



**Kolhapur Institute of Technology's  
College of Engineering (Autonomous),  
Kolhapur**

**Structure and Curriculum**

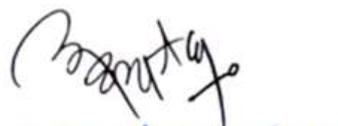
**for**

**First Year B.Tech.**

**(Biotechnology Engineering / Civil Engineering / Civil and  
Environmental Engineering / Mechanical Engineering)**

**To be effective from  
Academic Year 2023-2024**

  
chairperson  
BOS, BSH Dept.

  
Dean Academics,  
KITCOEK

  
Director  
KITCOEK

### List of Abbreviations

Sr. No.	Abbr	Description	Code
1	L	Lecture	
2	T	Tutorial	
3	P	Practical	
4	Cr	Credits	
5	BSC	Basic Science Course	BS
6	ESC	Engineering Science Course	ES
7	AEC	Ability Enhancement Course	AE
8	VSEC	Vocational and Skill Enhancement Course	VS
9	PCC	Programme Core Course	PC
10	IKS	Indian Knowledge System	IK
11	CC	Co-curricular Course	CC

## Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation Scheme for First Year B. Tech.

(Biotechnology Engineering / Civil Engineering / Civil and Environmental Engineering /  
Mechanical Engineering)

### SEMESTER-I (Group-3)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for	
UHSBS0101	Engineering Mathematics-I	BSC	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0108	General Physics and Optics	BSC	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0109	Engineering Mechanics	ESC	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0110	Basic Mechanical Engineering	ESC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0111	Introduction to Python Programming	ESC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0128	General Physics and Optics Lab	BSC	-	-	2	1	ISE	50	20	
UHSES0129	Engineering Mechanics Lab	ESC	-	-	2	1	ISE	50	20	
UHSES0130	Basic Mechanical Engineering Lab	ESC	-	-	2	1	ISE	25	10	
UHSES0131	Introduction to Python programming Lab	ESC	-	-	2	1	ISE	25	10	
UHSVS0132	Workshop Practice Lab	VSEC	-	-	2	1	ISE	50	20	
UHSIK0136	Ecology, Energy & Environment	IKS	2	-	-	2	ISE	100	40	
	<b>Total</b>		<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>		<b>800</b>		
<b>Total Contact Hours – 26</b>						<b>Total Credits - 21</b>				

## Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation Scheme for First Year B. Tech.

**(Biotechnology Engineering / Civil Engineering / Civil and Environmental Engineering /  
Mechanical Engineering)**

### SEMESTER-II (Group-3)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
UHSBS0201	Engineering Mathematics-II	BSC	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0212	Applied Chemistry	BSC	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSAE0203	Communication Skills	AEC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0213	Basic Civil Engineering	ESC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSPC0214	Fundamentals of Electrical Engineering	PCC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0233	Applied Chemistry Lab	BSC	-	-	2	1	ISE	50	20	
UHSAE0222	Communication Skills Lab	AEC	-	-	2	1	ISE	50	20	
UHSES0234	Basic Civil Engineering Lab	ESC	-	-	2	1	ISE	25	10	
UHSPC0235	Fundamentals of Electrical Engineering Lab	PCC	-	-	2	1	ISE	25	10	
UHSVS0238	Computer Aided Engineering Drawing	VSEC	2	-	2	3	ISE-I	25	20	40
							ISE-II	25		
							ESE (POE)	50		
UHSCC0239	Co-Curricular Course	CC	1	-	-	1	ISE	50	20	
	<b>Total</b>		<b>15</b>	<b>1</b>	<b>10</b>	<b>21</b>		<b>800</b>		
<b>Total Contact Hours – 26</b>			<b>Total Credits - 21</b>							

## Kolhapur Institute of Technology's College of Engineering (Autonomous), Kolhapur

Teaching and Evaluation Scheme for First Year B. Tech.

