using Python

**CO-2:** Understand Strings, Lists, Tuples and Dictionaries in Python

**CO-3:** Verify programs using modular approach, file I/O, Python standard library

**CO-4:** Implement Digital Systems using Python

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	2	1	1	1	1	-	-	1	-	1	1	-	2
CO-2	2	2	1	1	1	1	-	-	1	-	1	1	-	2
CO-3	2	2	2	1	1	2	-	-	1	-	1	1	-	2
CO-4	2	3	2	1	1	2	-	-	1	-	1	1	-	2

#### LIST OF PROGRAM MODULES AND EXERCISES:

##### 1. BASICS:

- Running instructions in Interactive interpreter and a Python Script.
- Write a program to purposefully raise Indentation Error and correct it.

##### 2. OPERATIONS:

- Write a program to compute GCD of two numbers by taking input from the user.
- Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

##### 3. CONTROL FLOW:

- Write programs using for loop that loops over a sequence.
- Write a Program for checking whether the given number is even or odd.
- Write a Program to Print the Fibonacci sequence using while loop.
- Write a program to print all prime numbers in a given interval (use break.)

#### **4. LISTS:**

- a) Write a program to find mean, median, mode for the given set of numbers in a list.
- b) Write a program to convert a list and tuple into arrays.
- c) Write a program to find common values between two arrays.

#### **5. DICTIONARY:**

- a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
- b) Write a program combine lists into a dictionary.

#### **6. STRINGS:**

- a) Write a program to check whether a string starts with specified characters.
- b) Write a program to check whether a string is palindrome or not.
- c) Write a program to split and join a string.
- d) Write a Program to Sort Words in Alphabetic Order.

#### **7. FILES:**

- a) Write a program to print each line of a file in reverse order.
- b) Write a program to compute the number of characters, words and lines in a file.
- c) Write a program to count frequency of characters in a given file.

#### **8. FUNCTIONS:**

- a) Write a function to implement Simple Calculator program.
- b) Write a function to Find the factorial of a number using recursion.
- c) Write a function dups to find all duplicates in the list.
- d) Write a function unique to find all the unique elements of a list.
- e) Write a function cumulative\_product to compute cumulative product of a list of numbers.
- f) Write a function reverse to print the given list in the reverse order.
- g) Write function to compute GCD, LCM of two numbers.

#### **9. MULTI-D LISTS:**

- a) Write a program that defines a matrix and prints.
- b) Write a program to perform addition of two square matrices.
- c) Write a program to perform multiplication of two square matrices.

#### **10. DATA SCIENCE:**

- a) Install NumPy package and explore it.
- b) Install Pandas and explore Pandas data frame related operations (Reading files, Data preparation and preprocessing).
- c) Install Matplotlib, seaborn packages and explore various plots.

#### **11. DATA ANALYSIS AND CASE STUDY:**

- a) Exploratory data analysis.
- b) Case Study on Classification and Regression.

#### **12. DIGITAL LOGIC:**

- a) Write Python programs to implement Digital Logic Gates–AND, OR, NOT, EX-OR.
- b) Write Python programs to implement Half Adder, Full Adder, and Parallel Adder.

**TEXT BOOKS:**

1. Python for Everybody: Exploring Data in Python 3, Charles Severance, 1<sup>st</sup> Edition, Shroff Publishers, 2017
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 1<sup>st</sup> Edition, 2018

**REFERENCES:**

1. Learning Python, Mark Lutz, 5<sup>th</sup> Edition, Orielly, 2013
2. Think Python: How to Think Like a Computer Scientist, Allen Downey, Shroff, 2<sup>nd</sup> Edition, O'Reilly, 2016
3. Core Python Programming, W. Chun, 1 Edition, Pearson Education, 2007
4. Fundamentals of Python: First Programs (Introduction to Programming), Kenneth A. Lambert, South-Western College Publishing, 2011

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. III Semester

### (22PC2ME201) MECHANICS OF SOLIDS LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

**COURSE PREREQUISITES:** Engineering Mechanics, Mechanics of Solids

#### COURSE OBJECTIVES:

- To analyze the various tests to be conducted on engineering materials
- To the significance of tests in evaluating the corresponding mechanical properties
- To analyze the importance of technical parameters used during tests
- To applying the concepts learned in the real time

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Determine the yield stress, ultimate tensile stress, percentage elongation of steel, compressive strength of brick and concrete

**CO-2:** Determine the ultimate shear stress, modulus of elasticity of steel

**CO-3:** Determine the stiffness of the close coiled helical spring and hardness number of mild steel, brass, copper and aluminum

**CO-4:** Determine the modulus of rigidity and impact strength of steel

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-2	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-3	3	3	2	1	1	-	-	-	-	-	-	2	3	1
CO-4	3	3	2	1	1	-	-	-	-	-	-	2	3	1

#### LIST OF EXPERIMENTS:

**Any Ten Experiments to be conducted from the following**

1. Direct tension test
2. Bending test on simply supported beam
3. Bending test on cantilever beam
4. Torsion test
5. Brinell hardness test
6. Rockwell hardness test
7. Test on close coiled helical spring
8. Compression test on a cube
9. Charpy Impact test
10. Izod Impact test

11. Direct shear test
12. Mechanical advantage of simple screw jack
13. Moment of Inertia of a fly wheel



## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. III Semester

#### (22PC2ME202) MACHINE TOOLS AND METROLOGY LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

**COURSE PRE-REQUISITES:** Machine Tools, Metrology and Engineering Materials

#### COURSE OBJECTIVES:

- To learn the principles of various machine tools and their accessories
- To know about Shaping, Slotting and planar machine tools
- To learn about various grinding machines and operations performed
- To know various methods of measurements on machine tools

