AY 2021-22           Course Information           Programme           B.Tech, (Mechanical Engineering)           Class, Semester         Second Year B, Tech., Sem III           Course Cole           Course Name           Probability and Statistics           Desired Requisites:         Tacching Scheme         Examination Scheme (Marks)           Lecture         21Hrs/week         T1         T2         ESE         Total           Practical         -         20         20         60         100           Practical         -           Course Objectives           To understand the importance of probability and statistical tools used in engineering.           2         To understand the importance of probability distributions.         3         To understand different hypothesis and types of errors.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to.           Course Outcomes (CO) with Bloom's Taxonomy Level <th colspanization,="" continuous="" prob<="" random="" th="" variable,=""><th></th><th></th><th>W</th><th></th><th>ge of Engineerin ded Autonomous Instit</th><th></th><th></th></th>	<th></th> <th></th> <th>W</th> <th></th> <th>ge of Engineerin ded Autonomous Instit</th> <th></th> <th></th>			W		ge of Engineerin ded Autonomous Instit		
Programme         B.Tech. (Mechanical Engineering)           Cluss, Semester         Second Year B. Tech., Sem III           Course Code         Probability and Statistics           Desired Requisites:         Probability and Statistics           Teaching Scheme         Examination Scheme (Marks)           Lecture         2Hrs/week         T1         T2         ESE         Total           Tutorial         -         20         20         60         100           Practical         -         Course Objectives         -           Interaction         -         Creditis: 2         -           To understand the importance of probability and statistical tools used in engineering.         -         -           3         To understand fifterent hypothesis and types of errors.         -         Apply           COI         Identify basic clements of probability functions and distributions.         Apply           COI         Identify basic clements of probability functions and distributions.         Apply           Module         Module Contents         Hours           Random Variable         Discreter random variable, Continuous random variable, probability mass function, cambally distribution function of two dimensional discrete random variable, joint distribution, function, bivariate discrete random variable, joint deasustan distribution, Exponenti				Α	Y 2021-22			
Class, Semester     Second Year B. Tech., Sem III       Course Code     Probability and Statistics       Desired Requisites:       Teaching Scheme     Examination Scheme (Marks)       Lecture     2Hrs/week     T1     T2     ESE     Total       Tutorial     -     20     20     60     100       Practical     -     -     -       Interaction     -     Course Objectives     -       To understand the importance of probability and statistical lools used in engineering.     -       To understand different hypothesis and types of errors.     -       Course Outcomes (CO) with Bloom's Taxonomy Level       At the end of the course, the students will be able to,     -       CO1     Identify basic elements of probability and statistics     Apply       CO2     Employ use of different probability functions and distributions     Analyze       CO3     Use different statistical tools for hypothesis testing     Evaluate       Module     Module Contents     Hours       Random Variable     Discrete random variable, Continuous random variable, probability mass function, Mean deviation, joint distribution function of two dimensional discrete random variable to introduction, bivariate discrete random variable, for probability distribution     6       Statistical Methods     Mours     Statistical Methods     J				Cour	se Information			
Class, Semester     Second Year B. Tech., Sem III       Course Code     Probability and Statistics       Desired Requisites:       Teaching Scheme     Examination Scheme (Marks)       Lecture     2Hrs/week     T1     T2     ESE     Total       Tutorial     -     20     20     60     100       Practical     -     -     -       Interaction     -     Course Objectives     -       To understand the importance of probability and statistical lools used in engineering.     -       To understand different hypothesis and types of errors.     -       Course Outcomes (CO) with Bloom's Taxonomy Level       At the end of the course, the students will be able to,     -       CO1     Identify basic elements of probability and statistics     Apply       CO2     Employ use of different probability functions and distributions     Analyze       CO3     Use different statistical tools for hypothesis testing     Evaluate       Module     Module Contents     Hours       Random Variable     Discrete random variable, Continuous random variable, probability mass function, Mean deviation, joint distribution function of two dimensional discrete random variable to introduction, bivariate discrete random variable, for probability distribution     6       Statistical Methods     Mours     Statistical Methods     J	Progra	amme		B.Tech. (Mechani	cal Engineering)			
Course Code         Probability and Statistics           Desired Requisites:         Probability and Statistics           Teaching Scheme         Examination Scheme (Marks)           Lecture         2Hrs/week         T1         T2         ESF.         Total           Tutorial         -         20         20         60         100           Practical         -         -         -         -           Interaction         -         Course Objectives         -           Interaction         -         Course Objectives         -           To get the knowledge of various types of probability distributions.         -         -           3         To understand different hypothesis and types of errors.         Apply           COI         Identify basic elements of probability and statistics         Apply           COI         Identify basic elements of probability and statistics         Apply           COI         Identify basic elements of probability and statistics         Apply           COI         Identify basic elements of probability and statistics         Apply           COI         Identify basic elements of probability and statistics         Apply           It         Probability distribution function, bivariate discrete random variable, joint distribution function, fiva			ter		<u> </u>			
Course Name         Probability and Statistics           Desired Requisites:         Probability and Statistics           Teaching Scheme         Examination Scheme (Marks)           Lecture         2Hrs/week         T1         T2         ESE         Total           Tutorial         -         20         20         60         100           Practical         -         -         Interaction         -         Interaction         -         -           Interaction         -         Course Objectives         -         -         -           To understand the importance of probability and statistical tools used in engineering.         -         -         -           3         To understand different hypothesis and types of errors.         -         -         -           CO1         Identify basic elements of probability and statistics         Apply         Apply           C02         Employue so different probability functions and distributions         Analyze         Apply           C03         Use different statistical tools for hypothesis testing         Evaluate         Hours           Random Variable         Discrete random variable, Continuous random variable, probability mass function, we analy distribution function of two dimensional discreter random variable.         Sint         4 <td>· · · ·</td> <td></td> <td></td> <td></td> <td>,</td> <td></td> <td></td>	· · · ·				,			
Desired Requisites:         Examination Scheme (Marks)           Lecture         2Hrs/week         TI         T2         ESE         Total           Tutorial         -         20         20         60         100           Practical         -         -         -         -         -           Interaction         -         Course Objectives         -         -         -           1         To understand the importance of probability distributions.         -				Probability and St	atistics			
Teaching SchemeExamination Scheme (Marks)Lecture2Hrs/weekT1T2ESETotalTutorial-202060100PracticalInteraction-Credits: 2Course Objectives1To understand the importance of probability and statistical tools used in engineering.2To get the knowledge of various types of probability distributions.3To understand different hypothesis and types of errors.Course Outcomes (CO) with Bloom's Taxonomy LevelAt the end of the course, the students will be able to,CO1Identify basic elements of probability functions and distributionsAnalyzeCO2Employ use of different probability functions and distributionsAnalyzeCO3Use different probability functions and distributionIremotor wariable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variableIIProbabily Distribution 								
Lecture         2Hrs/week         T1         T2         ESE         Total           Tutorial         -         20         20         60         100           Practical         -         -         -         -         -           Interaction         -         Credits: 2         -         -         -           1         To understand the importance of probability and statistical tools used in engineering.         -         -         -           2         To get the knowledge of various types of probability distributions.         -         -         -           3         To understand different hypothesis and types of errors.         -         -         -         -           COI         Identify basic elements of probability and statistics         Apply         -         -         -           CO2         Employ use of different probability functions and distributions         Analyze         -         Evaluate         -           Module         Module Contents         Hours         - </td <td></td> <td><u>u 1109</u></td> <td></td> <td></td> <td></td> <td></td> <td></td>		<u>u 1109</u>						
Lecture         2Hrs/week         T1         T2         ESE         Total           Tutorial         -         20         20         60         100           Practical         -         -         -         -         -           Interaction         -         Credits: 2         -         -         -           1         To understand the importance of probability and statistical tools used in engineering.         -         -         -           2         To get the knowledge of various types of probability distributions.         -         -         -           3         To understand different hypothesis and types of errors.         -         -         -         -           COI         Identify basic elements of probability and statistics         Apply         -         -         -           CO2         Employ use of different probability functions and distributions         Analyze         -         Evaluate         -           Module         Module Contents         Hours         - </td <td>Te</td> <td>aching</td> <td>Scheme</td> <td></td> <td>Examination So</td> <td>heme (Marks)</td> <td></td>	Te	aching	Scheme		Examination So	heme (Marks)		
Tutorial       -       20       20       60       100         Practical       -       -       -       -         Interaction       -       Credits: 2       -         1       To understand the importance of probability and statistical tools used in engineering.       2         2       To get the knowledge of various types of probability distributions.       3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply         CO1       Identify basic elements of probability and statistics       Apply         CO2       Employ use of different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         I       cumulative distribution function, bivariate discrete random variable, joint probability distribution, function of two dimensional discrete random variable       6         III       Probability Distribution       6       6         Statistical Methods       Kasare of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5				T1			Total	
Practical       -         Interaction       -         Course Objectives         1       To understand the importance of probability and statistical tools used in engineering.         2       To get the knowledge of various types of probability distributions.         3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloon's Taxonomy Level         At the end of the course, the students will be able to,       CO         CO       Identify basic elements of probability and statistics       Apply         CO2       Employ use of different probability and statistics       Apply         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Random Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable.       6         III       Probability Distribution       6         Gaussian distribution, Exponential distribution, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Greganization data, Population and sample, Methods of sampling <td< td=""><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td></td<>			-					
Interaction       -       Credits: 2         Course Objectives         1       To understand the importance of probability and statistical tools used in engineering.         2       To get the knowledge of various types of probability distributions.         3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply         C01       Identify basic elements of probability and statistics       Apply         C02       Employ use of different probability functions and distributions       Analyze         C03       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Random Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable.       6         III       Probability Distribution       6       5         Symmetry, Skewness, Kurtosis, and Types of Kurtosis       7       3         V       Characteristics: Attributes and variables, Collection and distribution: definition and its properties.       3       3         IV       Population and Sample<							100	
Course Objectives           1         To understand the importance of probability and statistical tools used in engineering.         2           2         To get the knowledge of various types of probability distributions.         3           3         To understand different hypothesis and types of errors.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,         Apply           CO1         Identify basic elements of probability and statistics         Apply           CO2         Employ use of different probability functions and distributions         Analyze           CO3         Use different statistical tools for hypothesis testing         Evaluate           Module         Module Contents         Hours           Random Variable         Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, Exponential distribution function of two dimensional discrete random variable         4           II         Probability Distribution         6         6           Statistical Methods         Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Wean deviation, Variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis         5           Votation and Sample         Exact					Cred	its. 7		
1       To understand the importance of probability and statistical tools used in engineering.         2       To get the knowledge of various types of probability distributions.         3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to.       Apply         CO1       Identify basic elements of probability and statistics       Apply         CO2       Employ use of different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Module distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       Probability Distribution         II       Probability Distribution       6         Statistical Methods       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, kurtosis, and Types of Kurtosis       5         VI       Fast of Hypothesis       4         Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       7         Kandom samples, parameter, stat	mura		_		Citu	us. 2		
1       To understand the importance of probability and statistical tools used in engineering.         2       To get the knowledge of various types of probability distributions.         3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to.       Apply         CO1       Identify basic elements of probability and statistics       Apply         CO2       Employ use of different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Module distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       Probability Distribution         II       Probability Distribution       6         Statistical Methods       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, kurtosis, and Types of Kurtosis       5         VI       Fast of Hypothesis       4         Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       7         Kandom samples, parameter, stat				Cou	rse Ohiectives			
2       To get the knowledge of various types of probability distributions.         3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply         CO1       Identify basic elements of probability and statistics       Apply         CO2       Employ use of different probability and statistics       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Mandom Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint aprobability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution       6         Gaussian distribution, Exponential distribution, Uniform distribution       6         Statistical Methods       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         Population and Sample       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       4         VI       T	1	Толи	derstand the in		•	ols used in engineering		
3       To understand different hypothesis and types of errors.         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply         CO1       Identify basic elements of probability and statistics       Apply         CO3       Use different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Mandow Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution, bivariate discrete random variable, joint probability Distribution, joint distribution function of two dimensional discrete random variable       6         II       Probability Distribution       6         Statistical Methods       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         V       Population and Sample       1       1         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties, Student t- distribution: definition and its prop				<u> </u>	•	<u> </u>		
Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to,         Apply           CO1         Identify basic elements of probability and statistics         Apply           CO2         Employ use of different probability functions and distributions         Analyze           CO3         Use different statistical tools for hypothesis testing         Evaluate           Module         Module Contents         Hours           I         Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution function, bivariate discrete random variable, joint probability Distribution         6           III         Brobability Distribution Gaussian distribution, Exponential distribution, Uniform distribution, fausaina distribution, Exponential distribution, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis         5           III         Population and Sample         3         3           INV         Organization of data, Population and sample, Methods of sampling         4           VI         Exact Sampling Distribution         4           definition and its properties         7         3           VI         Endom samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample t		<u> </u>		· • •	<u> </u>			
At the end of the course, the students will be able to,       Apply         CO1       Identify basic clements of probability and statistics       Apply         CO2       Employ use of different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Random Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution function, bivariate discrete random variable, joint probability Distribution       4         II       Probability Distribution       6         Statistical Methods       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties       7         VI       Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test.       7         Module wise Measurabe Students Learning	-			J1	· · · · · · · · · · · · · · · · · · ·			
CO1       Identify basic elements of probability and statistics       Apply         CO2       Employ use of different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Module       Nodule Contents       Hours         I       Random Variable Discrete random variable, Continuous random variable, probability mass function, probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution Gaussian distribution, Exponential distribution, Uniform distribution Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       3         IV       Population and Sample Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       4         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties       7         Module wise Measurable Students Learning Outcomes :       Analyze       7         Atter the completion of the course the student should be able to:       1       Understand different types of probability distributions.         1.       Understand different statistical methods						onomy Level		
CO2       Employ use of different probability functions and distributions       Analyze         CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         I       Random Variable Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution Gaussian distribution, Exponential distribution, Uniform distribution       6         III       Probability Distribution Gaussian distribution, Exponential distribution, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Population and Sample Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         VI       Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       After the completion of the course the student should be able to:       1         1.       Understand meaning of different variables and probability functions.       2       Understand meaning of different variables and probability functions.         2.								
CO3       Use different statistical tools for hypothesis testing       Evaluate         Module       Module Contents       Hours         Random Variable Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution Gaussian distribution, Exponential distribution, Uniform distribution Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         III       Population and Sample Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties       4         VI       Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       4       7         After the completion of the course the student should be able to:       1       1         1       Understand different variables and probability functions.       2         2       Understand different statistical methods.       4				· · ·				
Module       Module Contents       Hours         Random Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution       6         Statistical Methods       6         Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         VI       Exact Sampling Distribution       4         VI       Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       After the completion of the course the student should be able to:       1         1       Understand meaning of different variables and probability functions.       2       Understand different statistical methods.         4       Understand different statistical methods.       4       1		-	•	<u> </u>		ns	•	
Random Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution       6         III       Probability Distribution, Exponential distribution, Uniform distribution       6         III       Statistical Methods       6         IIII       Reaver of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         Population and Sample       1       1         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties, Student t- distribution: definition and its properties       4         VI       Test of Hypothesis       7         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       1       1         After the completion of the course the student should be able to:	CO3	Use d	ifferent statisti	cal tools for hypothe	esis testing		Evaluate	
Random Variable       Discrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution       6         III       Probability Distribution, Exponential distribution, Uniform distribution       6         III       Statistical Methods       6         IIII       Reaver of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         Population and Sample       1       1         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties, Student t- distribution: definition and its properties       4         VI       Test of Hypothesis       7         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       1       1         After the completion of the course the student should be able to:	N/ - J	1.		M			TT	
IDiscrete random variable, Continuous random variable, probability mass function, cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable4IIProbability Distribution Gaussian distribution, Exponential distribution, Uniform distribution Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis5IVPopulation and Sample Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling3VExact Sampling Distribution Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties, Student t- distribution: definition and its properties7Module wise Measurable Students Learning Outcomes : After the completion of the course the student should be able to: 1.7Understand different types of probability distributions. 2.Understand different types of probability distributions.3.Use of different statistical methods. 4.4.Understand data collection methods, population sample.	Modu		<b>1 1</b> / <b>-</b> - 1		iue Contents		Hours	
I       cumulative distribution function, bivariate discrete random variable, joint probability distribution, joint distribution function of two dimensional discrete random variable       4         II       Probability Distribution Gaussian distribution, Exponential distribution, Uniform distribution       6         III       Statistical Methods       6         III       Statistical Methods       5         III       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Population and Sample       3         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Exact Sampling Distribution       4         VI       Test of Hypothesis       4         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       4       7         .       Understand meaning of different variables and probability functions.       2         .       Understand different types of probability distributions.       3         .       Use of differen					ıs random variable u	probability mass functio	n	
probability distribution, joint distribution function of two dimensional discrete random variable6IIProbability Distribution Gaussian distribution, Exponential distribution, Uniform distribution6IIIStatistical Methods Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis5IVPopulation and Sample Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling3VExact Sampling Distribution Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties4VITest of Hypothesis Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test7Module wise Measurable Students Learning Outcomes : After the completion of the course the student should be able to: 1. Understand meaning of different variables and probability functions. 2. Understand different types of probability distributions. 3. Use of different statistical methods. 4. Understand data collection methods, population sample.4	I							
II       Probability Distribution       6         III       Statistical Methods       6         III       Statistical Methods       6         III       Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Population and Sample       3         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Exact Sampling Distribution       4         VI       Test of Hypothesis       7         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       After the completion of the course the student should be able to:       7         1.       Understand meaning of different variables and probability functions.       1       1         2.       Understand different types of probability distributions.       3         3.       Use of different statistical methods.       4	-							
II       Gaussian distribution, Exponential distribution, Uniform distribution       0         III       Statistical Methods Measure of Central tendency, Measure of dispersion, Range, Quartile deviation, Mean deviation, variance, Standard deviation, Coefficient of variance, moments, Symmetry, Skewness, Kurtosis, and Types of Kurtosis       5         IV       Population and Sample Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Exact Sampling Distribution: definition and its properties       4         VI       Test of Hypothesis Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       After the completion of the course the student should be able to:       1         1.       Understand meaning of different variables and probability functions.       2       Understand different types of probability distributions.         3.       Use of different statistical methods.       4		pi	obability distr	ibution, joint distri	bution function of	two dimensional discre		
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IV       Population and Sample       3         IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Exact Sampling Distribution       4         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties       4         VI       Test of Hypothesis       4         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Moduk wise Measurable Students Learning Outcomes :       4         After the completion of the course the student should be able to:       1.         Understand meaning of different variables and probability functions.       2.         Use of different statistical methods.       4         4.       Understand data collection methods, population sample.		rai Pi Ga St M	ndom variable robability Dist aussian distribu atistical Meth easure of Cen	<b>ribution</b> ation, Exponential d <b>ods</b> tral tendency, Meas	istribution, Uniform ure of dispersion, F	distribution Cange, Quartile deviatio	te 6	
IV       Introduction, Types of Characteristics: Attributes and variables, Collection and Organization of data, Population and sample, Methods of sampling       3         V       Exact Sampling Distribution       4         V       Chi- square distribution: definition and its properties, Student t- distribution: definition and its properties       4         VI       Test of Hypothesis       4         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       4         After the completion of the course the student should be able to:       1         Understand meaning of different variables and probability functions.       2         Use of different statistical methods.       4         4.       Understand data collection methods, population sample.		rai Pri Ga St M M	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation,	ribution ation, Exponential d ods tral tendency, Meas variance, Standard	istribution, Uniform ure of dispersion, F deviation, Coefficie	distribution Cange, Quartile deviatio	te 6	
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definition and its properties       4         definition and its properties       7         Image: VI       Test of Hypothesis Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       7         After the completion of the course the student should be able to:       1         Image: I	III	rational fraction of the second secon	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, mmetry, Skew opulation and troduction, Ty rganization of	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and	distribution Range, Quartile deviatio ent of variance, momen variables, Collection ar	te 6 n, 5	
Implified and its properties       Implified and its properties         VI       Test of Hypothesis         Random samples, parameter, statistic, standard error of statistic, null and alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       7         Module wise Measurable Students Learning Outcomes :       After the completion of the course the student should be able to:       1         Implified the different variables and probability functions.       Implified the different types of probability distributions.       1         Implified the different statistical methods.       Implified the different statistical methods.       1	III IV	rational fraction of the second secon	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, mmetry, Skew opulation and troduction, Ty rganization of o kact Sampling	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of	distribution Range, Quartile deviatio ont of variance, momen variables, Collection ar sampling	te 6 n, 5 nd 3	
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VI       alternative hypothesis, critical region, level of significance, Types of error, large sample test, Small sample test       /         Module wise Measurable Students Learning Outcomes :       /         After the completion of the course the student should be able to:       /         1.       Understand meaning of different variables and probability functions.         2.       Understand different types of probability distributions.         3.       Use of different statistical methods.         4.       Understand data collection methods, population sample.	III IV	rational results of the second	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, mmetry, Skew pulation and troduction, Ty rganization of or kact Sampling hi- square dis finition and its	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution tribution: definition properties	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of	distribution Range, Quartile deviatio ont of variance, momen variables, Collection ar sampling	te 6 n, 5 nd 3	
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<ol> <li>Understand meaning of different variables and probability functions.</li> <li>Understand different types of probability distributions.</li> <li>Use of different statistical methods.</li> <li>Understand data collection methods, population sample.</li> </ol>	III IV V	rational reserve for the second secon	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, mmetry, Skew opulation and troduction, Ty rganization of of cact Sampling ni- square dist finition and its est of Hypothe andom sample cernative hypothe	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution tribution: definition properties esis es, parameter, stat thesis, critical regio	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of a and its properties	distribution Range, Quartile deviatio ont of variance, momen variables, Collection ar sampling , Student t- distributio r of statistic, null ar	te 6 n, 5 nd 3 n: 4 nd 7	
<ol> <li>Understand different types of probability distributions.</li> <li>Use of different statistical methods.</li> <li>Understand data collection methods, population sample.</li> </ol>	III IV V VI	rai Pri Ga Stt M M Sy Po In Oi Ex Ch de To Ra alt sa	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, mmetry, Skew opulation and troduction, Ty rganization of a cact Sampling ni- square dis finition and its est of Hypothe andom sample ternative hypot mple test, Sma	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution tribution: definition properties es, parameter, stat thesis, critical regio ll sample test	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of and its properties istic, standard erro n, level of significat	distribution Range, Quartile deviatio ont of variance, momen variables, Collection ar sampling , Student t- distributio r of statistic, null ar	te 6 n, 5 nd 3 n: 4 nd 7	
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	III IV V VI Modul After t 1.	rational formation of the second seco	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, metry, Skew opulation and troduction, Ty rganization of cact Sampling ni- square dis finition and its est of Hypothe andom sample test, Sma Measurable S pletion of the or rstand meaning	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution tribution: definition properties es, parameter, stat thesis, critical regio Il sample test tudents Learning C course the student sh g of different variabl	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of and its properties istic, standard error n, level of significan <b>Dutcomes :</b> nould be able to: es and probability fu	distribution Range, Quartile deviatio ent of variance, momen variables, Collection ar sampling , Student t- distributio r of statistic, null ar nce, Types of error, lar	te 6 n, 5 nd 3 n: 4 nd 7	
5. Understand different sampling distribution methods.	III IV V VI Modu After t 1. 2.	rational for the second	ndom variable robability Dist aussian distribu atistical Meth easure of Cen ean deviation, mmetry, Skew opulation and troduction, Ty rganization of of cact Sampling ni- square dis finition and its est of Hypothe andom sample test, Sma Measurable S pletion of the or rstand meaning rstand differen	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution tribution: definition properties esis es, parameter, stat thesis, critical regio Il sample test tudents Learning ( course the student sh g of different variabl t types of probability	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of and its properties istic, standard error n, level of significan <b>Dutcomes :</b> nould be able to: es and probability fu	distribution Range, Quartile deviatio ent of variance, momen variables, Collection ar sampling , Student t- distributio r of statistic, null ar nce, Types of error, lar	te 6 n, 5 nd 3 n: 4 nd 7	
	III IV V VI Modul After ti 1. 2. 3.	ra ra Ga St M M Sy PC In Oi Ex Ch de TC Ra alt sa le wise he com Under Under Use o	ndom variable robability Dist aussian distribu- atistical Meth easure of Cen ean deviation, mmetry, Skew opulation and troduction, Ty rganization of of cact Sampling ni- square dis- finition and its est of Hypothe andom sample ternative hypothe mple test, Sma Measurable S pletion of the or rstand meaning rstand different stat	ribution ation, Exponential d ods tral tendency, Meas variance, Standard mess, Kurtosis, and Sample pes of Characterist data, Population and Distribution tribution: definition properties ess ess, parameter, stat thesis, critical regio Il sample test students Learning ( course the student sh g of different variabl t types of probability istical methods.	istribution, Uniform ure of dispersion, F deviation, Coefficie Types of Kurtosis ics: Attributes and sample, Methods of and its properties istic, standard error n, level of significan <b>Dutcomes :</b> nould be able to: es and probability fur y distributions.	distribution Range, Quartile deviatio ent of variance, momen variables, Collection ar sampling , Student t- distributio r of statistic, null ar nce, Types of error, lar	te 6 n, 5 nd 3 n: 4 nd 7	