**(Biotechnology Engineering / Civil Engineering / Civil and Environmental Engineering /  
Mechanical Engineering)**

### SEMESTER-I (Group-4)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for	
UHSBS0101	Engineering Mathematics-I	BSC	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0112	Applied Chemistry	BSC	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0113	Basic Civil Engineering	ESC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0111	Introduction to Python Programming	ESC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSPC0114	Fundamentals of Electrical Engineering	PCC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0133	Applied Chemistry Lab	BSC	-	-	2	1	ISE	50	20	
UHSES0134	Basic Civil Engineering Lab	ESC	-	-	2	1	ISE	25	10	
UHSES0131	Introduction to Python Lab	ESC	-	-	2	1	ISE	25	10	
UHSPC0135	Fundamentals of Electrical Engineering Lab	PCC	-	-	2	1	ISE	25	10	
UHSVS0138	Computer Aided Engineering Drawing	VSEC	2	-	2	3	ISE-I	25	20	40
							ISE-II	25		
							ESE (POE)	50		
<b>Total</b>			<b>14</b>	<b>1</b>	<b>10</b>	<b>20</b>		<b>725</b>		
<b>Total Contact Hours – 25</b>						<b>Total Credits - 20</b>				

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Teaching and Evaluation Scheme for First Year B. Tech.  
(Biotechnology Engineering / Civil Engineering / Civil and Environmental Engineering /  
Mechanical Engineering)

### SEMESTER-II (Group-4)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
UHSBS0201	Engineering Mathematics-II	BSC	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0208	General Physics and Optics	BSC	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSAE0203	Communication Skills	AEC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0209	Engineering Mechanics	ESC	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSES0210	Basic Mechanical Engineering	ESC	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50		
UHSBS0228	General Physics and Optics Lab	BSC	-	-	2	1	ISE	50	20	
UHSAE0222	Communication Skills Lab	ESC	-	-	2	1	ISE	50	20	
UHSES0229	Engineering Mechanics Lab	ESC	-	-	2	1	ISE	50	20	
UHSES0230	Basic Mechanical Engineering Lab	AEC	-	-	2	1	ISE	25	10	
UHSVS0232	Workshop Practice Lab	VSEC	-	-	2	1	ISE	50	20	
UHSIK0236	Ecology, Energy & Environment	IKS	2	-	-	2	ISE	100	40	
UHSCC0239	Co-Curricular Course	CC	1	-	-	1	ISE	50	20	
	<b>Total</b>		<b>16</b>	<b>1</b>	<b>10</b>	<b>22</b>		<b>875</b>		
<b>Total Contact Hours – 27</b>			<b>Total Credits - 22</b>							

<b>Title of the Course: Engineering Mathematics-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSBS0101</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

**Course Pre-Requisite:** Basics of matrices, complex algebra, derivative and its properties.

**Course Description:** In this course students will learn topics from complex numbers, linear algebra and single and multivariable differential calculus.

**Course Objectives:**

1. To provide the knowledge of linear algebra for solving linear system equations, eigen value and eigen vector problems.
2. To Introduce concept of partial derivative, it's properties, applications for computing errors and extreme values of functions of two variables.
3. To learn different numerical methods for the solution of algebraic and transcendental equations.
4. To study the applications of DeMoivre's theorem and elementary properties of hyperbolic functions.
5. To learn different methods for expansion of functions in the form of infinite series.

**Course Outcomes:**

CO	After the completion of the course the student should be able to:
CO1	find the rank of matrix, partial derivatives of given multivariable functions and recall standard series of elementary functions, formulae of hyperbolic functions.
CO2	understand statements of DeMoivre's theorem, mean value theorems, Euler's theorem on homogeneous functions, Cayley-Hamilton's theorem, general properties of roots of equation.
CO3	solve algebraic equations, linear system equations, eigenvalue and eigenvector problems, problems involving higher order partial derivatives.
CO4	apply LHospital's rule for finding limits of indeterminate forms, the knowledge of multivariable calculus for computing errors and extreme values and simplify complex quantities in real and imaginary parts.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										1	-	-
CO2	3	2										1	-	-
CO3	3	2										1	-	-
CO4	3	2										1	-	-

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

MSE is based on 50% of course content (first three units).

ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

<b>Course Contents</b>		
<b>Unit No.</b>	<b>Unit Title and Contents</b>	<b>Hours</b>
<b>1</b>	<b>Complex Numbers and Hyperbolic Functions</b> <ul style="list-style-type: none"> <li>➤ complex number</li> <li>➤ DeMoivre's theorem</li> <li>➤ Roots of complex numbers</li> <li>➤ Circular and hyperbolic functions, functions of a complex variable - definitions</li> <li>➤ Relation between circular &amp; hyperbolic functions.</li> <li>➤ Inverse hyperbolic functions.</li> <li>➤ Separation into real and imaginary parts.</li> </ul>	<b>6</b>
<b>2</b>	<b>Differential Calculus</b> <ul style="list-style-type: none"> <li>➤ Fundamental theorems : Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem.</li> <li>➤ Expansion of functions: Taylor's and Maclaurin's series.</li> <li>➤ Methods of expansion by using series of standard functions, substitution, differentiation, and integration.</li> <li>➤ Inderminate forms.</li> </ul>	<b>7</b>
<b>3</b>	<b>Partial Differentiation</b> <ul style="list-style-type: none"> <li>➤ First and higher order partial derivatives</li> <li>➤ Total derivatives and differentiation of implicit function</li> <li>➤ Change of variables</li> <li>➤ Euler's theorem on homogeneous function of two variables</li> <li>➤ Jacobian, properties of Jacobian, Jacobian of implicit function</li> <li>➤ Errors and approximations.</li> <li>➤ Maxima and Minima of functions of two variables.</li> </ul>	<b>8</b>
<b>4</b>	<b>Solution of Algebraic and Transcendental Equations</b> <ul style="list-style-type: none"> <li>➤ Properties of roots, Synthetic Division Method.</li> <li>➤ Bisection Method</li> <li>➤ Regula False Method</li> <li>➤ Secant Method</li> <li>➤ Newton Raphson Method</li> </ul>	<b>6</b>
<b>5</b>	<b>Matrices and Linear System Equations</b> <ul style="list-style-type: none"> <li>➤ Rank of matrix: echelon form</li> <li>➤ Consistency of linear system equations</li> <li>➤ System of linear homogeneous equations</li> <li>➤ System of linear non-homogeneous equations.</li> </ul>	<b>8</b>
<b>6</b>	<b>Eigen Values and Eigen Vectors</b> <ul style="list-style-type: none"> <li>➤ Linear dependence and independence of vectors</li> <li>➤ Eigen values, eigen vectors and their properties</li> <li>➤ Cayley-Hamilton's theorem (without proof)</li> <li>➤ Inverse and higher powers of matrix by using Cayley-Hamilton's theorem.</li> </ul>	<b>7</b>

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1.	Higher Engineering Mathematics	42	Dr. B. S. Grewal	Khanna Publishers, Delhi	2012
2.	A Text Book of Applied Mathematics Vol. I	6	P. N. Wartikar & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	Reprint 2007

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1.	Advanced Engineering Mathematics	10	Erwin Kreyszig	John Wiley & Sons	2011
2.	Advanced Engineering Mathematics	21	H. K. Dass	S. Chand & Company Pvt. Ltd, New Delhi	2014
3.	A text book of Engineering Mathematics		N. P. Bali, Iyengar	Laxmi Publications (P) Ltd., New Delhi	
4.	Engineering Mathematics		Ravish R Singh and Mukul Bhatt	McGraw Hill Education (India) Private Limited, Chennai.	2017
5.	Engineering Mathematics-I		G. V. Kumbhojkar	C. Jamnadas & Co	
6.	Mathematics for Engineers Volume-I	1	Rakesh Dube	Narosa Publishing House, New Delhi	2009

<b>Title of the Course: Engineering Mathematics-II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSBS0201</b>	<b>3</b>	<b>1</b>	<b>-</b>	<b>4</b>

**Course Pre-Requisite:** Basics of differential equations, conics, integration and its properties.

**Course Description:** In this course students will learn topics from differential equations, special functions and integral calculus.

**Course Objectives:**

1. To study gamma, beta functions, their properties and applications for evaluation of improper integrals.
2. To develop skills in curve tracing and measuring the arclength of the curves analytically.
3. To learn various techniques for evaluation of double integrals and its applications to compute area, mass, moment of inertia, volume.
4. To study different methods for finding solution of first order differential equations analytically and numerically.