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Perform operations on different Machine tools such as lathe, milling and drilling

**CO-2:** Perform operations on shaper, slotter and planar machines

**CO-3:** Perform operations on different grinding machines

**CO-4:** Measure the dimensions of different components to check its accuracy

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	3	2	2	2	1	1	1	1	1	1	1	2	2
CO-2	3	2	2	2	2	1	1	1	1	1	1	1	2	2
CO-3	3	2	2	2	2	1	1	1	1	1	1	1	2	2
CO-4	3	2	2	2	2	1	1	1	1	1	1	1	2	2

#### LIST OF EXPERIMENTS:

#### MACHINE TOOLS LAB:

#### ANY SIX EXPERIMENTS from the following

1. Exercise on Facing, Turning, Grooving, Thread cutting, Knurling and Drilling on lathe machine.
2. Exercise on Drilling, reaming, counter sinking and Tapping operations on drilling machine.
3. Exercise on Milling to perform plain /gear cutting
4. Exercise on Shaping to prepare plain surfaces.
5. Exercise on Planning to prepare plain surfaces.
6. Exercise on Slotting to prepare keyway slot (Internal/ External)
7. Exercise on Grinding of Tool angles.
8. Exercise on External Cylindrical Grinding.
9. Exercise on External Surface Grinding.

## **METROLOGY LAB**

### **ANY FOUR EXPERIMENTS from the following**

1. Use of gear teeth Vernier calipers and checking the chordal addendum and chordal height of spur gear.
2. Thread measurement by two wire/ three wire method.
3. Measurement with Tool makers microscope and its application.
4. Surface roughness measurement.
5. Machine tool alignment test on a lathe / milling machine.

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. III Semester

### (22SD5ME202) FIELD PROJECT

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME		
CIE	SEE	TOTAL
50	-	50

#### COURSE OBJECTIVES:

- To identify, analyze and solve industry / technical / societal problems creatively through sustained critical investigation
- To practice the skills, elegance and commitment to excellence needed to engage in lifelong learning
- To demonstrate an awareness and application of appropriate personal, social and professional ethical standards

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Understand the formulated industry / technical / societal problems

**CO-2:** Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study

**CO-3:** Demonstrate skills and knowledge of current information, technological tools and techniques specific to the professional field of study

**CO-4:** Analyze and / or develop models for providing solution to industry / technical / societal problems

**CO-5:** Use effectively oral, written and visual communication

#### COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using **mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial**)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
<b>CO-1</b>	2	-	-	-	-	3	3	-	3	-	1	3	-	-
<b>CO-2</b>	3	3	2	2	3	2	-	-	3	-	2	3	-	-
<b>CO-3</b>	-	-	3	-	3	2	-	2	3	3	3	3	-	-
<b>CO-4</b>	2	3	3	3	3	3	3	3	3	-	3	3	-	-
<b>CO-5</b>	-	-	-	-	2	-	-	3	3	3	-	3	-	-

#### COURSE OUTLINE:

Filed project-based learning offers students real world opportunities to research issues, think critically, gain new perspectives, solve problems and develop written and oral communication skills all within the framework of a team environment and guided by engaged and involved faculty

- A student shall undergo a one credit Field Project course in II year.
- It shall be a project based course involving the student to undertake issues for industries, companies, and any organizations which they encounter in their day-to-day work.
- Evaluation of the field project shall consist of Continuous Internal Evaluation (CIE) only for 50 marks.
- CIE shall be done by a Project Review Committee (PRC) consisting of the Head of the Department, faculty supervisor and a senior faculty member of the specialization / department.
- The internal evaluation shall be on the basis of two seminars for 50 marks one before SE-I and the other before SE-II as per the calendar dates and evaluation format.
- CIE shall be carried out for 50 marks on the basis of review presentation as per the calendar dates and evaluation format.
- The field project report shall be accepted for submission to the PRC only upon meeting the prescribed similarity index of less than 25%.

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. III Semester

### (22MN6HS102) ENVIRONMENTAL SCIENCE

TEACHING SCHEME		
L	T/P	C
2	0	0

EVALUATION SCHEME			
SE-I	SE-II	SEE	TOTAL
50	50	-	100

**COURSE PRE-REQUISITES:** Basic knowledge of Environmental Issues

#### COURSE OBJECTIVES:

- To recognize the impacts of human interventions towards environment
- To list out the benefits in creating a sustainable world
- To sketch out various activities in achieving a cleaner environment
- To emphasize the role of frontier technologies for a better planet to live

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Gain a variety of experiences & acquire a basic knowledge about the environment & its allied problems

**CO-2:** Interpret the key components in safeguarding the environment

**CO-3:** Appraise the quality of environment in order to create a healthy atmosphere

**CO-4:** Familiarize with the importance of emerging technologies towards green revolution

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	1	-	-	1	1	-	2	1	-	2	-	-
CO-2	3	2	2	1	-	1	1	-	2	1	-	2	-	-
CO-3	3	2	2	-	-	1	1	-	2	1	-	2	-	-
CO-4	3	2	1	1	-	1	1	-	2	1	-	2	-	-

#### MODULE 1:

**Introduction to Environmental Science:** Importance of Environmental Science, Overview of the environment & its components, Human intervention in destruction or sustenance of environment. Relationship between environmental science & society - Influence of Industry, Innovation & infrastructure on environment

#### MODULE 2:

**Synergy With Environment:** Health & Well Being-ensuring healthy lives and promoting wellbeing at all ages. Reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. Life under water and on land-conservation & sustainable usage, measures to protect marine & coastal ecosystems from various impacts. Protect and restore terrestrial ecosystems, sustainably managing forests, combat desertification. Biodiversity a valuable

resource- biological diversity as a support for food, water, medicine, shelter, cleaning of air and water and other material goods for sustaining life and increase resilience