6.	Understand different hypothesis and types of errors.
	Text Books
1	Gupta and Kapoor, "Fundamental of Mathematical Statistics"
2	Vijay Rohatgi, "An Introduction to probability and statistics"
	References
1	S.Ross, "Probability and Statistics for Engineers and Scientists"
	Useful Links
1	https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0Pix
	Ks2JE

	CO-PO Mapping														
		Programme Outcomes (PO) PSO													
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2													3
CO1	1	1													
CO2		1	2		1								1		
CO3	1			1	2	1							1		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

	Assessment Plan based on	<b>Bloom's Taxon</b>	omy Level (Mai	rks) For Theory	Course							
B	Bloom's Taxonomy Level	<b>T1</b>	Τ2	ESE	Total							
1	Remember											
2	Understand											
3	Apply	7	8	20	35							
4	Analyze	8	7	20	35							
5	Evaluate	5	5	20	30							
6	Create											
	Total 20 20 60 100											

	Wa	Ichand College (Government Aid	e <b>of Engineerin</b> ed Autonomous Institu							
			2021-22							
			e Information							
Progran	nme	B.Tech. (Mechani								
Class, Se	emester	Second Year B. To	ech., Sem III							
Course										
Course I	Name	Thermodynamics								
Desired	Requisites:									
		1								
Tea	aching Scheme		Examination Se	cheme (Marks)						
Lecture	3Hrs/week	T1	T2	ESE	Total					
Tutorial	-	20	60	100						
Practica	l -		-	· ·						
Interact	ion -		Cred	its: 3						
		•								
		Cours	e Objectives							
1	To learn about work	and heat interaction	s, and energy baland	ce between system and its	5					
1	surroundings									
2	To learn about applic	ation of I law to var	rious energy conver	sion devices						
3	To evaluate the changes in properties of substances in various processes									
4	To understand the di	fference between hig	gh grade and low gr	ade energies and II law li	mitations					
4	on energy conversion	1								
I										
	Cour	se Outcomes (CO)	with Bloom's Taxo	onomy Level						
At the e	nd of the course, the	e students will be a	ible to,							
CO1	Write energy balance	e to systems and con	trol volumes, in situ	ations involving heat	Apply					
	and work interaction	S								
CO2	Evaluate changes in	thermodynamic proj	perties of substances	5	Analyze					
CO3	Evaluate the perform	ance of energy conv	version devices and	to differentiate between	Evaluate					
005	high grade and low g	rade energies.								
Module		Modu	le Contents		Hours					
		d First law of Ther	•							
				e & Process; Exact &						
		s; Work - Thermody	•	-						
	-	-	-	rk and illustrations for						
Ι		electrical, magnetic,		-	8					
	-	nition of thermal equ		-						
		ermometers- Definit	-							
	-		• •	processes; Concept of						
		rious modes of ener	gy, Internal energy	and Enthalpy						
	Properties of Pure			terre D 1 1						
				xtures, Real gases and						
II	-	Compressibility chan	-		6					
	-	-	-	Definitions of saturated es; Superheated tables;						
				-						
		ates & determination		ner's chart.						
		steady and unstead	• •	my aquation for a						
III		Processes - Derivat		gy equation for a ing throttling; Examples	5					
of steady flow devices; Unsteady processes; numericals on of steady and unsteady										

	flow processes,	
IV	Second Law of ThermodynamicsSecond law - Definitions of direct and reverse heat engines; Definitions ofthermal efficiency and COP; Kelvin-Planck and Clausius statements; Definitionof reversible process; Internal and external irreversibility; Carnot cycle; Absolutetemperature scale.	6
V	<ul> <li>Clausius inequality and Availability</li> <li>Clausius inequality; Definition of entropy S; entropy S is a property; Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of entropy from steam tables- Principle of increase of entropy; Illustration of processes in T-s coordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles- Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, concept of Lost work.</li> </ul>	7
VI	Second law analysis for a control volume and Thermodynamic cycles Second law analysis for a control volume. Exergy balance equation and Exergy analysis. Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle and comparison with Carnot cycle.	6
2. Aj	first law of thermodynamics. ppreciate properties of pure substances through reading of charts and tables.	
4. In the	<ul> <li>pply first law of thermodynamics to various flow systems.</li> <li>terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics.</li> <li>nderstand the property entropy by its definition along with its evaluation for various pro</li> <li>6. Apply the second law to control volumes and explain some basic thermodynamic</li> </ul>	cesses.
4. In the 5. Ur	terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics. Inderstand the property entropy by its definition along with its evaluation for various pro . 6. Apply the second law to control volumes and explain some basic thermodynamic	cesses.
4. In the 5. Ur	terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics. Inderstand the property entropy by its definition along with its evaluation for various pro 6. Apply the second law to control volumes and explain some basic thermodynamic <b>Text Books</b> P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006	cesses. cycles.
4. In the 5. Ur 6.	terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics. Inderstand the property entropy by its definition along with its evaluation for various pro 6. Apply the second law to control volumes and explain some basic thermodynamic <b>Text Books</b> P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006 V. P. Vasandani and D. S. Kumar, "Heat Engineering", Metropolitan Book Company Edition, 1975	cesses. cycles. , 2nd
4. In the 5. Ur 6.	terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics. Inderstand the property entropy by its definition along with its evaluation for various pro 6. Apply the second law to control volumes and explain some basic thermodynamic <b>Text Books</b> P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006 V. P. Vasandani and D. S. Kumar, "Heat Engineering", Metropolitan Book Company	cesses. cycles.
4. In the 5. Ur 6.	terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics. Inderstand the property entropy by its definition along with its evaluation for various pro 6. Apply the second law to control volumes and explain some basic thermodynamic <b>Text Books</b> P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006 V. P. Vasandani and D. S. Kumar, "Heat Engineering", Metropolitan Book Company Edition, 1975 R. Yadav, "Fundamentals of Thermodynamics", Central Publication house, Allahabad	cesses. cycles. , 2nd
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4. In the 5. Ur 6. 1 2 3	terpret the need of second law of thermodynamics through studying limitations of first 1 ermodynamics. inderstand the property entropy by its definition along with its evaluation for various pro 6. Apply the second law to control volumes and explain some basic thermodynamic <b>Text Books</b> P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006 V. P. Vasandani and D. S. Kumar, "Heat Engineering", Metropolitan Book Company Edition, 1975 R. Yadav, "Fundamentals of Thermodynamics", Central Publication house, Allahabad 7th Edition, 2011. <b>References</b> Cengel and Boles, "Thermodynamics an Engineering Approach", Tata McGraw-Hill	cesses. cycles. , 2nd 1, Revised publication,
4. In the 5. Ur 6.	terpret the need of second law of thermodynamics through studying limitations of first l ermodynamics. inderstand the property entropy by its definition along with its evaluation for various pro 6. Apply the second law to control volumes and explain some basic thermodynamic <b>Text Books</b> P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006 V. P. Vasandani and D. S. Kumar, "Heat Engineering", Metropolitan Book Company Edition, 1975 R. Yadav, "Fundamentals of Thermodynamics", Central Publication house, Allahabad 7th Edition, 2011. <b>References</b> Cengel and Boles, "Thermodynamics an Engineering Approach", Tata McGraw-Hill Revised 7th Edition 2016 Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J. "Fundamentals of Thermodynam	cesses. cycles. , 2nd 1, Revised publication, ics", John
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	CO-PO Mapping														
	Programme Outcomes (PO) PSO														
	1	1 2 3 4 5 6 7 8 9 10 11 12												2	3
C01	3	2											1		
CO2	3	2	1										1		