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to:</b>
<b>CO1</b>	understand the concepts of improper integrals, multiple integrals and differential equations.
<b>CO2</b>	solve the first order differential equations and find numerical solution of Ordinary differential equations by various methods, evaluate improper integrals using special functions.
<b>CO3</b>	apply the knowledge differential and integral calculus for curve tracing, rectification and evaluation of multiple integrals.
<b>CO4</b>	select the appropriate method or technique for solving problems in applications of differential equations, applications of multiple integrals.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										1	-	-
CO2	3	2										1	-	-
CO3	3	2										1	-	-
CO4	3	2										1	-	-

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

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ISE 2	10
ESE	50

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<b>Course Contents</b>		
<b>Unit No.</b>	<b>Unit Title and Contents</b>	<b>Hours</b>
<b>1</b>	<b>Special Functions</b> <ul style="list-style-type: none"> <li>➤ Gamma function and its properties</li> <li>➤ Beta function and its properties</li> <li>➤ Differentiation under integral sign</li> </ul>	<b>6</b>
<b>2</b>	<b>Curve Tracing and Rectification</b> <ul style="list-style-type: none"> <li>➤ Tracing of curves in Cartesian form a) Semi cubical parabola, b) Cissoid of Diocles, c) Strophoid, d) Astroid, e) Witch of Agnesi, f) Common Catenary, g) Folium of Descartes,</li> <li>➤ Tracing of curves in polar form a) Cardioid, b) Pascal's Limacon, c) Lemniscate of Bernoulli, d) Parabola, e) Hyperbola, f) Rose curves</li> <li>➤ Rectification of plane curves (Cartesian and Polar form)</li> </ul>	<b>8</b>
<b>3</b>	<b>Multiple Integration</b> <ul style="list-style-type: none"> <li>➤ Double integration</li> <li>➤ Double integral evaluation in cartesian and polar.</li> <li>➤ Change of order of integration</li> <li>➤ Change of variable</li> <li>➤ Change into polar</li> <li>➤ Triple integral evaluation with given limits</li> </ul>	<b>7</b>
<b>4</b>	<b>Ordinary Differential Equations of First Order and First Degree and Its Applications</b> <ul style="list-style-type: none"> <li>➤ Linear differential equations</li> <li>➤ Exact differential equations</li> <li>➤ Reducible to exact differential equations</li> <li>➤ Equations not of first degree: equations solvable for <math>p</math>, equations solvable for <math>y</math>, equations solvable for <math>x</math> and Clairaut's type.</li> <li>➤ Applications to orthogonal trajectories (cartesian and polar equations)</li> <li>➤ Applications to simple electrical circuits</li> </ul>	<b>8</b>
<b>5</b>	<b>Numerical Solution of Ordinary differential equation of First Order and First Degree</b> <ul style="list-style-type: none"> <li>➤ Picard's method</li> <li>➤ Taylor's series method</li> <li>➤ Euler's method</li> <li>➤ Modified Euler's method</li> <li>➤ Runge Kutta Fourth Order method.</li> <li>➤ Simultaneous first order differential equations by Runge Kutta fourth order method.</li> </ul>	<b>7</b>
<b>6</b>	<b>Applications of Multiple Integration</b> <ul style="list-style-type: none"> <li>➤ Area enclosed by plane curves</li> <li>➤ Mass of a plane lamina</li> <li>➤ Center of gravity of plane lamina</li> <li>➤ Moment of inertia of plane lamina</li> </ul>	<b>6</b>

➤ Volume of solid of revolution

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1.	Higher Engineering Mathematics	42	Dr. B. S. Grewal	Khanna Publishers, Delhi	2012
2.	A Text Book of Applied Mathematics Vol. I & II	6	P. N. Wartikar & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	Reprint 2007

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
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3.	A text book of Engineering Mathematics		N. P. Bali, Iyengar	Laxmi Publications (P) Ltd., New Delhi	
4.	Engineering Mathematics		Ravish R Singh and Mukul Bhatt	McGraw Hill Education (India) Private Limited, Chennai.	2017
5.	Engineering Mathematics-II		G. V. Kumbhojkar	C. Jamnadas & Co	
6.	Mathematics for Engineers Volume-I	1	Rakesh Dube	Narosa Publishing House, New Delhi	2009

<b>Title of the Course: General Physics and Optics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSBS0108 / UHSBS0208</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Pre-Requisite:**

- To know basic concepts of vector analysis and laws of motion.
- To have basic ideas about properties of light and principles of quantum mechanics.