### **MODULE 3:**

**Climate Change:** Science behind climate change-factors responsible for climate change, Scientific evidence about past climate and present. Expected consequences of climate change- Impacts of climate change on growth and development. Role of greenhouse gases- Global temperature rise & its impact on environment & human health. Carbon footprint-Briefing on Paris agreement, Identify key sectors for low carbon footprint. Climate change mitigation & adaptation strategies

### **MODULE 4:**

**Moving Towards Sustainability:** Eco-Audit and its importance. Sustainable agriculture- Organic farming and hydroponics. Role of AI & IOT for efficient management of environmental issues-Health, air, water, and soil. Sustainable living practices- minimizing waste, limited use of earth's natural resources, wise use of environment and ensuring quality working/living environments

### **MODULE 5:**

**Innovations in Environmental Science:** Sustainable cities and communities-case study, Responsible consumption & production- Refuse, Reduce, Reuse and Recycle with examples. Innovative approaches to waste management-smart waste management, Plastic recycling-innovative ideas.

### **TEXT BOOKS:**

1. Environmental Studies for UG Courses, Erach Bharucha, UGC Publications, 2004
2. Environmental Studies, Rajagopalan, Oxford University Press
3. Introduction to Climate Change, Andreas Schmittner, Oregon State University, 2018

### **REFERENCES:**

1. Green Development: Environment and Sustainability in a Developing World, Bill Adams, 4<sup>th</sup> Edition, Routledge Publishers, 2021
2. Fixing Climate, Robert Kunzig & Wallace S. Broecker, Main Edition, Profile Books Publisher, 2009
3. Plastic Waste and Recycling-Environmental Impact, Societal Issues, Prevention and Solutions, 1<sup>st</sup> Edition, Academic Press, 2020

### **ONLINE RESOURCES:**

1. <https://www.coursera.org/learn/beyond-the-sustainable-development-goals-addressing-sustainability-and-development>
2. <https://www.coursera.org/specializations/climatechangeandsustainableinvesting>

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. IV Semester

### (22PC1ME205) CAD/CAM

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

**COURSE PRE-REQUISITES:** Engineering Graphics, Engineering Design, Production Technology

#### COURSE OBJECTIVES:

- To understand the mathematics behind the transformations and projections in design of products on CAD devices
- To know the various types of modeling and drafting
- To learn the fundamentals of part programming required for manufacturing a product
- To appreciate the integration of design and manufacturing functions through CAD and CAM

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Select the CAD hardware and solve the problems on transformations

**CO-2:** Compare the different types of models and perform drafting

**CO-3:** Develop part programs involving various operations for the manufacturing of simple and complex products

**CO-4:** Integrate the knowledge learnt in CAD and CAM

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	1	-	-	-	2	1	-	-	-	-	-	-	1	1
CO-2	3	-	2	-	3	1	-	-	2	-	-	2	2	2
CO-3	-	-	2	-	2	1	-	-	2	-	-	2	2	2
CO-4	3	-	3	-	2	2	-	-	2	-	-	-	1	1

#### UNIT – I:

**Introduction:** Computers in Industrial Manufacturing, Product cycle, CAD and CAM, Overview of CAD / CAM Hardware, Display devices, Hard copy devices.

**Computer Graphics and Geometric Modeling:** Raster scan graphics, coordinate systems, Database structure for graphics modeling, Transformation of geometry, 3D Transformations, Mathematics of projections, Clipping, Hidden surface removal, Introduction to Geometric Model, Types of modeling, Geometric construction methods, Curve representation.

## **UNIT – II**

**Solid Modeling:** Introduction, advantages, limitations and applications, Solid Entities, Solid Representation schemes – Boundary Representation (B-Rep) scheme, Constructive Solid Geometry (CSG) scheme.

**Drafting Systems:** Basic geometric commands, Layers, Display control commands, Editing, Dimensioning.

## **UNIT – III:**

**Computer Numerical Control:** Introduction to NC machines and CNC machines, Structure of CNC machine tools, Features of Machining center, Concept of ATC & APC, Feedback control.

**CNC Part Programming:** Fundamentals, Introduction to G & M codes, Manual part programming methods, Computer Aided Part Programming.

## **UNIT – IV:**

**Group Technology:** Philosophy of Group Technology, Part families, Methods of Parts Classification and Coding, Advantages and Limitations.

**Computer Aided Process Planning:** Introduction, Retrieval type and Generative type, Benefits.

## **UNIT – V:**

**Computer Aided Quality Control:** Introduction, Terminology in quality control, The computer in QC, Contact inspection methods, Noncontact inspection methods-optical and non-optical, Computer aided testing, Integration of CAQC with CAD/CAM.

**Computer Integrated Manufacturing Systems:** Introduction, Types of Manufacturing systems, Machine tools and related equipment, Material handling systems, Computer Control Systems, Human labor in the manufacturing systems, CIMS benefits.