CO3	3	2	3		2	1							1	
The stren	gth of	mappir	ng is to	be wri	tten as	1,2,3;	Where	, 1:Lov	w, 2:M	edium.	3:Hig	h		

	Assessment Plan based on	Bloom's Taxon	omy Level (Ma	rks) For Theory	Course							
B	Bloom's Taxonomy Level	<b>T1</b>	T2	ESE	Total							
1	Remember											
2	Understand											
3	Apply	7	8	20	35							
4	Analyze	8	7	20	35							
5	Evaluate	5	5	20	30							
6 Create												
	Total 20 20 60 100											

		W	alchand Colleg	ge of Engineerin	ng, Sangli						
			(	Y 2021-22							
			Cour	se Information							
Progr	amme		B.Tech. (Mechani	cal Engineering)							
Class,	Semes	ter	Second Year B. T	ech., Sem III							
Cours	se Code										
Cours	se Name	e	Materials Engineering								
Desire	ed Requ	isites:									
			•								
Т	eaching	g Scheme									
Lectu	re	4Hrs/week	T1		'otal						
Tutor		-	20	20	60		100				
Pract		-		-	-						
Intera	action	-		Cred	its: 4						
				rse Objectives							
1				coperties of different	metals and their mic	crostruc	tural and				
2		llographic rele		atals and its allows a	nd to predict their m	iorostru	atura				
$\frac{2}{3}$				esses, and powder m	<u> </u>	leiosuu					
4			investigate various								
	1										
				) with Bloom's Tax	conomy Level						
At the			students will be abl		1 .		A 1				
CO1				stic deformation pro-	cess, strengthening	rtive	Apply				
COI		on-destructive		inamear properties o	y conducting destruc	live					
CO2				nd classify various h	neat treatment proces	ses.	Analyze				
CO3	Apply	knowledge of	powder metallurgy	process, special gra			Evaluate				
0.05	engin	eering applicat	ions.								
34 1	•										
Modu		h		dule Contents	and for the Deserve		Hours				
Ι			defects, Deforma		ce of metals, Proper Role of dislocatio		6				
1		•		isms, Theory behind		115 111	0				
II			<u> </u>		(Destructive and ]	Non -	7				
11				uction to Fracture, fa			1				
		U		. 5	and classification, Syl	· · ·					
					Iron –Carbon equili ase rule, Lever rule,						
					librium diagrams for						
III				s of determining pha		-	7				
			-		f metals, Solidificati						
					v phase, Solidificati						
		agrams.	on, growth and o	veran transformatio	on rates, TTT and						
		0	Processes, Definitio	n, Purpose and class	sification of heat trea	atment					
				-	site formation, Conc						
IV					case hardening and s		6				
				nts, Precipitation Hardening, Thermo mechanical treatments.							
		eat treatment d		Monufooturing -	to for Test and	omiola					
			urgy, Introduction, Manufacturing route for – Tool materials, pushes, electrical contacts, brake pads etc., failure of powder								
V					onmental and Social		7				
	in	Materials Scie	nce and Engineering	g.							
VI	A	oplication and	properties of Stainle	ess steel, Duplex stai	nless steels, Nickel a	alloys,					

	HSLA, Maraging stainless steels, Precipitation hardenable stainless steels, 6 Martensitic stainless steels, Carbon steels for General purpose and pressure containing parts.
Modu	Ile wise Measurable Students Learning Outcomes :
After	the completion of the course the student should be able to:
1.	Classify different metals according to their physical, chemical and mechanical properties.
2.	Use NDT methods to supports and services to nearby industries.
3.	Describe solidification behaviour of metals and their alloys and to predict its microstructure.
4.	Evaluate metals and alloys in order to estimate physical and mechanical properties.
5.	Describe powder metallurgical processes.
6.	Design heat treatment cycle of ferrous and non ferrous metals and alloys.
	Text Books
1	V. Raghvan, "Solid State Phase Transformations", PHI Publication, 1st Edition, 1987, Reprinted 2004.
2	V. Raghvan, "Physical Metallurgy: Principles and Practice", PHI Publication, 3rd Edition, 2015.
3	William D. Callister, "Fundamentals of Materials Science and Engineering", Wiley India Pvt. Ltd, 9th Edition, 2014.
	References
1	Sidney H. Avener, "Physical Metallurgy", Tata McGraw Hill Education Private Limited, 2nd Edition, 2017
2	George E. Dieter, "Mechanical Metallurgy", Tata McGraw Hill Publication, Si Metric Edition, 3rd Revised edition, 2013.
3	Ashok Sharma, Rajan, "Heat Treatment: Principles & Techniques", PHI Learning Pvt. Ltd-New Delhi, 2nd edition, 2011.
	Useful Links
1	https://www.youtube.com/watch?v=KMcsjCXfLQw&list=PLyAZSyX8Qy5Am_2StOOQ5vCUE 3VIcAenE
2	https://www.youtube.com/watch?v=5nBBUahtzc&list=PLyAZSyX8Qy5C8ciqBBlypbx91j4now UbL

CO-PO Mapping															
		Programme Outcomes (PO)PSO													
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2 3													
CO1			3										2	1	
CO2			2						2			1		1	
CO3	CO3         2         1         2         1														
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course								
B	Bloom's Taxonomy Level	T1 T2		ESE	Total				
1	Remember								
2	Understand								
3	Apply	7	8	20	35				
4	Analyze	8	7	20	35				
5	Evaluate	5	5	20	30				
6	Create								

Total	20	20	60	100

			A	Y 2021-22			
				se Information			
Progr	amme		B.Tech. (Mechanie	cal Engineering)			
	Semest	ter	Second Year B.Te	<u> </u>			
	e Code			,			
	e Name		Strength of Materi	als			
Desire	ed Requ	isites:	Basic Engineering				
	1.		6 6				
Т	eaching	Scheme		Examination S	Scheme (Marks)		
Lectu	-	3 Hrs/week	T1	T2	ESE	Т	otal
Futor		1 Hrs/week	20	20	60		100
Practi		_			-		
Intera		_		Cre	dits: 4		
			Cou	rse Objectives			
	To ma	ake the student		•	loped in simple geon	netries si	uch as
1	1				arious types of simple		
2			•	<u> </u>	ccurring in various s		ometrie
Z	for di	fferent types of	loading.		-		
\ 4 4la a	and of		rse Outcomes (CO)		xonomy Level		
At the	1		students will be able		within the componen	te	Unders
201	Under	stand the natur		s that will develop	within the component	15.	andin
202	Calcu	late the stresse	s in various simple o	components due to	different loadings.		Applyi
CO2			I	1	e		g
CO3	1		and deformation that	t will result due to t	he elastic stresses		Anoly
205							Analyz
	develo	oped within the	e materials for simpl	e types of loading.			ng
	·	oped within the	•	· · · · ·			ng
Modu	ıle	•	Mod	e types of loading. lule Contents			ng
Modu	ıle St	resses and stra	Moc	dule Contents	tancian assumation	on and	ng
Modu I	ile St De	resses and stra formation in s	Moc ain solids- Hooke's law	<b>Jule Contents</b>	- tension, compression		ng
	ile St De sh	resses and stra formation in sear stresses- e	Moc ain solids- Hooke's law lastic constants and	<b>Tule Contents</b> 7, stress and strain 1 their relations- vo	- tension, compression olumetric, linear and		ng Hour
	ile St De sh str	resses and stra formation in s ear stresses- e ains, thermal s	Moc ain solids- Hooke's law lastic constants and tresses. True stress a	<b>dule Contents</b> , stress and strain- l their relations- ve and true strain	olumetric, linear and		ng Hour
	ile St De sh str To	resses and stra eformation in s ear stresses- e ains, thermal s orsion and She	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi	<b>Tule Contents</b> , stress and strain- their relations- ve and true strain <b>ing moment diagra</b>	olumetric, linear and	1 shear	ng Hour
Ι	Ile St De sh str To de	resses and stra formation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi and deformation i fts fixed at both end	<b>dule Contents</b> <i>t</i> , stress and strain their relations- ve and true strain <b>ing moment diagra</b> in circular and hol	olumetric, linear and	1 shear shafts,	ng Hour 6
Ι	Ile St. De shu str Tc de St	resses and stra formation in sear stresses- e ains, thermal so prsion and She prsion, stresses flection of shat resses in bean	Moc ain solids- Hooke's law lastic constants and tresses. True stress a car force and bendit and deformation in fts fixed at both ender is	<b>Iule Contents</b> , stress and strain- l their relations- vo and true strain <b>ing moment diagra</b> in circular and hol s, stresses and defle	am low shafts, stepped action of helical sprin	d shear shafts, igs.	ng Hour 6
Ι	ile St De shu str Te de St Be	resses and stra eformation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat resses in bean cams and type	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendie and deformation i fts fixed at both ender is s transverse loadin	<b>Aule Contents</b> Aule Contents Aule their relations- very and true strain <b>ing moment diagra</b> In circular and hol s, stresses and defle g on beams- shea	am low shafts, stepped action of helical sprin r force and bend n	shafts, gs.	ng Hour 6
Ι	Ile St De shu str To de St Be dia	resses and stra formation in s ear stresses- e ains, thermal s orsion and Sho orsion, stresses flection of shat resses in bean eams and type agrams- Types	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi and deformation i fts fixed at both end s transverse loadin s of beam supports	dule Contents dule Contents dule Contents dult their relations- very and true strain dult true strain s, stresses and defle s, simply supported	am low shafts, stepped action of helical sprin r force and bend n and over-hanging	shafts, ags. noment beams,	ng Hour 6
I	Ile St De sh str To de St Be dia ca	resses and stra formation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat resses in bean eams and type agrams- Types ntilevers. Theo	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi and deformation i fts fixed at both end is s transverse loadin s of beam supports ory of bending of b	<b>Aule Contents</b> dule Contents different strain different their relations- very and true strain <b>ing moment diagra</b> in circular and hole s, stresses and defle g on beams- shea , simply supported beams, bending stree	am low shafts, stepped ection of helical sprin r force and bend n and over-hanging ess distribution and	shafts, ags. noment beams, neutral	ng <b>Hour</b> 6 7
I	Ile St. De shu str Tc de St Be dia ca ax	resses and stra formation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat resses in bean eams and type agrams- Types ntilevers. Theo	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi and deformation i fts fixed at both end is s transverse loadin s of beam supports ory of bending of b	<b>Aule Contents</b> dule Contents different strain different their relations- very and true strain <b>ing moment diagra</b> in circular and hole s, stresses and defle g on beams- shea , simply supported beams, bending stree	am low shafts, stepped action of helical sprin r force and bend n and over-hanging	shafts, ags. noment beams, neutral	ng <b>Hour</b> 6 7
I	Ile St. De shu str Tc de St Be dia ca ax us	resses and stra eformation in sear stresses- e ains, thermal so orsion and She orsion, stresses flection of shat resses in bean eams and type agrams- Types ntilevers. Theo is, shear stress	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi and deformation i fts fixed at both end is s transverse loadin s of beam supports ory of bending of b s distribution, point	<b>Aule Contents</b> dule Contents different strain different their relations- very and true strain <b>ing moment diagra</b> in circular and hole s, stresses and defle g on beams- shea , simply supported beams, bending stree	am low shafts, stepped ection of helical sprin r force and bend n and over-hanging ess distribution and	shafts, ags. noment beams, neutral	ng <b>Hour</b> 6 7
I II III	Ile St De sh str To de St Be dia ca ax us De Ma	resses and stra eformation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat resses in bean cams and type agrams- Types ntilevers. Theo is, shear stress ed sections eflection of beat oment of inerti	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendi and deformation i fts fixed at both ends is transverse loadin s of beam supports bry of bending of b distribution, point ams ia about an axis and	<b>Jule Contents</b> <b>Jule Contents</b> A stress and strain- I their relations- very and true strain <b>ing moment diagra</b> in circular and hol s, stresses and defle g on beams- shea , simply supported beams, bending stress and distributed low	am low shafts, stepped action of helical sprin r force and bend n and over-hanging ads, for various com nertia, deflection of a	d shear shafts, ags. noment beams, neutral nmonly a beam	ng Hour 6 7 7
I	Ile St. De shu str Tc de St Be dia ca ax us De Mu us	resses and stra eformation in sear stresses- e ains, thermal so orsion and Sho orsion, stresses flection of shar resses in bean earns and type agrams- Types ntilevers. Theo is, shear stresse ed sections eflection of beat oment of inerti- ing double into	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendie and deformation i fts fixed at both ender is stransverse loadin s of beam supports ory of bending of b distribution, point ams ia about an axis and egration method, co	<b>Jule Contents</b> <b>Jule Contents</b> A stress and strain- I their relations- very and true strain <b>ing moment diagra</b> in circular and hol s, stresses and defle g on beams- shea , simply supported beams, bending stress and distributed low	am low shafts, stepped action of helical sprin r force and bend n and over-hanging ass distribution and ads, for various com	d shear shafts, ags. noment beams, neutral nmonly a beam	ng Hour 6 7
I II III	Ile St. De shu str Tc de St Be dia ca ax us De Ma us M	resses and stra eformation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat resses in bean eams and type agrams- Types ntilevers. Theo is, shear stress ed sections effection of beat oment of inerti- ing double into axwell's recipr	Moc ain solids- Hooke's law lastic constants and tresses. True stress a car force and bendi and deformation i fts fixed at both end is s transverse loadin s of beam supports ory of bending of b s distribution, point ams ia about an axis and egration method, co ocal theorems	<b>Jule Contents</b> <b>Jule Contents</b> A stress and strain- I their relations- very and true strain <b>ing moment diagra</b> in circular and hol s, stresses and defle g on beams- shea , simply supported beams, bending stress and distributed low	am low shafts, stepped action of helical sprin r force and bend n and over-hanging ads, for various com nertia, deflection of a	d shear shafts, ags. noment beams, neutral nmonly a beam	ng Hour 6 7 7
II III IV	Ile St De sh str To To de St Be dia ca ax us Do Ma us M	resses and stra formation in sear stresses- e ains, thermal sorsion and She orsion and She orsion, stresses flection of shat resses in bean eams and type agrams- Types ntilevers. Theo is, shear stress ed sections effection of beat oment of inerti- ing double into axwell's recipr	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendie and deformation i fts fixed at both ender is transverse loadin s transverse loadin s of beam supports ory of bending of b s distribution, point ams is about an axis and egration method, co ocal theorems	dule Contents dule Contents dule Contents dule Contents dult their relations- very and true strain <b>ing moment diagra</b> in circular and holes, stresses and defle g on beams- sheat , simply supported beams, bending stress and distributed low polar moment of in population of slope	am low shafts, stepped action of helical sprin r force and bend n and over-hanging ads, for various com nertia, deflection of a es and deflection in t	d shear shafts, ags. noment beams, neutral nmonly a beam beams,	ng Hour 6 7 7
I II III	Ile St St De sh str To To de St Be dia ca ax us De Ma us Ma	resses and stra formation in s ear stresses- e ains, thermal s orsion and She orsion, stresses flection of shat resses in bean cams and type agrams- Types ntilevers. Theo is, shear stress ed sections eflection of bea oment of inerti- ing double into axwell's recipr rincipal Stress prmal and she	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendie and deformation i fts fixed at both ends is transverse loadin s of beam supports bry of bending of b distribution, point ams ia about an axis and egration method, co ocal theorems	dule Contents dule Contents due Contents	am low shafts, stepped ection of helical sprin r force and bend n l and over-hanging ess distribution and ads, for various com nertia, deflection of a es and deflection in t stresses and planes.	d shear shafts, ags. noment beams, neutral nmonly a beam beams,	ng Hour 6 7 7
I II III IV	Ile St. De shu str Tc de St Be dia ca ax us De Ma us Ma us Ma	resses and stra formation in sear stresses- e ains, thermal s orsion and She orsion, stresses flection of shar resses in bean earns and type agrams- Types ntilevers. Theo is, shear stress ed sections eflection of beat oment of inerti- ing double inter axwell's recipr rincipal Stress ormal and shear rcle. Combined	Moc ain solids- Hooke's law lastic constants and tresses. True stress a ear force and bendie and deformation i fts fixed at both ender is stransverse loadin s of beam supports ory of bending of b distribution, point ams ia about an axis and egration method, co ocal theorems ar stress on oblique d effect of bending a	dule Contents dule Contents due Contents	am low shafts, stepped ection of helical sprin r force and bend n l and over-hanging ess distribution and ads, for various com nertia, deflection of a es and deflection in t stresses and planes.	d shear shafts, ags. noment beams, neutral nmonly a beam beams,	Hours 6 7 7 7 7
I II III IV	Ile St. De shu str To de St Be dia ca ax us De Ma us M M Ci E	resses and stra formation in sear stresses- e ains, thermal s prsion and She prsion, stresses flection of shat resses in bean eams and type agrams- Types ntilevers. Theo is, shear stress ed sections eflection of bea oment of inerti- ing double inter axwell's recipr fincipal Stress prmal and shear rcle. Combined ackling of Col	Moc ain solids- Hooke's law lastic constants and tresses. True stress a car force and bendi and deformation i fts fixed at both ender is s transverse loadin s of beam supports by of bending of b distribution, point ams ia about an axis and egration method, co ocal theorems ar stress on oblique d effect of bending a umns	<b>Jule Contents</b> <b>Jule Contents</b> I their relations- vo and true strain <b>ing moment diagra</b> in circular and hol s, stresses and defle g on beams- shea , simply supported beams, bending stree and distributed lo polar moment of i popuration of slope e planes, principal and shear in beams.	am low shafts, stepped ection of helical sprin r force and bend n l and over-hanging ess distribution and ads, for various com nertia, deflection of a es and deflection in t stresses and planes.	a beam beams, a beam beams, a beam beams, . Mohr	ng Hour 6 7 7 7 7