**Course Description:** In this course kinematics, fluid dynamics and quantum mechanics and their applications in real life situations are explained in depth.

**Course Objectives:**

- To study motion of body in two dimensions and solve related problems.
- To discuss different theories of fluid dynamics and their applications.
- To Study phenomena of light like interference, diffraction, polarization and their engineering applications.
- To explain various characteristics viz monochromaticity, coherence, directionality of laser and their applications in Medical, industrial field and to study concept of virtual reality.
- To study principles of quantum mechanics, properties of matter waves and derive Schrödinger equations and discuss applications of quantum mechanics in modern technology.
- To discuss various advanced engineering materials and working principles of different analytical instruments.

**Course Outcomes:**

CO	After the completion of the course the student should be able to
CO1	Define and state concepts of body in motion, fundamental properties of light and principles of quantum mechanics.
CO2	Demonstrate competency and understanding of the concepts of theories of motion, fluid dynamics, optical phenomena, quantum mechanics and recent trends in advanced materials.
CO3	Illustrate applications of different physical phenomena in engineering and technology.
CO4	Compute required physical quantity from given data.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3												
CO2	3	3												
CO3	3	3	1		1									
CO4	3	3	1		1									

**Course Contents**

Unit No.	Unit Title and Contents	Hours
1	<p><b>Unit 1: Kinematics and Elasticity</b></p> <p>Introduction: Kinematical equations, Projectile motion, Centre of mass, CM and Translational motion, Conditions for equilibrium, Forces on objects – beam and support, inclined beam, Forces on Muscles and Joint.</p> <p><b>Elasticity</b> – Stress and Strain, Hooke's law, behavior of wire under increasing load, factor of safety, Resilience, Factors affecting elasticity, Bending of beam,</p>	7

2	<b>Unit 2: Fluid Dynamics</b> Introduction, Viscosity, Streamline and Turbulent flow, Flow rate and Equation of Continuity, Poisseuille's Equation, Bernoulli's Principle, Applications of Bernoulli's principle, Flow in tubes, Blood flow, Capillarity and its applications.	7
3	<b>Unit 3:--- Interference, Diffraction and Polarization</b> <b>Interference:</b> Introduction, Interference from thin parallel films and its problems. <b>Diffraction:</b> Introduction, Diffraction Grating – theory, Resolving power of grating, Applications of Diffraction <b>Polarization:</b> Introduction, Optical activity – Laurent's half shade polarimeter, Photoelasticity, applications of polarization.	7
4	<b>Unit 4:--- Lasers and Optical Fiber</b> Introduction, Interaction of radiation with matter (induced absorption, spontaneous emission and stimulated emission), condition for laser production, Ruby laser, He – Ne Laser, Semiconductor laser, Characteristics of lasers, Applications of Laser, Holography, Holography and virtual reality <b>Optical Fiber: Principle and</b> Construction of optical fiber, classification of optical fiber, advantages and applications.	8
5	<b>Unit 5:Quantum mechanics</b> Introduction, de Broglie's hypothesis, Heisenberg's uncertainty principle and its applications, wave function and Max born interpretation of wave function, Schrödinger time dependent and time independent wave equations, applications of Schrödinger wave equation - infinite deep well potential (particle in a box),	7
6	<b>Unit 6:- Advanced Materials and Analytical Instruments</b> Metallic glass, Biomaterials, Nanomaterials, CNT, Aerogel, Atomic absorption spectroscopy, Scanning Electron Microscope, Raman spectroscopy.	6

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1.	A textbook of Engineering Physics -	11	M.N. Avadhanulu and P. G. Kshirsagar	S. Chand & Company Ltd., Delhi	2019
2.	Engineering Physics	1	Shailendra Sharma, Jyostna Sharma	Pearson Publications	2018
3.	Physics Principles with Applications	7	Douglus Giancoli	Pearson Publication	2014