## **TEXT BOOKS:**

1. CAD / CAM Theory and Practice, Ibrahim Zeid, Tata McGraw-Hill, 2009
2. CAD/CAM Principles and Applications, P. N. Rao, Tata McGraw-Hill, 2017

## **REFERENCES:**

1. CAD / CAM, A. Zimmers and P. Groover, Prentice Hall International/Pearson Education, 2018
2. Automation, Production Systems and Computer integrated Manufacturing, Groover, Pearson Education, 2016
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, Pearson Education, 2000
4. Principles of Computer Aided Design and Manufacturing, Farid Amirouche, Pearson Education, 2004
5. CAD/CAM: Concepts and Applications, Alavala, Prentice Hall International, 2018



# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. IV Semester

### (22PC1ME206) DYNAMICS OF MACHINERY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

**COURSE PREREQUISITES:** Engineering Mechanics, Mechanics of Solids, Kinematics of Machinery

#### COURSE OBJECTIVES:

- To Investigate the construction methods for mechanisms like - Chebyshev's spacing, Freudenstein's Equation polygons, acceleration diagrams
- To identify the significance of the principles of equilibrium, super position, virtual work & D'Alembert's principle
- To familiarize with the methods of static & dynamic stability
- To study the mechanical vibrations on various systems

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Design of machine components with respect to the forces developed in engineering applications

**CO-2:** Analyze the flywheels, governors and gyroscopes to withstand forces

**CO-3:** Evaluate whether the proposed design is acceptable for dynamic condition

**CO-4:** Analyze the different vibratory systems using equilibrium, energy, Rayleigh's and Dunkerly's method

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2	2	2	2	1	1	-	-	1	-	2	3	-
CO-2	3	2	2	2	2	1	1	-	-	1	-	2	3	-
CO-3	3	2	2	2	1	1	2	-	-	1	-	2	3	-
CO-4	3	2	2	2	2	1	2	-	-	1	-	2	3	-

#### UNIT – I:

##### Static and Dynamic Force Analysis of Planar Mechanisms: (NEGLECTING FRICTION)

Introduction-freebody diagrams-conditions of equilibrium-two and three force members-Inertia forces and D'Alembert's principle. Four bar mechanism-Precision positions-structural error- Chebyshev's spacing, Freudenstein's Equation, problems.

Precession: Gyroscopes, effect of precessional motion on the stability of moving vehicles such as motor car, aero planes, Gyroscopic effect on ships like steering, pitching and rolling conditions.

## **UNIT – II:**

### **Turning Moment Diagrams and Flywheels:**

**Turning Moment:** Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram - Fluctuation of energy-design of flywheels.

**Governors:** Types of Governors – Watt governor, Porter and Proell governors, Spring loaded governor- Hartnell, Sensitiveness, isochronism and hunting of governor.

## **UNIT – III:**

**Clutches:** Friction in pivots and collars – uniform pressure, uniform wear theory. Friction clutches, Single disc or plate clutch, multiple disc clutch and cone clutch.

**Brakes and Dynamometers:** Simple block brakes, band brake of vehicle and working of internal expanding brake. Dynamometers - absorption and transmission types-general description and method of operation.

## **UNIT – IV:**

**Balancing:** Balancing of rotating masses – single and multiple-single and different planes-balancing of reciprocating masses-primary and secondary balancing-analytical and graphical methods.

**Unbalanced Forces and Couples:** Balancing of multi cylinder inline and radial engines for primary, secondary balancing and - locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

## **UNIT – V:**

**Vibrations:** Free vibration of mass attached to a vertical spring - Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly's method – Raleigh's method. - Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

## **TEXT BOOKS:**

1. Kinematics and Dynamics of Machinery, R. L. Norton, McGraw-Hill, 2017
2. Theory of Machines, S. S. Ratan, Tata McGraw-Hill, 2017

## **REFERENCES:**

1. Theory of Machines and Mechanisms, P. L. Ballaney, Khanna Publisher, 1995
2. Theory of Machines, Thomas Bevan, 3<sup>rd</sup> Edition Pearson Education, 2017
3. Theory of Machines and Mechanisms, J. E. Shigley, Tata McGraw-Hill, 2016
4. Theory of Machines, R. S. Kurmi, J. K. Gupta, 2015

## **ONLINE RESOURCES:**

1. <https://archive.nptel.ac.in/courses/112/104/112104114/>
2. <https://archive.nptel.ac.in/courses/112/106/112106270/>

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. IV Semester

### (22PC1ME207) FLUID MECHANICS AND HYDRAULIC MACHINES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

#### COURSE OBJECTIVES:

- To understand the properties of fluids, principles of buoyancy, flow, force and head calculations
- To evaluate of types of fluid flow, laminar and dynamic
- To gain knowledge on boundary layer principles applied to airfoils
- To comprehend principles of operation of different types of hydraulic machinery

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Analyze the fluid properties to solve flow, force and velocity problems

**CO-2:** Evaluate the flow characterizing in static and dynamic nature of flow

**CO-3:** Apply fluid flow dynamics to solve problems in hydraulic machines

**CO-4:** Understand the model analysis of hydraulic machinery and select appropriate machines for hydro power plant

#### COURSE ARTICULATION MATRIX:

(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	1	1	-	-	1	-	-	2	-	1	3	1
CO-2	3	2	1	1	-	-	2	-	-	-	-	1	3	1
CO-3	3	3	1	1	-	-	1	-	-	2	2	2	3	1
CO-4	3	3	2	2	-	-	1	-	-	2	3	1	3	1

#### UNIT – I:

**Fluid Statics:** Properties of fluid– specific gravity, viscosity, surface tension, vapor pressure and their influence on fluid motion, Pressure at a point, measurement of pressure, Forces on immersed surfaces

**Fluid Kinematics:** Introduction, methods of describing the fluid motion, Classification of flows, acceleration equations, Streamline, pathline and streak lines and stream tube, continuity equation, Stream function, velocity potential function

#### UNIT – II:

**Fluid Dynamics:** Surface and body forces – Euler's and Bernoulli's equation, Venturimeter, Orifice meter, Pitot tube, Darcy Weisbach equation–Minor losses in pipes– pipes in series and pipes in parallel. Momentum equation, force on pipe bends. Navier-Stokes Equation Introduction only.