student should be able to

- Recognize basic concepts of stress, strain and their relations based on linear elasticity. 1.
- 2. Calculate stresses and deformation of a torsional bar.
- 3. Develop shear and bending moment diagrams. Calculate bending and transverse shear stresses.
- 4. Analyze deflections of beam under combined loads
- 5. Apply concept of Mohr's circle to compute principal stresses and angles.
- Predict stability and buckling for a slender member under an axial compressive force. 6.

	Text Books
1	Beer and Johnson, Mechanics of Materials, McGraw Hill, 6th Edition, 2013
2	Hibbeler, R.C., Statics and Mechanics of Materials, Prentice-Hall, SI Edition, 2004
3	Ramamurthum, Strength of materials, DhanpatRai and Sons New Delhi, 3rd edition, 2009
	References
1	Den Hartog, Jacob P., Strength of Materials. Dover Publications Inc., 3rd Edidtion 1961
2	Timoshenko S., Strength of Materials,. Krieger Publishing Company, 3rd edition, 1976
3	Mott, Robert L., Applied Strength of Materials, Prentice-Hall, 4th edition, 2002
	Useful Links
1	https://nptel.ac.in/courses/112/107/112107146/
2	https://nptel.ac.in/courses/112/107/112107147/
3	https://www.coursera.org/learn/mechanics-1
4	https://ocw.mit.edu/courses/materials-science-and-engineering/3-11-mechanics-of-materials-fall- 1999/

						CO-I	PO Ma	pping							
				Р	rograi	nme C	Outcon	nes (PC	<b>)</b> )					PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3		1									1		
CO2		3	2	1									1		
CO3		3	2	1								1	1		
The stren	oth of i	mappir	ng is to	be wr	itten as	1.2.3:	Where	e. 1:Lo	w. $2:N$	Iedium	. 3:His	vh			

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High

## **Assessment (for Theory Course)**

	Assessment Plan based on	Bloom's Taxon	omy Level (Ma	rks) For Theory	Course
B	Bloom's Taxonomy Level T1		T2	ESE	Total
1	Remember				
2	Understand	7	8	20	35
3	Apply	8	7	20	35
4	Analyze	5	5	20	30
5	Evaluate				
6	Create				
	Total	20	20	60	100

		W		ge of Engineering aded Autonomous Inst		
			,	Y 2021-22	,	
			Cour	se Information		
Progr	amme		B.Tech. (Mechani	cal Engineering)		
Class	, Semes	ter	Second Year B.Te	ch., Sem III		
Cours	se Code					
Cours	se Nam	e	Manufacturing Pr	ocesses		
Desir	ed Requ	isites:				
		g Scheme			cheme (Marks)	
Lectu		4Hrs/week	T1	T2	ESE	Total
Tutor		-	20	20	60	100
Pract		-			-	
Intera	action	-		Crec	lits: 4	
	To m	otivate and cha		rse Objectives	op the processes in corr	elation with
1					of the raw materials into	
	produ	ct by convention	onal or unconventio	nal manufacturing n	nethods.	
2					cs of machining on var	ious machine
			e- processing techni		TT / 1 T / 1	·
3	Tom	ake the student	s to aware of fundai	nental principles of	Unconventional Machin	ning Processes
		Cou	rse Outcomes (CO	) with Bloom's Tax	konomy Level	
At the	end of		students will be abl		<b>,</b>	
CO1					rn materials, sand, casti	ng Apply
			rocesses and their d		metal cutting processe	s Analyze
CO2			machining process		metal cutting processe	Analyze
CO3			÷ .	ngjoints,Rapid proto	otyping for patterns	Evaluate
Modu				dule Contents		Hours
			lanufacturing proc	esses		
		etal Casting	ulding Methods M	letal casting proces	ses and equipments, H	leat
					cepts, casting defects	
Ι		sidual stresses		,,,		10
1		etal Forming				
					ic deformation and y	
				• •	s, load estimation for b t forming (shearing, d	
		awing, bendin		drawing) and shee	t forming (shearing, u	
		letal cutting	6/			
		•		6	ous force components:	
				l tool life. Surfa	ce finish and integr	•
тт			44			
II	M	achinability, C	<b>U</b>		ing Milling and finish	ing 10
II	M to	ol materials, C	<b>U</b>		ing, Milling and finish	
II	M to pr	ol materials, Cocesses,	<b>U</b>		ing, Milling and finish	
	M to pr In Jo	ol materials, C ocesses, troduction to C <b>bining/fastenin</b>	Cutting fluids, Coat CNC machining and additive mat	ing, Turning, Drilli nufacturing proces	ses	ing
II	M to pr In Jo Pl	ol materials, C ocesses, troduction to C <b>bining/fastenin</b> tysics of weldi	Cutting fluids, Coat CNC machining <b>and additive ma</b> ing, brazing and sol	ing, Turning, Drilli nufacturing proces dering, design consi		ing
	M to pr In Jo Pl ar	ol materials, C ocesses, troduction to C <b>bining/fastenin</b> tysics of weldi ad liquid state j	Cutting fluids, Coat CNC machining <b>g and additive ma</b> ng, brazing and solo oining processes, A	ing, Turning, Drilli nufacturing proces dering, design consi dhesive bonding,	ses	ing
III	M to pr In Jo Pl ar U	ol materials, C ocesses, troduction to C <b>bining/fastenin</b> tysics of weldi ad liquid state j <b>nconventional</b>	Cutting fluids, Coat CNC machining ag and additive man ng, brazing and solo oining processes, A Machining Proces	ing, Turning, Drilli nufacturing proces dering, design consi dhesive bonding, ses	ses iderations in welding,So	olid 6
	M to pr In JC Pl ar U In	ol materials, C occesses, troduction to C oining/fastenin tysics of weldi d liquid state j nconventional troduction to A	Cutting fluids, Coat CNC machining and additive man ng, brazing and sol- oining processes, A Machining Proces	ing, Turning, Drilli nufacturing proces dering, design consi dhesive bonding, ses	ses iderations in welding,So ing(3D Printing) and ra	olid 6

	Ultrasonic Machining, Principles and Process Parameters, comparison and 9 application of these processes.	
VI	Electrical Discharge Machining, Principle and processes parameters, MRR, surface finish,tool wear, dielectric, power and control circuits, wire EDM, Electro- chemical machining (ECM), etchant &maskant, process parameters. Laser Beam Machining (LBM),Plasma Arc Machining (PAM) and Electron Beam Machining (EBM)	
Modu	le wise Measurable Students Learning Outcomes :	
Studen	it should be able to	
1.	Understand the basic metal casting process.	
2.	Describe metal forming process and equipment/machines used.	
3.	Explain different metal cutting operations performed on various machine tools.	
4.	Identify joining processes and recognize their applications.	
5.	Explain basics of unconventional machining processes	
6.	Classify the different conventional and unconventional manufacturing methods employed for making different products.	
	Text Books	
1	P.N.Rao, "Manufacturing Technology- Foundry, Forming and Welding", Vol. I Tata McGraw Hill, 4th edition, 2013, ISBN: 9781259062575	
2	P.C.Sharma, "A Textbook of Production Technology(Manufacturing processes)", S. Chand co., 8th revised edition 2014. ISBN:8121911141	&
3	P. L. Jain, "Principles of Foundry Technology", , Tata McGraw-Hill, New Delhi, 5t Edition,2009. ISBN: 0070151296, 9780070151291	th
'		
	References	
1	E. Paul DeGarmo, J.T. Black, Ronald A. Kosher, "Materials and Processes in Manufacturing John Wiley and Sons Ltd, 9th revised edition, 2004.ISBN:,9780471656777	
2	George E. Dieter, "Mechanical Metallurgy", Tata McGraw Hill Publication, Si Metric Edition 3rd Revised edition, 2013, ISBN : 9780070168930	n,
3	Kalpakjian and Schmid, "Manufacturing processes for engineering materials", Pearson Ind Limited, 7th Edition-2008,ISBN: 9780132272711	ia
	Useful Links	
1	https://www.vlab.co.in/broad-area-mechanical-engineering	
2	http://vlabs.iitb.ac.in/vlab/labsme.html	

						CO-I	PO Ma	apping							
				Р	rograi	nme C	Outcon	nes (PC	))					PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3											2	1	2	
CO2			2						3				2		
CO3			2						1				1	2	
The stren	gth of a	mappir	ng is to	be wr	itten as	3 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh			

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course							
B	Bloom's Taxonomy Level	T1	T2	ESE	Total			
1	Remember							
2	Understand							

3	Apply	7	8	20	35
4	Analyze	8	7	20	35
5	Evaluate	5	5	20	30
6	Create				
	Total	20	20	60	100

			Å	AY 2021-22			
				rse Information			
Progr	amme			nical Engineering)			
	Semes	ter	Second Year B.T	e e			
	se Code		Second Tear D.1				
	se Coue		Thermodynamic	Lab			
		-	Thermouynamic	s Lau			
Desire	ed Requ	lisites:					
Т	eaching	g Scheme		Examination	Scheme (Marks)		
Lectu		-	LA1	LA2	ESE	]	Fotal
Tutor		_	30	30	40		100
Practi		2Hrs/Week			-		100
	action	21113/ WCCK		Cro	edits: 1		
1111017							
			Сог	Irse Objectives			
	To im	part the technic			oils, greases, and soli	d fuels u	ised in
1		generators.	· · · · · · · · · · · · · · · · · · ·	1 1	, ,,		-
2	To pr	epare the stude			ics to various thermoo		
3	To de	velop the skills	of students for eva	aluating performanc	e of thermodynamics	systems	s
	1.0			D) with Bloom's Ta	axonomy Level		
At the			students will be ab	-	1 . 1 .	1	A 1
CO1					ndustrial systems su	ich as	Apply
CO2			roduction systems.	fuel by using Bomb	alorimeter		Analyze
$\frac{CO2}{CO3}$				arious cyclic system			Evaluate
05			amodynamics to v	anous cyclic system	15.		Lvaluau
			List of Expe	riments / Lab Acti	vities		
List o	f Exper	iments:					
	testing						
1.	0	on Grease dropp	oing point apparatu	18.			
	Test o	on Redwood Vi	scometer.				
2.	Test o	on Aniline poin	4				
3.							
3. 4.	Deter	mination of fla	sh and fire point of	f a lubricating oil.			
3. 4. 5.	Deter A test	mination of flation of flation	sh and fire point of rimeter.	f a lubricating oil.			
3. 4. 5. <b>Ther</b>	Deter A test modyna	mination of fla on Bomb calo a <b>mics Laws ap</b>	sh and fire point of rimeter.	f a lubricating oil.			
3. 4. 5. <b>Ther</b> 1.	Deter A test <b>modyna</b> Vapor	mination of fla on Bomb calo amics Laws ap r compression t	sh and fire point of rimeter. <b>plication</b> utor.	f a lubricating oil.			
3. 4. 5. <b>Ther</b> 1. 2.	Deter A test <b>modyna</b> Vapor Air co	mination of flat on Bomb calo amics Laws ap r compression t onditioning Tut	sh and fire point of rimeter. <b>plication</b> utor. or.	f a lubricating oil.			
3. 4. 5. <b>Ther</b> 1. 2. 3.	Deter A test <b>modyna</b> Vapo Air co Mini	mination of flat on Bomb calo amics Laws ap r compression to onditioning Tut steam power pl	sh and fire point of rimeter. <b>plication</b> utor. or.	f a lubricating oil.			
3. 4. 5. <b>Ther</b> 1. 2. 3. 4.	Deter A test <b>modyna</b> Vapo Air co Mini a Cooli	mination of flat on Bomb calo <b>amics Laws ap</b> r compression to onditioning Tut steam power pl ng Tower.	sh and fire point of rimeter. <b>plication</b> utor. or. ant.	-	teady state conditions		
3. 4. 5. <b>Ther</b> 1. 2. 3.	Deter: A test modyna Vapo: Air co Mini : Cooli Meas	mination of flat on Bomb calo <b>amics Laws ap</b> r compression to onditioning Tut steam power pl ng Tower. urement of ther	sh and fire point of rimeter. <b>plication</b> utor. or. ant. mal conductivity o	-	teady state conditions		
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5.	Deter A test <b>modyna</b> Vapo Air co Mini Cooli Meas Recip	mination of flat on Bomb calo <b>amics Laws ap</b> r compression to onditioning Tut steam power pl ng Tower.	sh and fire point of rimeter. <b>plication</b> utor. or. ant. rmal conductivity or ressor unit.	-	teady state conditions	<b>.</b>	
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5. 6.	Deter A test <b>modyna</b> Vapo Air co Mini Cooli Meas Recip	mination of flat on Bomb calo amics Laws ap r compression to onditioning Tut steam power pl ng Tower. urement of ther rocating compl	sh and fire point of rimeter. <b>plication</b> utor. or. ant. rmal conductivity or ressor unit.	-	teady state conditions		
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5. 6. 7.	Deter A test <b>modyna</b> Vapo Air cc Mini Cooli Meas Recip Intern	mination of flat on Bomb calor amics Laws ap r compression to onditioning Tut steam power pl ng Tower. urement of ther rocating compu- tal combustion	sh and fire point of rimeter. <b>plication</b> utor. or. ant. mal conductivity o ressor unit. engine setup.	of metal rod under st Text Books			
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5. 6.	Deter A test modyna Vapo Air co Mini Cooli Measu Recip Intern	mination of flat on Bomb calor amics Laws ap r compression to onditioning Tut steam power pl ng Tower. urement of ther rocating compu- tal combustion	sh and fire point of rimeter. <b>plication</b> utor. or. ant. mal conductivity of ressor unit. engine setup. ynamics", Tata Mo	of metal rod under st Text Books Graw Hill Publicat	ion, 3rd Edition., 201	2,	
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5. 6. 7.	Deter A test modyna Vapo Air co Mini Cooli Measu Recip Intern P. K.	mination of flat on Bomb calo <b>amics Laws ap</b> r compression to onditioning Tut steam power pl ng Tower. urement of ther rocating compu- al combustion	sh and fire point of rimeter. <b>plication</b> utor. or. ant. mal conductivity of ressor unit. engine setup. ynamics", Tata Mo	of metal rod under st Text Books Graw Hill Publicat		2,	pany, 2n
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5. 6. 7.	Deter A test modyna Vapo Air cc Mini Cooli Mease Recip Intern P. K. V. P. Editio	mination of flat on Bomb calo <b>amics Laws ap</b> r compression to onditioning Tut steam power pl ng Tower. urement of ther rocating compu- al combustion	sh and fire point of rimeter. <b>plication</b> utor. or. ant. mal conductivity of ressor unit. engine setup. ynamics", Tata Mo	of metal rod under st Text Books Graw Hill Publicat	ion, 3rd Edition., 201	2,	pany, 2n
3. 4. 5. <b>Ther</b> 1. 2. 3. 4. 5. 6. 7.	Deter A test modyna Vapo Air cc Mini Cooli Meas Recip Intern P. K. V. P. Editio 1975,	mination of flat on Bomb calor amics Laws ap r compression to onditioning Tut steam power pl ng Tower. urement of ther rocating compu- nal combustion Nag "Thermod Vasandani ar n.	sh and fire point of rimeter. <b>plication</b> utor. or. ant. mal conductivity of ressor unit. engine setup. <u>ynamics", Tata Ma</u> nd D. S. Kumar,	of metal rod under st Text Books Graw Hill Publicat 'Heat Engineering	ion, 3rd Edition., 201	2, ok Com	