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1.	Modern Engineering Physics	4	A.S.Vasudeva	S.Chand	2007
2.	Engineering Physics	1	Dattu R Joshi	Tata Mc. Graw Hills Pub. Co. Ltd.	2010
3.	A Text Book of Optics	22	Subramanyam & Brij Lal,	S. Chand & Company (P.) Ltd.	1995
4.	Basic Quantum Mechanics	1	Ajoy Ghatak,	Laxmi Publications	
5.	A Textbook of Fluid Mechanics and Hydraulic Machines	10	Dr.R.K.Bansal	Laxmi Publications(P)Ltd.	2019

6.	Principles and Practice of Analytical Chemistry	5	F.W. Fifield, D. Kealey	Blackwell Science Ltd	2000
7.	'This Quantum World'			Wikibooks.org	
8.	Quantum Entanglement - Einstein's "Spooky Action At A Distance"			Franson University Of Maryland At Jim Baltimore County.	

**Unit wise Measurable students Learning Outcomes:**

1. To **discuss** motion of body in two dimensions and find centre of mass of body.
2. To **explain** different theories of fluid dynamics and their applications in engineering.
3. To **illustrate** application of interference to surface characteristics, use of diffraction grating to measure wavelength of given source of light and analysis of crystal structure using x- ray diffraction.
4. To **explain** phenomenon of polarization and applications of polarization in engineering.
5. To **state** characteristics, applications of laser.
6. To **explain** wave particle duality, **derive** Schrödinger's equation and relation of principles of quantum mechanics with modern technology.
7. To **explain** properties and applications of modern materials and **illustrate** operation of different instruments used to study properties of materials.

<b>Title of the Course: Engineering Mechanics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0109 / UHSES0209</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Pre-Requisite:** Preliminary knowledge of Physics and Mathematics

**Course Description:**

Engineering mechanics forms a core subject which is taught to students of all disciplines of engineering. The study of this subject is aimed at developing a thorough understanding of basic concepts and principles of mechanics and their application to solve engineering problems.

**Course Objectives:**

1. To explain the concepts of force and its effects on matter as related to material behaviour.
2. To impart the skills for identification of appropriate tools for analysis of force systems.
3. To enable visualization of the rigid body motion and relate the various motion parameters.

**Course Learning Outcomes:**

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	<b>Interpret</b> the equivalence of force systems and resultant.	2	Understanding
CO2	<b>Infer</b> the effect of a force system on body or particle.	2	Understanding
CO3	<b>Apply</b> the conditions of equilibrium to a system of bodies in equilibrium.	3	Applying
CO4	<b>Analyse</b> the relation between the force and motion parameters of moving body / bodies.	4	Analysing

**CO-PO Mapping:**

CO	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	1	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	1	-	-	-	-