**UNIT – III:**

**Impact of Jets:** Hydro-dynamic force of jets on stationary and moving flat, inclined and curved vanes - jet striking centrally and at tip, flow over radial vanes, flow over series of vanes, velocity triangles.

**UNIT – IV:**

**Hydraulic Turbines:** Classification of turbines, design of Pelton wheel, Francis turbine and Kaplan turbine–working proportion, work done, efficiency, draft tube-theory, functions and efficiency. Geometric similarity, Unit and specific quantities, characteristic curves, selection of type of turbine, cavitation, surge tank and water hammer, elements of hydro power plant.

**UNIT – V:**

**Hydraulic Pumps:** Classification, centrifugal pumps–types, working, workdone, monomeric head, losses and efficiency, specific speed – pumps in series and parallel – performance characteristic curves, NPSH, Reciprocating Pump – types, Working, Discharge, slip, indicator diagrams

**TEXT BOOKS:**

1. Hydraulics and Fluid mechanics including Hydraulic Machines, Modi and Seth, 21<sup>st</sup> Edition, Standard Book House, 2015
2. Introduction to Fluid Mechanics, R. W. Fox, A. T. McDonald, 2001

**REFERENCES:**

1. Fluid Mechanics and Fluid Power Engineering, D. S. Kumar, S. K. Kataria & Sons, 2018
2. Fluid Mechanics and Machinery, D. Rama Durgaiyah, New Age International, 2006
3. Hydraulic Machines, T. R. Banga & S. C. Sharma, 7<sup>th</sup> Edition, Khanna Publishers, 2007
4. Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Lakshmi Publications, 2015
5. Fluid Mechanics: V. L. Streeter & E. B. Wylie, Tata McGraw-Hill, 1983

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. IV Semester

### (22HS1MG201) ENGINEERING ECONOMICS AND ACCOUNTANCY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

#### COURSE OBJECTIVES:

- To understand the basic concepts of economics and different forms of business organizations
- To create awareness on basics of business economics and to analyze the concepts of demand and supply
- To describe each stage of product life cycle with the help different costs and their role in maintaining optimum cost of production and overall profitability by considering different market competitions
- To acquaint with the basic accounting knowledge and financial accounting process
- To evaluate the performance of the organization using various ratios

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Perform decision making function effectively in an uncertain framework by applying the based concepts of economics and select suitable form of business organization which meets the requirements of business

**CO-2:** Take the right decisions towards buying and selling of goods and services based on the demand and supply dynamics in the markets

**CO-3:** Fix the right price based upon production cost which can best meet the pre-determined objectives of the business under different market conditions

**CO-4:** Prepare book of accounts and understand overall position of the business

**CO-5:** Interpret the firm's financial performance using various ratios

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)		
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
CO-1	-	-	-	-	-	-	-	1	2	1	3	1	-	-	-
CO-2	-	-	-	-	-	-	-	1	2	1	3	1	-	-	-
CO-3	-	-	-	-	-	-	-	1	2	1	3	1	-	-	-
CO-4	-	-	-	-	-	-	-	1	2	1	3	1	-	-	-
CO-5	-	-	-	-	-	-	-	1	2	1	3	1	-	-	-

#### UNIT-I:

**Introduction to Economics:** Definition, nature, scope and types of Economics. National Income (NI) & types of Inflation.

### **Forms of Organizing Private and Public-Sector Business Enterprises:**

**Private Sector Business Enterprises:** (i) Sole Proprietorship – Definition, features, merits, limitations & suitability. (ii) Partnership – Definition, Partnership Act, features, types, merits, limitations, suitability. (iii) Joint-Stock Company – Definition, Companies Act, features, types, merits, limitations, suitability.

**Public Sector Business Enterprises:** Definition, features, objectives, merits, problems

### **UNIT-II:**

**Business Economics:** Definition, nature and scope, linkages with other disciplines.

**Demand Analysis:** Law of Demand, Factors affecting demand; Elasticity of Demand-Types Measurement, Factors affecting and Significance,

**Demand Forecasting:** Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply function and Law of Supply.

### **UNIT-III:**

#### **Production, Cost, Market Structures & Pricing:**

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions - Cobb-Douglas.

**Cost Analysis:** Types of Costs, Short run and long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis (Simple problems)

### **UNIT-IV:**

**Introduction to Financial Accounting:** Definition, basic principles and double-entry book-keeping, practice of accounting process-Journal, ledger, trial balance and final accounts (simple problems)

### **UNIT-V:**

**Ratio Analysis:** Meaning, computation of ratios (i) Liquidity Ratios: Current Ratio and Quick Ratio, (ii) Solvency Ratios: Interest Coverage Ratio and Debt-Equity Ratio, (iii) Activity Ratios: Stock/Inventory Turnover Ratio and Debt Turnover Ratio, (iv) Profitability Ratios: Gross Profit Ratio, Net Profit Ratio & Earning Per Share (EPS) Ratio

### **TEXT BOOKS:**

1. Managerial Economics, D.M. Mithani, 9<sup>th</sup> Edition, Himalaya Publishing House, 2022
2. Managerial Economics, Satya P. Das & J. K. Goyal, 2<sup>nd</sup> Edition, Sage Publications, 2022
3. Financial Accounting, S. N. Maheswari, 6<sup>th</sup> Edition, Vikas Publications, 2018

### **REFERENCES:**

1. Managerial Economics, Dominick Salvatore, Siddhartha K. Rastogi, 9<sup>th</sup> Edition, Oxford Publications, 2020
2. Financial Accounting for Management: An Analytical Perspective, Ambrish Gupta, 6<sup>th</sup> Edition, Pearson Education, 2018
3. Business Economics, H. L. Ahuja, 13<sup>th</sup> Edition, S. Chand, 2019