	Kerences	
1	Cengel and Boles, "Thermodynamics an engineering Approach", Tata McGraw-Hill publication,	

	Revised 7th Edition,2011,
2	R. Yadav, "Thermodynamics and heat engine", Central Publication house Allahabad, Revised 7th
	Edition. 2016
3	R. Yadav, "Steam and Gas Turbine", Central Publication house, Allahabad, Revised 7th
5	edition,2010
	Useful Links
1	https://www.youtube.com/watch?v=g8LrAsL4oH0&list=PLRoYs08qHtE7HDTE3KerpAWPyqf
1	QiEq8x
2	https://www.youtube.com/watch?v=h9LeZs0N8qQ

	CO-PO Mapping														
		Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2											1		
CO2	3	2	1		3			3	3		3		1		
CO3	3	2	3		2	1			3				1		
The stren	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.										
Assessmen Based on Conducted by Typical Schedule (for 26-week Sem) Mark										
t				s						
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30						
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50						
LA2	Lab activities,	Lab Course	During Week 7 to Week 12	20						
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12	30						
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40						
Lab ESELab courseDuring week 15 to week 1640attendance, journalFacultyMarks Submission at the end of Week 1840										
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown,										
considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab										
activities/Lab performance shall include performing experiments, mini-project, presentations, drawings,										

programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)								
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total				
Remember								
Understand								
Apply	10	10	10	30				
Analyze	10	10	20	40				
Evaluate	10	10	10	30				
Create								
Total Marks	30	30	40	100				

			lege of Engineerin nt Aided Autonomous Instit						
			AY 2021-22						
			ourse Information						
Program	nme	B.Tech. (Mech	hanical Engineering)						
Class, S	emester	Second Year I	B.Tech., Sem III						
Course	Code								
Course	Name	Materials Eng	ineering Laboratory						
Desired	<b>Requisites:</b>								
Tea	Teaching Scheme   Examination Scheme (Marks)								
Lecture	-	LA1	LA2	ESE	Total				
Tutoria	1 -	30	30	40	100				
Practica	al 2Hrs/W	leek	-						
Interact	tion -		Cred	its: 1					
			Course Objectives						
-			destructive test methods						
		dification behavior o	of metals and its alloys a	nd to predict their mi	icrostructure, an				
	phases To demonstrate	methodology for mo	tallographic sample pre	aration					
3		methodology for me	allographic sample prej						
		Course Outcomes (	CO) with Bloom's Tax	onomy Level					
At the en	nd of the course	e, the students will be							
			n destructive testing met	hods	Apply				
			n the microstructure ov						
	materials.								
C <b>O3</b>	Perform metallo	ographic sample prep	aration process.		Evaluat				
		List of Ex	periments / Lab Activi	ties					
List of I	Experiments:								
l. Ten	eile test as ner	ASTM/IS standards.							
	dness test	ASTIMIS standards.							
	arpy Impact test								
			Magnetic particle test, I	Dye penetrant test, Sp	park Test,				
			easurement test, Electric						
		olume fraction of pha							
		rain size of metals an							
	ermination of it	ntergranular attack in	austenitic stainless steel						
. Det				lS.					
7. Det 3. Det	ermination of h	ardenability of a give	en steel component.		nd allows as non				
7. Det 3. Det 9. Met	ermination of h tallography/Mic	ardenability of a give crostructural examina			nd alloys as per				
7. Det 3. Det 9. Met 10. Hea	ermination of h tallography/Mic at treatment of s	ardenability of a give crostructural examina	en steel component.		nd alloys as per				
<ol> <li>Det</li> <li>Det</li> <li>Det</li> <li>Det</li> <li>Met</li> <li>Met</li> <li>Hea</li> <li>Cre</li> </ol>	ermination of h tallography/Mic	ardenability of a give crostructural examina	en steel component.		nd alloys as per				
<ol> <li>Det</li> <li>Det</li> <li>Det</li> <li>Det</li> <li>Met</li> <li>Met</li> <li>Hea</li> <li>Cre</li> </ol>	ermination of h tallography/Mic at treatment of s ep test	ardenability of a give crostructural examina	en steel component.		nd alloys as per				
7. Det 3. Det 9. Met 10. Hea 11. Cre 12. The	ermination of h tallography/Mic at treatment of s ep test ermal analysis	ardenability of a give crostructural examina teels.	en steel component. ttion test on ferrous and Text Books	non ferrous metals a					
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S	ardenability of a give crostructural examina teels.	en steel component. tion test on ferrous and	non ferrous metals a					
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The 1	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S 2004,	ardenability of a give crostructural examina teels.	en steel component. ttion test on ferrous and <b>Text Books</b> nsformations", PHI Pub	non ferrous metals an	, 1987, Reprinte				
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The 1	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S 2004, V. Raghvan, "P	ardenability of a give crostructural examina steels. Golid State Phase Tra hysical Metallurgy: F	en steel component. tion test on ferrous and <b>Text Books</b> nsformations", PHI Pub Principles and Practice",	non ferrous metals an dication, 1st Edition PHI Publication, 3rd	, 1987, Reprinte 1 Edition, 2015.				
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The 1 2 3	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S 2004, V. Raghvan, "P William D. Call	ardenability of a give crostructural examina iteels. Colid State Phase Tra hysical Metallurgy: F lister, "Fundamentals	en steel component. ttion test on ferrous and <b>Text Books</b> nsformations", PHI Pub	non ferrous metals an dication, 1st Edition PHI Publication, 3rd	, 1987, Reprinte 1 Edition, 2015.				
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The 1	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S 2004, V. Raghvan, "P	ardenability of a give crostructural examina iteels. Colid State Phase Tra hysical Metallurgy: F lister, "Fundamentals	en steel component. tion test on ferrous and <b>Text Books</b> nsformations", PHI Pub Principles and Practice",	non ferrous metals an dication, 1st Edition PHI Publication, 3rd	, 1987, Reprinte 1 Edition, 2015.				
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The 1 2 3	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S 2004, V. Raghvan, "P William D. Call	ardenability of a give crostructural examina iteels. Colid State Phase Tra hysical Metallurgy: F lister, "Fundamentals	en steel component. tion test on ferrous and <b>Text Books</b> nsformations", PHI Pub Principles and Practice",	non ferrous metals an dication, 1st Edition PHI Publication, 3rd	, 1987, Reprinte 1 Edition, 2015.				
7. Det 8. Det 9. Met 10. Hea 11. Cre 12. The 1 2 3	ermination of h tallography/Mic at treatment of s ep test ermal analysis V. Raghvan, "S 2004, V. Raghvan, "P William D. Call 9th Edition, 201	ardenability of a give crostructural examina iteels. Solid State Phase Tra hysical Metallurgy: F lister, "Fundamentals 14.	en steel component. Ition test on ferrous and Text Books nsformations", PHI Pub Principles and Practice", s of Materials Science an	non ferrous metals an olication, 1st Edition PHI Publication, 3rd Id Engineering", Wil	, 1987, Reprinte 1 Edition, 2015. ey India Pvt. Lt				

2	George E. Dieter, "Mechanical Metallurgy", Tata McGraw Hill Publication, Si Metric Edition,						
<sup>2</sup> 3rd Revised edition, 2013.							
2	Ashok Sharma, Rajan, "Heat Treatment: Principles & Techniques", PHI Learning Pvt. Ltd-New						
5	<sup>5</sup> Delhi, 2nd edition, 2011.						
	Useful Links						
1	https://sm-nitk.vlabs.ac.in/#						
2	https://www.youtube.com/watch?v=D8U4G5kcpcM						

	CO-PO Mapping														
		Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	3										2	1	
CO2			2	1										1	
CO3	2		2										2	1	
The stren	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														

Assessment									
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.									
Assessmen	Based on	Based onConducted byTypical Schedule (for 26-week Sem)Ma							
t				S					
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30					
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50					
LA2	Lab activities,	Lab Course	During Week 7 to Week 12	30					
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12	50					
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40					
Lauese	attendance, journal	Faculty	Marks Submission at the end of Week 18	40					
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab									
activities/Lab performance shall include performing experiments, mini-project, presentations, drawings,									
programming and other suitable activities, as per the nature and requirement of the lab course. The									
experimental	lab shall have typicall	y 8-10 experimen	ts.						

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)									
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total					
Remember									
Understand									
Apply	15	10	5	30					
Analyze	15	10	15	40					
Evaluate		10	20	30					
Create									
Total Marks	30	30	40	100					

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			A	Y 2021-22	,				
			Cou	rse Information					
Progra	amme		B.Tech. (Mechanical Engineering)						
	Semester		Second Year B. 7						
Course									
	e Name		Workshop I						
Desire	d Requisites:		1						
Те	aching Scheme	e		Examination	Scheme (Marks)				
Lectur	-		LA1	LA2	ESE	Total			
Tutori			30	30	40	100			
Practic		Veek	-		-	1			
Intera				Cr	edits: 1				
			Cou	Irse Objectives					
1	To demonstrat	te diffe		•	operate the wood work	cing lathe machin			
2			pes and properties		perute the wood worr				
3	<u>*</u>	•	A A A	centre lathe mach	ine				
I	*								
				)) with Bloom's T	axonomy Level				
At the		· · ·	students will be ab						
CO1		vood w	orking processes	& explain these n	hachines, tooling dev	ices & Apply			
	equipements	h a 1-m a r	uladaa af waxiawa	and manageting of		A o 1			
CO2			wledge of various aking of sand mou			Analyz			
			g lathe machine for			Evalua			
CO3	process								
	-					1			
			List of Expe	riments / Lab Act	ivities				
List of	Experiments:								
	-								
1.Man	ufacturing Pro	cess La	ab:						
A One	Job of Dottom	molrino	I a action . Com	an tary chan (Waalych	on III [4 IInc]				
		•	n: Workshop-II]	entry shop/Worksh [10 Hrs]	op-11j [ <b>4 mrsj</b>				
ס. Sail	a resultg Lau [I		n. workshop-11]	[10 1119]					
1.	Preparation of	sand fo	or mould at d core	making with demo	onstration of small co	omponents			
2.	Tensile, Comp	pressive	e and shear strengt			•			
	Permeability te								
			for molding sand						
			/core) [Green and		aka apperatus)				
				ss No. on Sieve Sh ation: Workshop-I					
			turning machine [		.] [ <b>41113]</b>				
				rous and non ferro	us foundries.				
			udents Learning O						
	-		course the student	should be able to					
	Operate wood		•						
2.		-	g Experiments and						
3.	Carrying out	t simple	e Turning operatio	n & inspect the jo	b				
	DUD "			Text Books	1 (1 1 1) 11 22 1				
1					and fielding", Vol. I	Fata McGraw-Hi			
	$4^*$ edition, 201	13, ISB	N: 978125906257	5					

2	P.C.Sharma, "A Textbook of Production Technology (Manufacturing processes)", S. Chand & co., 8* revised edition 2014. ISBN:8 I -219- 1 114-1								
3	K. Hajra Choudhury, Nirjhar Roy S.K, "Elements of Workshop Technology" - Vol II[Machine Toolsj", ktedia Promoters and Publishars Pvt. Ltd. Mumbai, i O h edition, 2010. ISBN: 9788185099156, 8185099154								
	References								
1	George E. Dieter, "Mechanical Metallurgy", McGraw Hill Book Company, Revised 3° Indian edition, ISBN : 9780070168930, 2013								
2	W.A.J. Chapman, "Workshop Ttchnology", CBS Publishing & Distributors, Delhi. Sof./,5'h Edition, 2001,book code: 9788123904016								
	Useful Links								
1	https://www.vlab.co.in/ba-nptel-labs-mechanical-engineering								
2	https://www.vlab.co.in/broad-area-mechanical-engineering								

CO-PO Mapping															
	Programme Outcomes (PO) PSO														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			1	2									2		
CO2	2												2		
CO3	2			2										2	
The stren	gth of a	mappir	ng is to	be wr	itten as	\$ 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh			

		Asses	sment									
	There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.											
Assessmen	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Mark								
t				s								
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30								
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50								
1.4.2	Lab activities,	Lab Course	During Week 7 to Week 12	20								
LA2	attendance, journal	Faculty	Marks Submission at the end of Week 12	30								
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40								
Lauese	attendance, journal	Faculty	Marks Submission at the end of Week 18	40								
	•	• •	pical schedule of lab assessments is shown, shall be as per academic calendar. Lab									

considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based o	Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)											
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total								
Remember												
Understand												
Apply	10	10	10	30								
Analyze	10	10	20	40								
Evaluate	10	10	10	30								
Create												
Total Marks	30	30	40	100								