**Assessments :**

**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

<b>Course Contents:</b>	
<b>Unit No 1: Fundamentals of Force and Force Systems</b> Fundamental Laws in mechanics, Force, System of Forces, Resolution and Composition of Forces, Resultant of coplanar force system, Moment, Varignon's Theorem, Law of Moments, Couple, Equivalent force couple system.	<b>07 Hrs</b>
<b>Unit No 2: Equilibrium of Bodies and Friction</b> Equilibrium of systems/bodies, Conditions of Equilibrium, Lamis' Theorem, Free Body Diagram, Friction: Friction for bodies on horizontal and inclined planes and their applications.	<b>07 Hrs</b>
<b>Unit No 3: Analysis of Beams and Trusses</b> Beam, Types of supports, Types of beams, Types of loads, Analysis of Simple and Compound beams, Virtual work method for support reactions. Introduction of Trusses, Perfect Truss, Deficient Truss, Redundant Truss, Analysis of Statically determinate plane trusses by Method of Joints & Method of Section,	<b>08 Hrs</b>
<b>Unit No 4: Centroid &amp; Moment of Inertia</b> Center of Gravity & Centroid, Moment of Inertia of Standard shapes, Parallel and perpendicular axis theorem, Moment of Inertia of composite figures, Radius of Gyration, introduction of mass moment of inertia.	<b>07 Hrs</b>
<b>Unit No 5: Kinematics &amp; Kinetics of Motion of Bodies</b> Kinematics: Introduction to basic terminologies. Equations of motion for uniform and variable acceleration, Motion under Gravity for Linear motion, Kinetics of Linear motion: Newton's Laws, Alembert's Principle, Work- Energy Principle, Impulse Momentum Principle, Kinetics of Circular Motion, Banking of roads, Super elevation.	<b>08 Hrs</b>
<b>Unit No 6: Impact and Collision</b> Introduction to energy & momentum, Impact, Types of Impact, Law of Conservation of Momentum, Coefficient of Restitution, Direct and Indirect Impact and their applications.	<b>04 Hrs</b>
<b>Textbooks:</b> 1. P.G. Despande, Applied Mechanics, Mahalaxmi Publication. 2. R.S. Khurmi, Text book of Engineering Mechanics, S. Chand Publications.	
<b>References:</b> 1. S. S. Bhavikattis, Engineering Mechanics, New Age International Pvt. Ltd. 2. R. K. Bansal and Sanjay Bansal, Engineering Mechanics 3. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers Vol.-I and II, Tata Mc-Graw Hill Publication. 4. K. I. Kumar, Engineering Mechanics, Tata Mc-Graw Hill Publication. 5. S. B. Junnerkar, Engineering Mechanics. 6. Irving H. Shames, Engineering Mechanics, Prentice Hall of India, New Delhi. 7. S. N. Saluja, Applied Mechanics, Satya Prakashan, New Delhi. 8. Ferdinand Singer, Engineering Mechanics by Statics and Dynamics, Harper and Row Publications. 9. R. S. Khurmi, Engineering Mechanics, S. Chand Publications 10. S. Rajasekaran, G. Sankarasubramanian, Fundamentals of Engineering Mechanics, Vikas Publishing House.	
<b>Unit wise Measurable students Learning Outcomes:</b> 1. Be able to find the resultant and/or equilibrant of coplanar and non-coplanar force systems. 2. Be able to find the centroid and moment of inertia of plane geometric figures. 3. Be able to apply the concept of equilibrium. 4. Be able to find beam reaction and member forces of truss. 5. Be able to solve problems involving kinematics and kinetics of linear and rotational motion. 6. Be able to understand the concept of impact of bodies.	

<b>Title of the Course: Basic Mechanical Engineering</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0110 / UHSES0210</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Course Pre-Requisite:** Chemistry, Mathematics, Physics

**Course Description:** This course aims to impart preliminary knowledge of various mechanical systems like heat engines, refrigeration and air conditioning systems, power plants, energy conversion devices, power transmission devices, manufacturing processes, automation, mechatronic system and robot.

**Course Objectives:**

- 1.Acquire basic knowledge of mechanical engineering
2. Understand principle of energy conversion systems.
- 3.Understand and identify power transmission devices with their functions
- 4.Learn and understand manufacturing process
- 5.Learn and understand elements of automation, mechatronic system and robotics.
6. Describe the scope of mechanical engineering in multidisciplinary industries.

**Course Learning Outcomes:**

CO	After the completion of the course the student should be able to
CO1	<b>Explain</b> construction and working of various works producing, work absorbing, energy conversion and power transmission devices.
CO2	<b>Explain</b> the main components of an automobile.
CO3	<b>Explain</b> various types of manufacturing processes and elements of robotic and mechatronic system.
CO4	<b>Apply</b> steady flow energy equation to various work producing and work absorbing devices in thermal engineering to find heat or work transfer.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P11	P12
CO1	2	2										
CO2	2	2										
CO3	2	2										
CO4	2	2										