4. Principles of Marketing: A South Asian Perspective, Kotler Philip, Gary Armstrong, Prafulla Y. Agnihotri, and Eshan-ul Haque, 13<sup>th</sup> Edition, Pearson Education/ Prentice Hall of India, 2010

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. IV Semester

#### (22ES1EE103) FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

#### COURSE OBJECTIVES:

- To get awareness of different network theorems used for analysis of electrical circuits
- To understand the basic operation of control circuits used for vehicles
- To know about working of different electrical machines used for propulsion of vehicles
- To know the basic operation of semiconductor devices used for automobiles

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Analyze the given electrical circuits using different network theorems and circuit reduction techniques

**CO-2:** Understand the operation and applications of transformers

**CO-3:** Assess the performance of electrical machines used for propulsion of vehicles

**CO-4:** Understand the operation of various semiconductor devices used in vehicles

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	2	1	2	2	2	2	2	1	2	1	2	3	2	3
CO-2	2	1	2	2	2	2	2	1	2	1	2	3	2	3
CO-3	2	1	2	2	2	2	2	1	2	1	2	3	3	3
CO-4	2	1	1	2	2	1	2	1	2	1	2	3	1	2

#### UNIT-I:

**Electrical Circuits:** Circuit Concept R-L-C Parameters-Ohm's Law - Kirchhoff's Laws - Series - Parallel resistive networks. AC Circuits: Average value, rms value, form factor of sinusoidal function, analysis of series R-L, R-C and R-L-C circuits-simple problems

#### UNIT-II:

**DC Machines:** Principle of operation of DC Generator – emf equation – types, DC Motor -principle- types –torque equation – Speed Control-simple problems

#### UNIT-III:

**AC Machines-I:** Principle of operation of single phase transformer–emf equation–losses– OC and SC tests - efficiency and regulation (simple Problems),



**UNIT-IV:**

**AC Machines-II:** Principle of operation of induction motor – slip –torque characteristics, Principle of operation of alternator – regulation by synchronous impedance method

**UNIT-V:**

**Fundamentals of Electronics:** P-N junction diode-symbol-V-I Characteristics-Applications, SCR characteristics and applications, LED, Introduction to BJT, CE Characteristics, Logic gates-truth tables

**TEXT BOOKS:**

1. Electronic Devices and Circuits, David A. Bell, 5<sup>th</sup> Edition, Oxford University Press, 2008
2. Introduction to Electrical Engineering, M. S. Naidu and S. Kamakshaiah, Tata McGraw-Hill, 2017
3. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 11<sup>th</sup> Edition, Pearson/Prentice Hall, 2016

**REFERENCES:**

1. Principles of Electrical and Electronics Engineering, V. K. Mehta, S. Chand, 2010
2. Basic Electrical Engineering, Kothari and Nagarath, 4<sup>th</sup> Edition, Tata McGraw-Hill, 2019
3. Basic Electrical Engineering, T. K. Nagasarkar and M. S. Sukhija, 3<sup>rd</sup> Edition, Oxford University Press, 2017
4. Electrical & Electronics Technology, E. Hughes, 10<sup>th</sup> Edition, Pearson, 2010

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. IV Semester

### (22PC2ME205) CAD/CAM LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

**COURSE PRE-REQUISITES:** Machine Tools and Metrology, Engineering Graphics

**COURSE OBJECTIVES:**

- To understand the ways in which 2D sketches and 3D models are made using appropriate CAD packages
- To know the procedure of building assembly drawings and get assembly views
- To learn the part programming techniques for turning and milling operations

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Draw 2D Part Drawings, create 3D solid models using CAD software

**CO-2:** Design product assemblies and create assembly views

**CO-3:** Develop Part programs and generation of tool path for CNC Turning and Milling operations

**COURSE ARTICULATION MATRIX:**

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	1	-	3	-	3	2	2	1	2	2	-	1	3	2
CO-2	1	-	3	-	3	2	2	1	2	2	-	1	2	2
CO-3	1	-	3	-	2	2	2	-	2	-	-	1	2	3

**LIST OF EXPERIMENTS:**

**CAD:**

1. 2D Drawing using sketcher (2 Exercises)
2. Solid modeling (2 Exercises)
3. Assembly Modelling (2 Exercises)
4. Drafting (1 Exercise)

**Software: AutoCAD, CATIA**

**CAM:**

**1. Part programming for Turning**

- a) Facing
- b) Step turning
- c) Taper turning operations.

## **2. Part Programming using Fixed Cycle**

- a) Facing
- b) Taper Turning
- c) Step Turning

## **3. Part Programming using Canned Cycles**

- a) Multiple Turning
- b) Thread Cutting
- c) Grooving

## **4. Part programming for Milling**

- a) Linear interpolation
- b) Circular interpolation
- c) Pocket milling

5. Generation of NC tool path using CNC simulation software

6. Part Programming and simulation of various geometries using CNC simulation software.

**Software:** CNC Simulation software, CAM software

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. IV Semester

### (22PC2ME206) KINEMATICS AND DYNAMICS LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

**COURSE PRE-REQUISITES:** Kinematics of Machinery, Mechanics of Solids, Engineering Mechanics

#### COURSE OBJECTIVES:

- To Investigate the various mechanisms like 4-bar, cam and follower mechanisms
- To find the static and dynamic balancing and the gyroscopic effects
- To evaluate the performance of journal bearing, governors and cam follower mechanisms
- To analyze the natural frequencies for undamped and damped vibration systems