				Aided Autonomous Inst AY 2021-22	линс)			
				AY 2021-22 rse Information				
Progra	ammo			nical Engineering)				
			Second Year B. 7					
	Semest e Code	ler	Second Tear D.	rech., Sein rv				
	e Code e Name		Applied Mathem	otion for Machanical	Engingens			
			Applied Mathem	atics for Mechanical	Engineers			
Desire	d Requ	lisites:						
Т	aching	Scheme		Evamination	Scheme (Marks)			
Lectur	-	3Hrs/week	T1	T2	ESE	<b>T</b>	otal	
Practi		-	20	20	00		100	
		-		Crea	-			
Intera	ction	-		Cre	dits: 3			
			Car	una Ohiostinos				
	T. 1.			urse Objectives	n - 6 - t- 1 - n t-			
1		*		hance thinking powe			C: 11	
2	To int	roduce fundam	nental concepts of	mathematics and the	ir applications in eng	gineering	fields	
		Carr		O)	T1			
Δt the	end of		students will be at	0) with Bloom's Ta	xonomy Level			
CO1				s in engineering field	ld		Apply	
201		-		nethods to solve the		and	Analyz	
CO2		ering field				und	7 mary 2	
	engin							
Modu	le		M	odule Contents			Hours	
		urier Series						
			ns Dirichlet's co	nditions, Definition,	Determination of	Fourier		
I						1 Ounor		
1		CHICICHINUCHIC		pansion of functions	s, even and odd fu	nctions.	7	
	∣	coefficients(Euler's formulae), expansion of functions, even and odd functions, change of interval and functions having arbitrary period, half range Fourier sine						
		ange of interv	al and functions h	L		-	7	
	an	ange of interv d cosine series	al and functions h	L		-	7	
11	an Pa	ange of interv d cosine series rtial Differen	al and functions h	having arbitrary peri	od, half range Four	tier sine		
II	an Pa Fo	ange of interv d cosine series r <b>tial Differen</b> ur Standard f	al and functions h tial Equations forms of Partial	L	od, half range Four	tier sine	7	
II	an Pa Fo din	ange of interv d cosine series <b>rtial Differen</b> ur Standard f nensional Hea	al and functions h tial Equations forms of Partial t equation	having arbitrary peri	od, half range Four	tier sine		
	an Pa Fo dii M	ange of interv d cosine series <b>rtial Differen</b> ur Standard f nensional Heat <b>atrices and its</b>	al and functions h tial Equations forms of Partial t equation Application	having arbitrary peri	od, half range Four	to one	6	
II	an Pa Fo diu M Tr	ange of interv d cosine series rtial Differen ur Standard f nensional Heat atrices and its anspose Adjoin	al and functions h tial Equations forms of Partial t equation 5 Application nt ,General propert	having arbitrary peri differential equation	od, half range Four	to one Matrix		
	an Pa Fo din M Tr Tr	ange of interv d cosine series <b>Irtial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation M	al and functions h tial Equations forms of Partial t equation 5 Application nt ,General propert Matrices Rotation	having arbitrary peri differential equation ties, rank determinan Franslation, mirror so	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter	to one Matrix	6	
	an Pa Fo diu M Tr Tr Tr Li	ange of interv d cosine series rtial Differen ur Standard f nensional Heat atrices and its anspose Adjoin ansformation M near different	al and functions h tial Equations forms of Partial t equation Application nt ,General propert Matrices Rotation	having arbitrary peri differential equation ties, rank determinan Franslation, mirror so <b>constant coefficient</b>	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter ts	to one Matrix nsor.	6	
	an Pa Fo diu M Tr Tr Tr Li De	ange of interv d cosine series rtial Differen ur Standard f nensional Heat atrices and its anspose Adjoin ansformation M near different efinition, comp	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General propert Matrices Rotation tial equation with olete solution, the o	differential equation ties, rank determinan Translation, mirror so <b>constant coefficient</b> operator D, auxiliary	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter s equation , rules for	to one Matrix nsor.	6	
III	an Fo din M Tr Tr Tr Li De the	ange of interv d cosine series <b>irtial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation M near different finition, comp e complement	al and functions h tial Equations forms of Partial t equation s Application nt ,General property Matrices Rotation 7 tial equation with plete solution, the of ary function, inve	having arbitrary peri differential equation ties, rank determinan Franslation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter s equation , rules for	to one Matrix nsor.	6	
III	an Fo diu M Tr Tr Tr Li De the int	ange of interv d cosine series <b>rtial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation M near different finition, comp e complement egrals , homog	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General propert Matrices Rotation <b>Cial equation with</b> olete solution, the of ary function, invegeneous linear diffe	having arbitrary peri differential equation ties, rank determinan Franslation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter s equation , rules for	to one Matrix nsor.	6	
III	an Pa Fo diu M Tr Tr Tr Li De the int	ange of interv d cosine series <b>irtial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation N <b>near different</b> finition, comp e complement egrals , homog	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General property Matrices Rotation T <b>Stal equation with</b> blete solution, the of ary function, invest geneous linear different tial	differential equation ties, rank determinan Franslation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter ts equation , rules for for finding the pa	to one Matrix nsor. finding articular	6	
III	an Pa Fo diu M Tr Tr Tr Li De the int	ange of interv d cosine series rtial Differen ur Standard f nensional Heat atrices and its anspose Adjoin ansformation M near different efinition, comp e complement egrals, homog cotor Different oncept of vector	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General propert Matrices Rotation tial equation with blete solution, the of ary function, invegeneous linear diffe- tial or field, directional	differential equation ties, rank determinan Translation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ten s equation , rules for for finding the pa	to one Matrix nsor. finding articular tangent	6 7 6	
III IV	an Pa Fo diu Tr Tr <b>Li</b> De the int <b>V</b> e Co	ange of interv d cosine series <b>Intial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation M <b>near different</b> finition, comp e complement egrals , homog <b>actor Different</b> oncept of vector	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General property Matrices Rotation T <b>ial equation with</b> blete solution, the of ary function, invegeneous linear diffection tial or field, directionation we. Velocity, accession	differential equation ties, rank determinan Franslation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ten s equation , rules for for finding the pa	to one Matrix nsor. finding articular tangent	6	
III IV	an Fo diu M Tr Tr Li De the int Ve Co lin co	ange of interv d cosine series <b>irtial Differen</b> ur Standard f atrices and its anspose Adjoin ansformation M near different finition, comp e complement egrals, homog octor Different oncept of vector e to the curv	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General property Matrices Rotation T <b>ial equation with</b> blete solution, the of ary function, invegeneous linear diffection tial or field, directionation we. Velocity, accession	differential equation ties, rank determinan Translation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ten s equation , rules for for finding the pa	to one Matrix nsor. finding articular tangent	6 7 6	
III IV V	an Pa Fo diu Tr Tr Li De the int Ve Co lin co	ange of interv d cosine series <b>irtial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation M <b>near different</b> finition, comp e complement egrals , homog <b>ctor Different</b> oncept of vector e to the curv nservative vector <b>ator Integral</b>	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General propert Matrices Rotation T <b>ial equation with</b> blete solution, the of ary function, inve- geneous linear difference tial or field, directionar ve. Velocity, access tor field.	differential equation ties, rank determinan <u>Franslation, mirror so</u> <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations al derivatives, gradic eleration, divergent	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter ts equation , rules for for finding the pa ent of vector field, and curl of vecto	to one Matrix nsor. finding articular tangent or field,	6 7 6	
III IV	an Fo din Tr Tr Li De the int Ve Co lin co	ange of interv d cosine series <b>irtial Differen</b> ur Standard f anensional Hear <b>atrices and its</b> anspose Adjoin ansformation M <b>near different</b> finition, comp e complement egrals, homog <b>ctor Differen</b> oncept of vector e to the curv nservative vector <b>ctor Integral</b> ne integrals, S	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General property Matrices Rotation T <b>ial equation with</b> olete solution, the of ary function, inve- geneous linear difference tial or field, directionar ve. Velocity, access tor field. Surface and volume	having arbitrary peri differential equation ties, rank determinan Franslation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations al derivatives, gradid eleration, divergent me integral, Greens	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter ts equation , rules for for finding the pa ent of vector field, and curl of vecto	to one Matrix nsor. finding articular tangent or field,	6 7 6	
III IV V	an Fo diu M Tr Tr Li De the int Ve Co lin co	ange of interv d cosine series <b>intial Differen</b> ur Standard f nensional Heat <b>atrices and its</b> anspose Adjoin ansformation M near different finition, comp e complement egrals , homog ctor Different oncept of vector e to the curv nservative vector ctor Integral ne integrals, S	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General propert Matrices Rotation tial equation with olete solution, the of ary function, inve- geneous linear different tial or field, directionar we. Velocity, access tor field. Surface and volumerem, Stokes's Theo	differential equation differential equation ties, rank determinan Translation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations al derivatives, gradid eleration, divergent me integral, Greens rem.	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter ts equation , rules for for finding the pa ent of vector field, and curl of vecto	to one Matrix nsor. finding articular tangent or field,	6 7 6 7	
III IV V VI	an Fo din Tr Tr Li De the int Co lin co Ve Lin Di le wise	ange of interv d cosine series <b>irtial Differen</b> ur Standard f nensional Hear <b>atrices and its</b> anspose Adjoin ansformation N <b>near different</b> finition, comp e complement egrals, homog <b>ctor Different</b> oncept of vector e to the curv nservative vector <b>ctor Integral</b> ne integrals, S vergence theor <b>Measurable S</b>	al and functions h tial Equations forms of Partial t equation <b>Application</b> nt ,General property Matrices Rotation T <b>ial equation with</b> blete solution, the of ary function, inve- geneous linear differential or field, directionary ve. Velocity, access tor field. Surface and volumerem, Stokes's Theo <b>itudents Learning</b>	differential equation differential equation ties, rank determinan Translation, mirror so <b>constant coefficient</b> operator D, auxiliary erse operator, rules erential equations al derivatives, gradid eleration, divergent me integral, Greens rem.	od, half range Four ns and application t, Jacobian ,Banded caling, concept of ter s equation , rules for for finding the pa ent of vector field, and curl of vecto theorem in plane,	to one Matrix nsor. finding articular tangent or field,	6 7 6 7	

Solve	the problems of Fourier series, expansion of function in Fourier series.
Modu	le 2:
Solve	differential equations and Application to Heat equation
Modu	le 3:
Solve	examples in transformation of Matrices as translation, rotation, scaling etc
Modu	le 4:
Solve	examples in linear differential equation with constant coefficients.
Modu	le 5:
Solve	example and understand the problems of fluid mechanic by using vector calculus and the problems
of con	servation of mass.
Modu	le 6:
Solve	and understand the problems of surface integral, line integral
Volum	e integral, and understand concept of Greens theorem, Stokes 's theorem.
	Text Books
1	"Advanced Engineering Mathematics", Erwin Kreyszig, Wiley Eastern Limited Publication,
1	1978, 1st Edition.
2	"A Text Book o[Applied Mathematics, Vol I and II", P. N. and J. N. Wartikar, Vidyarthi Griha
2	Prakashan, Pune, 2006.
3	"Higher Engineering Maths", B.S. Grewal, Khanna Publication, 2005, 39th Edition
	References
1	"Advanced Engineering Mathematics", Wylie C.R., Tata McGraw Hill Publication, 1999, 8th
1	Edition.
2	"Advanced Engineering Mathematics", H. K. Dass, S. Chand & Company Ltd., 1988, I " Edition
	Useful Links
1	https://www.youtube.com/watch?v=Na6N2DwdL_k&list=PLp6ek2hDcoNB3jiva0_CRJ- 1wmTOo98E0
2	https://www.youtube.com/watch?v=W3HXK1Xe4nc&list=PLbPn3CUduj5TPQtrwfI70F1SW4Lv Pf90d

CO-PO Mapping														
Programme Outcomes (PO) PSO														
1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
2														
2														
	1 2 2	1 2 2 2	1         2         3           2	1         2         3         4           2		Programm	Programme Outo	Programme Outcomes (	Programme Outcomes (PO) PSC					

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course											
B	Bloom's Taxonomy Level	T1	T2	ESE	Total							
1	Remember											
2	Understand											
3	Apply	10	10	30	50							
4	Analyze	10	10	30	50							
5	Evaluate											
6	Create											