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Analyze the inversions of mechanisms and cam and follower mechanism

**CO-2:** Determine the gyroscopic couple and balancing masses in rotating system

**CO-3:** Analyze the various governors and speed of journal bearing

**CO-4:** Calculate the natural frequency of different vibratory systems and modes of vibration in torsion

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	2	2	3	1	1	-	2	2	1	2	2	-
CO-2	3	3	2	2	-	1	1	-	2	2	1	2	2	-
CO-3	3	3	2	2	-	1	1	-	2	2	1	2	3	-
CO-4	3	3	2	2	-	1	1	-	2	2	1	2	3	-

#### LIST OF EXPERIMENTS:

##### Any Ten experiments

1. Study the inversions of 4-bar and slider crank mechanisms using models.
2. To analyze the cam and follower behavior at different follower movement.
3. Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing
4. Experimental analyses of the motion of a motorized gyroscope
5. To balance the masses statically and dynamically of a rotating mass system
6. Determine the effect of varying mass on the center of sleeve in porter governor and study the Proell and Hartnell governor
7. To determine whirling speed of shaft and study the modes of vibration.

8. To determine the frequency of undamped free vibration of spring mass system
9. Experimental verification of Dunkerley's Rule
10. To determine the natural frequency of undamped torsional vibration of a single and double rotor shaft system
11. To determine the frequency of the forced vibration of simply supported beam for different damping.
12. A simple Four Bar Linkage Motion Simulation using software.

**ONLINE RESOURCES:**

1. <https://archive.nptel.ac.in/courses/112/104/112104114/#>
2. <https://archive.nptel.ac.in/courses/112/106/112106270/>

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. IV Semester

### (22PC2ME207) FLUID MECHANICS AND MACHINERY LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

**COURSE PRE-REQUISITES:** Fluid Mechanics and Hydraulic Machines

#### COURSE OBJECTIVES:

- To analyze the experiments to understand the concept, find the values and obtain the result of experiments
- To apply fundamental principles of fluid mechanics for the solution of practical mechanical engineering problems of water conveyance in pipes, orifices, mouth pieces, notches & weirs
- To analyze various pumps, water turbines, pipes and pressure measurement devices
- To evaluate efficiency for pumps and turbines

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Apply fundamental equations of fluid mechanics for turbines and pumps.

**CO-2:** Analyze fluid flow problems.

**CO-3:** Create a model of fluid flow equipment.

**CO-4:** Evaluate the experimental results with theoretical concepts.

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	3	1	1	-	-	1	-	2	2	-	1	3	1
CO-2	3	2	1	1	-	-	2	-	-	-	-	1	3	1
CO-3	3	3	1	1	-	-	1	-	2	2	2	2	3	1
CO-4	3	3	2	2	-	-	1	-	1	2	3	1	3	1

#### LIST OF EXPERIMENTS:

**ANY 10 EXPERIMENTS to be conducted from the following:**

1. Verification of Bernoulli's theorem.
2. Calibration of Venturimeter/ Orifice meter.
3. Calibration of notches.
4. Determination of friction factor for a given pipe.
5. Determination of Minor losses for the given equipment.
6. Impact of jet on vanes.
7. Performance test on Pelton wheel.
8. Performance test on Francis turbine.

9. Performance test on Kaplan turbine.
10. Performance test on single stage centrifugal pump.
11. Performance test on multi stage centrifugal pump.
12. Performance test on reciprocating pump.

# VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

## B.Tech. III Semester

### (22PW4ME201) DESIGN THINKING

TEACHING SCHEME		
L	T/P	C
1	2	2

EVALUATION SCHEME		
CIE	SEE	TOTAL
40	60	100

#### COURSE OBJECTIVES:

- To instill a sense of significance towards applying creativity to product and service design
- To teach a systematic approach to identifying and defining a problem before brainstorming for a solution
- To inculcate core design principles and applied creativity to develop innovative strategies that better connect engineers and technologies with their end users
- To build a mindset leading to flow of creative ideas, validating those ideas and prioritizing the best ones among them.
- To motivate students to apply design thinking while implementing projects focusing on local, regional or global societal problems

**COURSE OUTCOMES:** After completion of the course, the student should be able to

**CO-1:** Demonstrate the understanding of design principles from a technology perspective

**CO-2:** Validate problem statements through user empathisation with societal, cultural, global and environmental consciousness

**CO-3:** Use specific and relevant ideation and brainstorming techniques to find innovative solutions

**CO-4:** Prototype a solution to address user challenges

**CO-5:** Investigate the cultural, emotional, environmental, technological and business factors relevant to developing new product or service design concept

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	-	-	2	-	-	2	-	-	3	3	1	1	-	2
CO-2	-	-	3	2	1	3	-	-	3	2	1	1	2	1
CO-3	-	-	2	-	-	2	-	-	2	2	3	-	-	-
CO-4	-	-	3	-	2	-	-	-	2	3	1	-	-	1
CO-5	-	-	-	3	-	3	1	-	1	-	1	-	-	-

#### UNIT-I:

**Design Overview and Doing Design:** Various perspectives of design; Good and Bad Design; Introduction to the Design Double Diamond: Discover-Define-Develop-Deliver; Discover Phase- Looking for problems; Identifying Stakeholders and Defining User Personas; User Empathization; Data collection, creating and conducting surveys



and Empathy Tools – What/How/Why, Five Why method, Empathy Maps, AEIOU method, Story Share and Capture

#### **UNIT-II:**

**Need Analysis:** Types of Users, Types of Needs; Market Size; Value Proposition to the Users; Identifying Addressable Needs and Touch points; Structuring Need Statements; Customer Experience (CX) Design; Service Design and Development Process; Customer Journey Map (CJM), Service Experience Cycle.