Total	20	20	60	100

		W		ge of Engineerin			
			A	Y 2021-22			
			Cou	rse Information			
Progr	amme		B.Tech. (Mechan	ical Engineering)			
Class,	Semes	ter	Second Year B.Te	ech., Sem IV			
Cours	se Code	9					
Cours	se Nam	e	Fluid Mechanics	and Fluid Machines			
Desire	ed Req	uisites:					
	•		1				
Т	eaching	g Scheme		Examination So	cheme (Marks)		
Lectu	re	3Hrs/week	T1	T2	ESE	Tota	al
Tutor	rial	-	20	20	60	100	)
Practi	ical	-		-	I		
Intera	action	_		Cred	its: 3		
		<u> </u>	1				
			Соц	rse Objectives			
1	To le	arn about the a		and momentum conse	rvation laws for flui	d flows	
2			nportance of dimen				
3	To ot	tain the velocit	ty and pressure vari	ations in various type	es of simple flows		
4	To an	alyze the flow	in water pumps and	l turbines.			
A 1	1.0			)) with Bloom's Tax	onomy Level		
At the			students will be ab	le to, ressure measurement,	fluid station kinom	ation	Annly
CO1			nsional analysis.	ressure measurement,	, muld statics, kinem	atics,	Apply
~~~				eory related to: fluid	statics, kinematics.	A	nalyze
CO2			•	ary layer theory and i			j =
CO3			ic machines for the		• •	E	valuate
Modu	ıle		Мо	dule Contents		ŀ	Hours
		roperties of Fl					
Ι		-		ressure, compressibil	-		4
			using different mar	iation in pressure, I	Pascal law, and Pr	essure	
		uid Kinemati	-	iometers.			
				mechanics, Reynolds	s transport Theorem	. Flow	
т				ate, stream line, stre			7
II				esian coordinates in			7
		•	eleration of fluid pa	articles. Velocity pote	ential function and s	stream	
		nction.					
			ation and Viscous	<b>Flows</b> e equation, Develop	mant of Fular's ag	untion	
				Bernoulli's equation,			
				ow through orifice.			
				nd rectangular notch		r r · ·	
III		iscous/Lamina		-	-		7
				w, Laminar flow through		loss of	
	h4			Power absorbed in v		1	
		AT 1 1 4 A			osses in pipe flow.	shear	
	b		<b>low</b> : Reynolds exp				
	b) st	ress in turbuler	nt flow, major and	minor losses (Darcy	's and Chezy's equ	ation),	
	b) sti H	ress in turbuler GL, TEL, Flow	nt flow, major and through siphon pij	minor losses (Darcy bes, Branching pipes	's and Chezy's equ	ation),	
	b) sti H D	ress in turbuler GL, TEL, Flow <b>imensional an</b> a	nt flow, major and v through siphon pip alysis and Bounda	minor losses (Darcy bes, Branching pipes ry layers	's and Chezy's equ and equivalent pipe.	ation),	
IV	b) sti H D a)	ress in turbuler GL, TEL, Flow imensional and Dimensional	nt flow, major and v through siphon pip alysis and Bounda analysis: Dimensio	minor losses (Darcy bes, Branching pipes	's and Chezy's equ and equivalent pipe. equations, Bucking	ation), gham's	7
	b) str H D a) π	ress in turbuler GL, TEL, Flow imensional and Dimensional	nt flow, major and v through siphon pip alysis and Bounda analysis: Dimensional alculation of dim	minor losses (Darcy bes, Branching pipes <b>ry layers</b> onally homogeneous	's and Chezy's equ and equivalent pipe. equations, Bucking	ation), gham's	7

V	<b>Rotodynamic machines</b> Euler's equation – theory of Rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves –	7
	Cavitation in pumps- Reciprocating pump – working principle	
	Classification and Performance of hydro turbines.	
	Classification of water turbines, heads and efficiencies, velocity triangles- Axial,	
VI	radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working	7
	principles –draft tube- Specific speed, unit quantities, performance curves for	/
	turbines – governing of turbines.	
Modu	Ile wise Measurable Students Learning Outcomes :	L
	the completion of the course the student should be able to:	
1.	Explain fundamentals of fluid properties and pressure measurement.	
		when mand
2.	Derive expressions of fluid statics and conditions of equilibrium of floating and s	ubmerged
bodies		
3.	Summarize characteristics of fluid motions and mass conservation equations.	_
4.	Analyze various forces acting on fluid particles and momentum equations with different	forms
5.	Understand theory of rotodynamic machines.	
6.	Analyze rotodynamic machines for their performance.	
	Text Books	
1	S K Som, Gautam Biswas, SumanChakraborty, "Introduction to Fluid Mechanics	and Fluid
1	Machines" Tata McGraw – Hill Publication. 3rd Edition 2012.	
2	M. Potter, D.Wiggert "Fluid Mechanics" Schaum's Outline Series Mcgraw-Hill N	New York
	Second edition 2008.	
3	R.K.Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publica	ations Pvt.
	Ltd. New Delhi 9th edition, 2005.	
	References	
	Streeter, Wylie and Bedford, "Fluid Mechanics", Tata McGraw – Hill Publication. 9	th Edition
1	2000.	ur Lanuoli
2	Franke and White, "Fluid Mechanics", Tata Mcgraw-Hill New Delhi. 5th Edition 2003	
	CengelYunus A. And Cimbala John M. "Fluid Mechanics and Fundamental and app	lications",
3	Tata Mcgraw-Hill New Delhi. 1st Edition 2006.	
1	Useful Links	
1	https://www.youtube.com/results?search_query=fluid+mechanics+nptel	10116
2	https://www.youtube.com/watch?v=HGbbdXNcIQA&list=PLbMVogVj5nJQEgL1sHuY OqXInnt	1 24000m
	CO-PO Manning	

	CO-PO Mapping														
		Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2											1		
CO2	3	2	1										1		
CO3	3	2	3		2	1						3	1	3	
The stren	gth of	mappir	ng is to	be wr	itten as	5 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh			

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

B	Bloom's Taxonomy Level	T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	10	10	30	50
4	Analyze	5	5	20	30
5	Evaluate	5	5	10	20
6	Create				
	Total	20	20	60	100

		W		ge of Engineerin					
			(	AY 2021-22	·····,				
				rse Information					
Progra	amme			ical Engineering)					
-	Semest	er	Second Year B. 7	<u> </u>					
,	e Code								
	e Name		Metal Forming						
	ed Requ		8						
	u noqu								
Те	eaching	Scheme		Examination S	cheme (Marks)				
Lectu	-	3Hrs/week	T1	T2	ESE	Total			
Tutor		-	20	20	60	100			
Practi		-			-	100			
Intera				Cred	lits: 3				
mara				citta	11.5. 5				
			Co	Irse Objectives					
1	To far	niliarize studer		ilk and Sheet Metal fo	orming processes				
2					beculiars used for Metal F	orming			
2	1				ming processes and to jud	U			
3				arradies of Metal For	ming processes and to juc	ige men			
		on as formed p		traccas and various d	afasts an soundared during	Matal			
4		o instil deformation pattern, residual stresses and various defects encountered during Metal							
	Formi	ng							
		Con	na Outaamaa (CC	)) with Plaam's Tax	ronomy Loval				
At the	end of		students will be ab	D) with Bloom's Tax	conomy Level				
At the					machine tools and main	Apply			
CO1		ss-variables		processes, necessary		i ippij			
CO2	-		ation patterns and	benefits of metal form	ming processes	Analyze			
CO3	1		-	esses of metal forming		Analyze			
005	111/050	igute the defec			5 processes				
Modu	ıle		Mo	odule Contents		Hours			
mouu		assification of			hanics of Metal Forming,				
			e		e e				
Ι		Ideal Work for Plastic Deformation and Deformation Efficiency, Friction in Metal Forming, Causes for Residual Stresses in Metal Forming, Basic Equations Methods							
		of Solutions for Metal-Forming Analysis.							
					and Metal Flow, Benefits				
II			•		esign, Defects, Residual	6			
11	-	resses, Case stu	-	the properties, Die De	Sign, Dereto, Residual	0			
				mill Main Variables	in rolling, Forward Slip,				
			* •		y to deformation zone, Ro	11			
III		-		•	Stresses, Benefits, Ring	n 7			
			ad Rolling, Case st		Suesses, Denemis, King				
		-	-	es, Die Materials and	Die Design Main				
<b>W</b>					Metal Flow, Defects,	6			
IV		-	— Sejournet Proce			6			
					s, Tube Sinking, Tube				
			-	-	-				
V		-	•	g Mandrel, Main Var	-	. 7			
				Kou and Tube Drawi	ng, Drawing benefits ove	r   7			
		rusion, Case s							
	[ <b>C</b> ]	assitication of	Sneet Metal Formi	ng Processes Hormal	hility Locte Horming				
VI				-	bility Tests, Forming ck, Stretch Forming and	6			

	Stretch Wrap Forming, Spinning, Deep Drawing and Redrawing, Ironing and
	Sinking, Defects in formed parts, Brief description of Explosive Forming, Case studies
Modu	Ile wise Measurable Students Learning Outcomes :
After	the completion of the course the student should be able to:
	<ol> <li>Summarize the Metal Forming Processes and know their general mechanics</li> <li>Summarize various forging operations, main variables and benefits. Investigate deformation pattern, residual stresses, die design and defects.</li> <li>Illustrate geometrical parameters of rolling mill, and main variables. Inspect deformation pattern and metal flow, residual stresses, benefits and defects</li> <li>Discuss types of extrusion processes. Describe die design, main variables, deformation pattern, residual stresses, benefits and defects</li> <li>Investigate Wire, Rod and Tube Drawing processes, main variables, deformation pattern, residual stresses, die design, benefits and defects</li> <li>Investigate the Formability Test and its importance. Distinguish various sheet metal operations, and defects in sheet metal forming</li> </ol>
	Text Books
1	George E. Dieter Jr., Mechanical Metallurgy', Mc-Graw H ill, Third Edition, 1989
2	Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology', Pearson (Prentice Hall), Fifth Edition, 2005
3	B. L. Juneja, 'Fundamentals of Metal Forming Processes', New Age International (P) Limited, Publishers, First Edition, 2007
	References
1	Schuler GmbH, Metal Forming Handbook', Springer, Fifth Edition, 1998
2	Heinz Tschaetsch, Metal Forming Practise, Processes, Machines, Tools', Springer, Seventh Edition, 2005
3	V. N. Danchenko, 'Metal Forming', Ministry of Education and Science of Ukraine, National Metallurgy Academy of Ukraine, First Edition, 2007
	Useful Links
1	https://youtu.be/HSn3G3r69QE
2	https://onlinecourses.nptel.ac.in/noc19_me52/preview

CO-PO Mapping															
		Programme Outcomes (PO)										-	PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3														
CO2	2														
CO3		1											1		
The strengt	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														

such gui of mapping is to be written as 1,2,5, where, 1.10%, 2.1weatann, 5.11

## **Assessment (for Theory Course)**

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course								
B	loom's Taxonomy Level	T1	T2	ESE	Total				
1	Remember								
2	Understand								
3	Apply	10	10	30	50				
4	Analyze	5	5	20	30				

5	Evaluate	5	5	10	20
6	Create				
	Total	20	20	60	100

		W	alchand Colleg (Government A	ge of Engineer					
			Α	Y 2021-22					
			Cour	se Information					
Progra	amme		B.Tech. (Mechani	cal Engineering)					
Class,		ter	Second Year B. T	ech., Sem IV					
Cours	e Code	9							
Cours	e Nam	e	Kinematics and T	heory of Machines					
Desire	d Requ	uisites:							
			1						
Те	eaching	g Scheme		Examination S	Scheme (Marks)				
Lectur	re	3Hrs/week	T1	T2	ESE	Т	otal		
Tutori	al	-	20	20	60	1	00		
Practi	cal	-			-				
Intera	ction	-		Cre	edits: 3				
		1							
			Cou	rse Objectives					
1				nematics and rigid-	body dynamics of kin	ematica	ılly		
1		n machine com							
2			s understand the mo ation at any point in		hanisms in terms of the	e displa	cement,		
					am systems to generat	e specif	ied		
3		t motion	dents to design linkage mechanisms and cam systems to generate specified						
4	<b>^</b>		s understand the kir	nematics of gear tra	ins				
			rse Outcomes (CO		axonomy Level				
At the			students will be ab		. 10 11	C	<b>TT 1</b>		
CO1		by mechanism		according to applic	cation and find degrees	sof	Understa nd		
CO2			age mechanisms fo	r optimal functioni	ng		Analyze		
CO3			kage mechanism for				Evaluate		
Modu	le		Moo	dule Contents			Hours		
	C	assification of	mechanisms- Basi	c kinematic concep	pts and definitions- D	egree			
_					sions of four bar chain		_		
Ι					ntage- Transmission a		7		
			ersal Joint- Rocker		rn mechanism, straigh	t nne			
					nple mechanisms, grap	hical			
II					velocity and acceler		8		
11			op closure equation	ns, Coincident poi	nts- Coriolis compone	ent of	0		
		celeration	1 1 1	1.	1 1 1 0				
III					al synthesis for motion ms slider crank mecha		7		
111		namics	kinematic analysis (	of simple meenants			7		
			cams and follower	s- Terminology and	d definitions- Displace	ement			
	di	agrams- Unifo	rm velocity, parabo	olic, simple harmon	nic and cycloidal mot	tions-			
IV					cams- circular and tar		7		
					is, graphical and analy	ytical			
			synthesis for roller		vers fundamental law of ge	aring			
_					interference/undercu				
V					lic and regular gear		6		
		nematics							
VI	Sı	urface contacts.		g friction - friction d	lrives, belt and rope d	lrives	5		

	lule wise Measurable Students Learning Outcomes :
Afte	r the completion of the course the student should be able to:
1.	Identify the mechanism that should be used according to application and
find	degree of freedom of different mechanisms.
2.	Analyze the given mechanism for its velocity and acceleration.
3.	Synthesize slider crank mechanism and four bar mechanism for given
inpu	t positions.
4.	Understand basics of cams and develop cam profile.
5.	Understand principle of gear drive.
6.	Understand concept of friction and its applications.

	Text Books									
1	Ratan S.S, "Theory of Machines", Tata McGraw Hill, New Delhi, 3rd Edition, 2011.									
2	Sadhu Singh, "Theory of Machines", Pearson Education, 2nd Edition, 2009									
3	H. G. Phakatkar, "Theory of Machines I", Nirali Publication, 5th Edition 2009.									
	References									
1	Thomas Bevan, "Theory of Machines", CBS Publishers, New Delhi, 1st Edition, 2010.									
2	J. E. Shigley,"Theory of Machines and Mechanism", , McGraw Hill, New York. 4th Edition,									
2	2011									
3	G.S. Rao and R.V. Dukipatti, "Theory of Machines and Mechanism", New Age International									
5	Publications Ltd. New Delhi. 2011									
	Useful Links									
1	Kinematics of Mechanisms and Machines - YouTube									
2	Module 1 Lecture 1 Kinematics Of Machines - YouTube									
3	Lecture 01   Introduction to Kinematics of Machines   KOM - YouTube									

CO-PO Mapping															
		Programme Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1		3		1									1		
CO2		3		1									1		
CO3			3			1							1		
The stren	gth of 1	mappii	ng is to	be wr	itten as	\$ 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh			

	Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course								
B	Bloom's Taxonomy Level	<b>T1</b>	T2	ESE	Total				
1	Remember								
2	Understand	5	5	15	25				
3	Apply								
4	Analyze	10	10	20	40				
5	Evaluate	5	5	25	35				
6	Create								
	Total	20	20	60	100				

		W		ge of Engineerin ded Autonomous Instit				
			Α	Y 2021-22	,			
			Cour	se Information				
Progr	amme		B.Tech. (Mechani	cal Engineering)				
Class,			Second Year B.Te	ch., Sem IV				
Cours								
Cours	e Nan	ne	Instrumentation &	Control				
Desire	d Req	uisites:						
		[						
Т	eachin	g Scheme		Examination So	cheme (Marks)			
Lectu		3Hrs/week	T1	T2	ESE	Total		
Tutor	ial	1Hrs/week	20	20	60	100		
Practi	cal	-		-	I			
Interac	ction	-		Cred	its: 4			
			1					
			Соц	rse Objectives				
1	Top	rovide a basic k		•	nd their components.			
2			<u> </u>	easurement of mech	<b>X</b>			
3	1		oility and control.		•			
4	1	U U	of the measurement	t systems with the pr	ocess for process monito	oring and		
-	cont	ol.						
		0	0.1 (20		<b>T</b> 1			
At the	and of		students will be abl	) with Bloom's Tax	onomy Level			
					nd control of Industrial	Apply		
CO1	1	esses.	isti unicitation syste	ins for monitoring a	la control or maastral	rippiy		
		Measure mechanical quantities using instruments, their accuracy & range, and use Analyze						
CO2			ontrolling devices au					
CO3	Anal	yze system and	its mathematical mo	odel for standard inp	ut responses.	Evaluate		
Modu	ıle		Mod	ule Contents		Hours		
Ι	Significance of mechanical measurements, Classification of measuring instruments, Generalized measurement system, Types of inputs: Desired, interfering and modifying inputs.							
transducers, NozMeasurement ofIIMethods.Acceleration MeStrain Measurement			zle flapper transduc Angular Velocity: A asurement: Theory of nent : Theory of	asurement: Potentiometer, LVDT, Capacitance Types, Digital le flapper transducer. Angular Velocity: Analog and Digital tachometers, Stroboscopic surement: Theory of accelerometer and vibrometers ent : Theory of strain gauges, gauge factor, Temperature				
compensation, Bridge circuit, Strain gauge based load cells and torque sensorsPressure Measurement: Elastic pressure transducers, High pressure measurements, Bridge man gauge. Vacuum measurementIIIFlow Measurement: Ultrasonic flow meter, Magnetic flow meter, Rota meter. Temperature Measurement: Resistance thermometers, Thermistors and Thermocouples, Pyrometers. Sensitivity analysis of sensor.Introduction to control systems. Classification of control system. Open loop and						1 7		
IV	c ti	losed loop syst ansfer function	tems. Mathematical , Block diagram alge	modelling of contact ebra.	rol systems, Concept o	f 6		
V	I	ime Domain sp	ecifications. Step re	esponse of second of	rder system. Steady-state			

	error, Error coefficients, Steady state analysis of different type of systems using	7						
	step, ramp and parabolic inputs.Introduction to concepts of stability, The Routh criteria for stability,							
	Experimental determination of frequency response, Stability analysis using Root							
VI	locus, Bode plot and Nyquist Plots, State space modeling, Process control							
	systems, ON-OFF control, P-I-D Control.	7						
	Module wise Measurable Students Learning Outcomes :							
	After the completion of the course the student should be able to:							
	1. Explain the use and principles of measuring devices and error							
	measurements.							
	2. Demonstrate the use of various working instruments of displacement,							
	strain, velocity, vibration measurement.							