#### **UNIT-III:**

**Ideation Process:** Introduction to creativity and closed-world solutions, Idea generation techniques: Brainstorming, Mind Maps, SCAMPER, Systematic Inventive Thinking methods (Subtraction, Multiplication, Division, Task Unification and Attribute Dependency);

**Strategic Innovation for Competition in Future:** Linear Innovation vs. Non-linear innovation, Understanding and identifying weak signals, 3-box thinking, 3-Box framework and Box-3 ideation, Four-Action Framework (Eliminate-Reduce-Raise-Create, or ERRC Matrix).

#### **UNIT -IV:**

**Building Prototypes:** Building Conceptual model of product/service using various prototype methods, test a business model or business case to support the viability of the solution using MVP.

**Design for Sustainability:** Concern for Environment and Sustainability in Design, Case Studies to understand good Design For Environment (DFE) Decisions; Sustainable Design Approaches in the five stages of the Product Life Cycle.

#### **UNIT -V:**

**Capstone Project (Interdisciplinary):** Applying design thinking principles and methods for problem definition, ideation, prototyping, testing, refining and taking the solution to the users, using visual representation tools to indicate problem, User persona, needs, empathisation, ideas and prototype that leads to chosen solution, creating presentation.

#### **TEXT BOOKS:**

1. Change by Design, Tim Brown, Harper Business, 2012
2. The Design of Everyday Things, Donald A. Norman, MIT Press, 2013

#### **REFERENCES:**

1. The Art of Innovation, Tom Kelly, Jonathan Littman, Harper Collins Business, 2002
2. Design Thinking: Integrating Innovation, Customer Experience, and Brand Value, Thomas Lockwood, Allworth Press, 2009
3. Design Thinking for Start-ups: A Handbook for Readers and Workbook for Practitioners, Jimmy Jain, Notion Press, 2018

#### **ONLINE RESOURCES:**

1. <https://www.ideo.com/pages/design-thinking>
2. <https://www.ibm.com/design/thinking/page/framework>
3. [https://onlinecourses.nptel.ac.in/noc20\\_mg38/preview](https://onlinecourses.nptel.ac.in/noc20_mg38/preview)
4. <https://nptel.ac.in/courses/110106124>

5. <https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>

## VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

### B.Tech. IV Semester

### (22MN6HS201) INTELLECTUAL PROPERTY RIGHTS

#### TEACHING SCHEME

L	T/P	C
2	0	0

#### EVALUATION SCHEME

SE-I	SE-II	SEE	TOTAL
50	50	-	100

#### COURSE OBJECTIVES:

- To familiarize students with the nuances of Intellectual Property Rights (IPR) to help them integrate the IPR process in their research activities
- To make the students capable of identifying their own protectable innovations and realizing the process of taking it from bench to market

**COURSE OUTCOMES:** After completing this course the student should be able to

**CO-1:** Get an adequate knowledge on patent and copyright for their innovative research works and academic projects

**CO-2:** Understand and acquire the knowledge of trademarks and registration aspects

**CO-3:** Interpret various forms of Intellectual Property on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects

**CO-4:** Obtain useful insights from the information in patent documents, especially on novelty of their idea from state-of-the art search, during their research career. This provides further way for developing their idea or innovations

**CO-5:** Get awareness about current trends in IPR and Govt. steps in fostering IPR

#### COURSE ARTICULATION MATRIX:

*(Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)*

CO	PROGRAM OUTCOMES (PO)												PROGRAM SPECIFIC OUTCOMES (PSO)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	-	-	-	-	-	2	-	3	-	-	-	2	-	-
CO-2	-	-	-	-	-	2	-	3	-	-	-	2	-	-
CO-3	-	-	--	-	-	2	-	3	-	-	-	2	-	-
CO-4	-	-	-	-	-	2	-	3	-	-	-	2	-	-
CO-5	-	-	-	-	-	2	-	3	-	-	-	2	-	-

#### UNIT – I:

**Overview of Intellectual Property:** Introduction and the need for Intellectual Property Right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

## **UNIT – II:**

**Patents:** Patents - Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

## **UNIT – III:**

**Copyrights:** Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

## **UNIT – IV:**

### **Trademarks:**

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

## **UNIT – V:**

**Design:** meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

**Geographical Indication (GI):** meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection

**Plant Variety Protection:** meaning and benefit sharing and farmers' rights – Procedure for registration, effect of registration and term of protection

**Layout Design Protection:** meaning – Procedure for registration, effect of registration and term of protection

**Current Contour:** India's New National IP Policy, 2016 – Govt. of India step towards promoting IPR – Govt. Schemes in IPR – Career Opportunities in IP - IPR in current scenario with case studies

## **TEXTBOOKS:**

1. Intellectual Property Rights: Protection and Management Nithyananda, K V, India, IN: Cengage Learning India Private Limited, 2019
2. Intellectual Property Rights, Neeraj, P., & Khusdeep, D, India, IN: PHI learning Private Limited, 2014
3. Intellectual property right, Deborah, E. Bouchoux, 4<sup>th</sup> Edition, Cengage learning

## **REFERENCE:**

1. Law relating to Intellectual Property Rights, Ahuja, V K, India, IN: Lexis Nexis, 2017

## **ONLINE RESOURCES:**

1. Intellectual Property Rights – An Overview, Subramanian, N., & Sundararaman, M. Retrieved from <http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf>, 2018
2. WIPO Intellectual property Handbook, World Intellectual Property Organisation, Retrieved from [https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo\\_pub\\_489.pdf](https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf), 2004