	3. Describe the working of various measuring instruments for pressure,							
	flow and temperature.							
	<ol> <li>Construct a simple mathematical model for physical systems.</li> </ol>							
	<ol> <li>Analyze control system under different time domain.</li> </ol>							
	6. Identify the suitable techniques for analyzing the response time and							
	stability of the control systems							
	stability of the control systems							
	Text Books							
	Ernest O. Doeblin, "Measurement Systems: Application and Design", Tata McGrav	v- Hill 5th						
1	Edition, 2004.	,						
2	Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 5	5th Edition,						
Z	2010.							
3	Kumar D S, "Mechanical Measurements and Control", Metropolitan publication, 4	th Edition,						
	2006.							
	References	uromonto"						
1	Thomas G. Beckwith, Roy D. Marangoni, John H. LienhardV, "Mechanical Meas Pearson Education India, 6th Edition, 2007.	surements,						
	Gregory K. McMillan, "Process/Industrial Instruments and Controls Handbook", Mc	Graw-Hill						
2	New York, 5th Edition, 1999.	Ciuti Inili						
3	Holman J.P., "Experimental Methods for Engineers", Tata McGraw-Hill., 7th Edition,	2004.						
4	Williams Bolton, "Instrumentation and control", Elsevier Limited, 2nd Edition, 2015.							
5	Kevin James, "PC Interfacing and Data Acquisition: Techniques for Me	easurement,						
	Instrumentation and Control", Newnes Publishers, 1st Edition, 2000.							
1	Useful Links							
1	https://nptel.ac.in/courses/108/101/108101037/							

	CO-PO Mapping														
		Programme Outcomes (PO)											PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3		2										2		
CO2	3	2	3										2		
CO3	3		3										3		
The stren	gth of a	mappir	ng is to	be wr	itten as	\$ 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	i, 3:Hig	gh			

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

B	Bloom's Taxonomy Level	T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	10	10	30	50
4	Analyze	5	5	20	30
5	Evaluate	5	5	10	20
6	Create				
	Total	20	20	60	100

		Wa		e of Engineerin ded Autonomous Institu							
			A`	Y 2021-22							
			Cours	se Information							
Progra	amme		B.Tech. (Mechani	cal Engineering)							
Class,	Semest	er	Second Year B. T	ech., Sem IV							
Cours	e Code										
Cours	e Name	;	Fluid Mechanics a	nd Fluid Machines I	ab						
Desire	d Requ	isites:									
	-										
Те	eaching	Scheme	Examination Scheme (Marks)								
Lecture -		-	LA1	LA2	ESE	Total					
Tutorial -		-	30	30	40	100					
Practio	cal	2 Hrs/Week		-	I						
Intera	ction	-	Credits: 1								
			Cour	rse Objectives							
1	To int	roduce the stud	ents about basic pri	nciples and laws thro	ough conducting exper	iments in					
1	labora										
2			s to analyze the flui								
3	To dev	velop skills in t	he evaluation of flu	id turbo machines.							
		Carre	na Autoomaa (CA)	with Dloom's Torr							
At the	end of t		students will be able	) with Bloom's Taxe	monny Level						
$\frac{1}{CO1}$				d conduct the experiment	nents for validation.	Apply					
CO2		<b>A</b>		of fluid turbo machin		Analyze					
CO3			nance of fluid turbo			Evaluate					

#### List of Experiments / Lab Activities

## List of Experiments:

STUDY and demonstration.

1. Study of similarity principles.

## Experiments and Trials. ( All are compulsory)

- 1. Experiment on impact of Jet.
- 2. Experiment on Prandtl type pitot type apparatus.
- 3. Verification of Bernoulli's Equation.
- 4. Calibration of Venturi meter and Orifice meter.
- 5. Determination of Minor losses in pipe fittings.
- 6. Determination of loss of friction in series of pipes.
- 7. Trial on Pelton Turbine.
- 8. Trial on Kaplan Turbine.
- 9. Trial on Francis Turbine.
- 10. Trial on Centrifugal Pump.
- 11. Trial on Multistage pump.
- 12. Trial on series and parallel pump.

In case of mini-projects, drawing, presentations etc, write the relevant details of the same.

	Text Books										
1	Modi and Seth," Fluid mechanics and hydraulic machines", Standard book house, third edition										
	2012										
2	N.S. Govindrao, "Fluid flow machines", Tata Mc Hill, Second edition 1983.										
3	Jagdish Lal, "Fluid and Turbo machines", New Age publisher, Second edition 1982.										
4	S K Som, Gautam Biswas, Suman Chakraborty, "Introduction to Fluid Mechanics and Fluid										
	Machines" Tata McGraw – Hill Publication. 3rd Edition, 2012.										

	References										
1	P.L. Balleny, "Thermal Engg.", Khanna pub. New delhi, third edition, 2002.										
2	Cohen and Rogers, "Gas turbines and Compressor", Pearson Ed, second edition, 1996.										
3	3. R. Yadav, "Thermodynamics and Heat Engines – Vol-II", CPH Allahabad, third edition 1999.										
	Useful Links										
1	https://www.youtube.com/watch?v=HGQM913rI10&list=PLkUEX3IbW7lclZ9jK-thjumHM2-meHGjF										
2	https://nptel.ac.in/courses/112/103/112103290/										

	CO-PO Mapping															
		Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3	2								3			1			
CO2	3	2	1				3		3				1	3		
CO3	3	2	3		2	1				3		3	1	3		
The stren	gth of 1	mappir	ng is to	be wr	itten as	\$ 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh				

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.										
Assessmen	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Mark						
t				s						
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30						
	attendance, journal	Faculty	Marks Submission at the end of Week 6							
LA2	Lab activities,	Lab Course	During Week 7 to Week 12	30						
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12							
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40						
Lauese	attendance, journal	Faculty	Marks Submission at the end of Week 18	40						
Week 1 indic	ates starting week of a	semester. The typ	pical schedule of lab assessments is shown,							
considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab										
activities/Lab	nerformance shall inc	lude performing	experiments mini-project presentations dra-	wings						

activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)												
Bloom's Taxonomy Level	LA1	Total										
Remember												
Understand												
Apply	10	10	15	35								
Analyze	10	10	15	35								
Evaluate	10	10	10	30								
Create												
Total Marks	30	30	40	100								

		Wa	alchand Colleg (Government Ai	e of Engineeri								
				Y 2021-22	······,							
				se Information								
Progra	amme		B.Tech. (Mechani	ical Engineering)								
-	Semest	er	Second Year B. Tech., Sem IV									
	e Code											
	e Name		Metal Forming and Manufacturing Lab									
	ed Requ											
20010												
Т	eaching	Scheme		Examination	Scheme (Marks)							
Lectu	re	-	LA1	LA2	ESE	Total						
Tutor	ial	-	30	30	40	100						
Practi	cal	2Hrs/Week			-							
Intera	ction	-		Cre	dits: 1							
			Cou	rse Objectives								
	To De	monstrate diffe			perate the wood work	ing lathe						
1	machi				L	e						
2	To Ev	aluate various t	ypes and properties	s of sand.								
	1				ne.							
4	To Perform simple turning operation on centre lathe machine.To Understanding of importance of I igs and Fixtures design in mass production.											
5	To acquire the knowledge of press tools working and their desi aspects.											
	10 400	•	rse Outcomes (CO		*							
At the	end of t		students will be abl									
					ne, tooling devices an	d Apply						
CO1	equipr	-	C		C							
<b>CO2</b>	Apply	the knowledge	e of various Sand	properties of moul	ding sand	Analyze						
	1				3D Printing and Non	- Evaluat						
CO3	Conve	ntional Process	ses		C	e						
	1					I						
			List of Exper	iments / Lab Activ	vities							
List of	f Experi	ments:										
[1] Stu	idy and	demonstration	-	<b>e</b> 1	on Rolling (02 Hrs)							
			using model or cha		_							
	•	<b>.</b>	cess parameters for		of passes							
			chniques for differe		on Forging ( <b>02 Hrs</b> )							
			ie and closed die fo		) in Poliging (02 1118)							
			die forging process									
			or closed die forgin									
			extrusion process ((									
	•				t Metal Die Set [on di	rawing sheet] or						
			punch assembly (04		deep drawing operation	on ( <b>02 Hr</b> s)						
		-	te container [square	-		)II (02 IIIS)						
			of 3D Printing pro-		(02 1110)							
					ng Processes. (04 Hrs	s)						
				<b>Fext Books</b>								
1				Foundry, Forming a	and Welding", Vol. 1	Tata McGraw-						
1		rd edition, 200										
2	P.C.Sh co,200		book of Production	Technology(Manu	facturing processes) "	,S. Chand &						
	1	11/20	ls-Design and Cons									

2938-5	
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	2930-3										
	References										
1	W.A.J. Chapman ,"Workshop Technology "- Vol I, II & III, CBS Publ.& Dist.N.Delhi										
2	B.L.Juneja, "Fundamentals of Metal forming processes", New Age International (P)										
2	Ltd., Publishers, First edition, 2007										
3	HMT, "Production Technology", Tata McGraw-Hill Pub. Ltd., N.Delhi										
	Useful Links										
1	http://msvs-dei.vlabs.ac.in/msvs-dei/ [http://vlabs.iitb.ac.in/vlab/labsme.html]										
2	https://www.vlab.co.in/broad-area-mechanical-engineering										

	CO-PO Mapping															
		Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	3				2					1		1	2			
CO2			2													
CO3					3					1						
The stren	gth of :	mappir	ng is to	be wr	itten as	5 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh				

		Asses	sment							
	ee components of lab a									
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.										
Assessmen	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Mark						
t				S						
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30						
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50						
LA2	Lab activities,	Lab Course	During Week 7 to Week 12	30						
	attendance, journal	Faculty	Marks Submission at the end of Week 12	50						
	Lab activities,	Lab Course	During Week 15 to Week 18	40						
Lab ESE	attendance, journal	Faculty	Marks Submission at the end of Week 18	40						
Week 1 indic	ates starting week of a	semester. The ty	pical schedule of lab assessments is shown,	1						
considering a	1 26-week semester. Th	ne actual schedule	shall be as per academic calendar. Lab							
activities/Lab	performance shall inc	clude performing	experiments, mini-project, presentations, dra	wings,						
programming	g and other suitable act	ivities, as per the	nature and requirement of the lab course. The	e						

programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on	Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)												
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total									
Remember													
Understand													
Apply	10	10	15	35									
Analyze	10	10	15	35									
Evaluate	10	10	10	30									
Create													
Total Marks	30	30	40	100									

	Wa	alchand Colleg (Government Aid	e of Engineeri ded Autonomous Inst							
		A	Y 2021-22							
		Cours	e Information							
Programme		B.Tech. (Mechani	cal Engineering)							
Class, Semest	ter	Second Year B. To	ech., Sem IV							
<b>Course Code</b>										
Course Name	9	Kinematics and Theory of Machines Lab								
Desired Requ	isites:									
Teaching	Scheme	Examination Scheme (Marks)								
Lecture	-	LA1	LA2	ESE	Total					
Tutorial	-	30	30	40	100					
Practical	2 Hrs/Week		I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I							
Interaction	-		Cree	lits: 1						

Course Objectives										
1	To develop skills of generation of gear tooth and cam profiles.									
2	To prepare the students to perform the analysis of gear drives and mechanisms.									

## Course Outcomes (CO) with Bloom's Taxonomy Level

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

C01	Apply principles of kinematics to plot velocity and acceleration diagrams of mechanisms.	Apply								
CO2	Investigate gear trains for various power transmission systems.									
CO3	Evaluate various types of gears and belt drives .									

## List of Experiments / Lab Activities

### List of Experiments:

## **Term Work contains following:-**

- 1. To plot displacement, velocity and acceleration curves for two types of cam follower systems.
- 2. To verify angular displacement ratio of shafts connected by Hooke's joint
- 3. To find out Coriolis component of acceleration.
- 4. To develop computer program for velocity and acceleration analysis of four bar chain and single slider crank mechanism.
- 5. To generate involute gear tooth profile.
- 6. To solve problems on epicyclic gear train by tabular method.
- 7. To determine moment of inertia by Bi-filler suspension, Tri-filler suspension or compound pendulum method.
- 8. To study different mechanisms and analyse them with respect to links, joints, Degrees of freedoms.
- 9. To analyse gear trains in lathe, drilling, milling machine etc
- 10. To study any one automobile gearbox.
- In case of mini-projects, drawing, presentations etc, write the relevant details of the same.

	Text Books								
1	Ratan S.S, "Theory of Machines", Tata McGraw Hill, New Delhi, 3rd Edition, 2011.								
2	V. B. Bhandari, "Design of Machine Elements", Tata McGraw Hill, 3rd Edition, 2011								
3	Sadhu Singh, "Theory of Machines", Pearson Education, 2nd Edition, 2009								
References									
1	Thomas Bevan, "Theory of Machines", CBS Publishers, New Delhi, 1st Edition, 2010.								
2	J. F. Shigley, "Mechanical Engineering Design", , McGraw Hill, New York. 4th Edition, 2011								
	Useful Links								
1	Virtual Labs (vlabs.ac.in)								

# 2 Kinematics and Dynamics of Mechanisms (iitkgp.ac.in)

	CO-PO Mapping															
	Programme Outcomes (PO)													PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO1	1		3										1			
CO2		1		3	1								1			
CO3			3		1				1				1			
The stren	gth of 1	mappir	ng is to	be wr	itten as	\$ 1,2,3;	Where	e, 1:Lo	w, 2:N	Iedium	, 3:Hig	gh				

Assessment											
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.											
Assessmen	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Mark							
t				s							
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30							
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50							
LA2	Lab activities,	Lab Course	During Week 7 to Week 12	30							
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12	50							
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40							
Lau ESE	attendance, journal Faculty Marks Submission at the end of Week 18										
considering a	Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings,										

activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based o	n Bloom's Tay	onomy Level	(Marks) (For lal	o Courses)
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand				
Apply	10	10	15	35
Analyze	10	10	15	35
Evaluate	10	10	10	30
Create				
Total Marks	30	30	40	100

			A 1	V 2021 22	,							
				Y 2021-22 se Information								
Progr	amme		B.Tech. (Mechanie									
	Semes	tor	Second Year B. Te									
	e Code		Second Tear D. Te									
	e Name		Presentation and F	Report Writing								
	d Requ											
Т	eaching	g Scheme		Examination S	cheme (Marks)							
Lectu		-	LA1	LA2	ESE	Total						
Tutor	ial	-	30	30	40	100						
Practi	cal	-		-								
Intera	Interaction 1Hrs/Week Credits: 1											
			·									
				se Objectives								
1			se student's underst		-							
2			and review research	articles and gain an	understanding of a	new field, in the						
		ce of text book										
3	To ju	lge the value of	f different contributi	ons and identify pro	mising new direction	ons.						
		Carry		with Discussion Town								
At the	end of		rse Outcomes (CO) students will be able		onomy Level							
CO1			their understanding		2S	Apply						
CO2			s critically and effici			Analyze						
<b>CO3</b>	Sumn	narize and revie	w the topics in abse	ence of textbooks.		Evaluate						
	1					I						
			List of Experi	ments / Lab Activi	ties							
List of	Experi	ments:										
Ba	sed on a	any recent subi	ect student should ch	noose the topic for r	eport writing and pr	esentation.						
		• •	tion, Literature revi	-								
	-		s, future scope and c		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							
	Ū.	C	•									
Modul	e wise ]	Measurable Stu	dents Learning Out	comes :								
After t	he com	pletion of the c	ourse the student she	ould be able to:								
			n about new techno	logy areas from liter	ature available in v	arious						
engine	ering a	reas.										
			т	ext Books								
1	As pe	r topic chosen l		CAL DUURS								
-		1	•									
			R	leferences								
1	As pe	r topic chosen l										
			TT	0 1 7 • 1								
1	1		sen by the student.	seful Links								

	CO-PO Mapping														
		Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C01	2	2											2		

CO2	2	2	1		1			1	1				2		
CO3	2	2	1		2	1			2				1		
The stren	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														

Assessment							
	ee components of lab a E is a separate head of		LA2 and Lab ESE. A2 together is treated as In-Semester Evaluat	ion.			
Assessmen	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Mark			
t				s			
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	30			
	attendance, journal	Faculty	Marks Submission at the end of Week 6				
LA2	Lab activities,	Lab Course	During Week 7 to Week 12	30			
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12				
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40			
Lau ESE	attendance, journal	Faculty	Marks Submission at the end of Week 18	40			

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)							
Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total			
Remember							
Understand							
Apply	10	10	15	35			
Analyze	10	10	15	35			
Evaluate	10	10	10	30			
Create							
Total Marks	30	30	40	100			