**Assessments:**

**Teacher Assessment:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

<b>Course Contents:</b>	
<b>Unit 1: Engineering Thermodynamics</b> Thermodynamic system, properties, state, process, cycle, path and point functions, heat and work, internal energy, thermodynamic equilibrium, Zeroth law, first law of thermodynamics, applications of first law to steady flow process, numerical treatment on steady flow energy equation, PMM-I, limitations of first law, statements of second law, PMM-II. Heat transfer: modes of heat transfer (no numerical treatment).	<b>6 Hrs.</b>
<b>Unit 2: Applications of thermal engineering</b> <b>Introduction to I. C. Engines:</b> Constructional details of I C Engine, Construction and working of two strokes, four stroke S.I. and C.I. engines, comparison between SI-CI engines, two stroke-four stroke engines, applications of I.C. Engines. <b>Automotive Engineering:</b> Definition of automobile, classification, main elements, block diagram of Electric Vehicles, alternative fuels <b>Introduction to Refrigeration and Air Conditioning:</b> Vapor compression refrigeration system, refrigerant types and properties, construction and working of household refrigerator and window air conditioner	<b>7 Hrs.</b>
<b>Unit 3:Energy Conversion Devices</b> <b>Hydraulic pumps:</b> Construction, working and applications of reciprocating (single and double acting) pump, centrifugal pump and submersible pump. <b>Air compressors:</b> Construction, working and applications of reciprocating, and axial compressors. <b>Hydraulic turbines:</b> construction and working of Pelton wheel, Francis turbine and Kaplan turbine.	<b>7 Hrs.</b>
<b>Unit 4: Manufacturing Processes and Mechatronic Systems</b> Classification of manufacturing processes, metal casting-steps in sand casting, advantages and applications of casting, hot and cold working of metals, metal deformation processes such as forging, sheet metal working, metal joining processes welding: Electric arc, gas welding and resistance welding with their applications, brazing and soldering, metal cutting operations such as turning, drilling, milling and grinding (working principle only), introduction to additive manufacturing. Introduction to mechatronics and robotics: block diagrams indicating main elements of mechatronic system and industrial robot.	<b>8 Hrs.</b>
<b>Textbooks:</b> 1. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Basic Mechanical Engineering, Scitech Publications. 2. Sadhu Singh, Elements of Mechanical Engineering, S.Chand (G/L) & Company Ltd (1 December 2010) 3. Basant Agrawal and C. M. Agrwal, Basic Mechanical Engineering,Wiley India Pvt. Ltd. 4. Pravin Kumar, Basic Mechanical Engineering, Pearson India Education Ltd, 2018.	
<b>References:</b> 1. Hajara and Choudhari, Workshop Technology Vol. 1 and 2, Standard Publishers. 2. V.B.Bhandari, Design of Machine Element, Tata McGraw-Hill Publication 3. Dr. P.C.Sharma, Production Technology, S. Chand Pulications, New Delhi. 4. Dr.KripalSingh,Automobile Engineering Volume I and II, Standard Education and Publishers. 5. N P Mahalik, Mechatronics- Principles, Concepts and Applications- Tata McGraw-Hill Publication, New Delhi. 6. R.K. Rajput, a Text book of Thermal Engineering, Laxmi Publication, Delhi.	
<b>Unit wise Measurable students Learning Outcomes:</b> 1. Apply steady flow energy equation to various work producing and work absorbing devices in thermal engineering to find heat or work transfer. 2. Explain the construction and working of internal combustion engines and refrigeration air conditioning systems. 3. Explain the construction and working of energy conversion devices like hydraulic pump, air compressor, hydraulic turbines and fluid power systems. 4. Explain various types of manufacturing processes and elements of robotic and mechatronic system.	

<b>Title of the Course: Introduction to Python Programming</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0111</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Description:**

The course aims to give exposure to Python programming language.

**Course Objectives:**

1. Identify working principles of computers and programming languages.
2. Demonstrate use of decision and repetition structure in order to solve specific problem.
3. Model a given big problem statement in to smaller parts to provide modular approach.
4. Choose proper data structure like list, tuples, dictionaries etc. for solving given problem

**Course Outcomes:**

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Explain working principles of computers and programming languages	II	Understanding
CO2	Demonstrate important Python programming attributes like variables, expressions, python flow control.	II	Understanding
CO3	Divide a given big problem statement in to smaller parts to provide modular approach	III	Analyze
CO4	Develop proficiency in handling strings and file systems and implement python programs using core data structures like Lists, Tuples and Dictionaries	IV	Applying

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1										
CO2	2	1										
CO3		1									1	
CO4	1	2	2	2	2							1

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

MSE is based on 50% of course content (first three units).

ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

Course Contents		
Unit No.	Unit Title and Contents	Hours
1	<b>Introduction:</b> What is a program? Understanding programming, Hardware and Software, How Computers Store Data, Compilation, Interpretation, Designing a Program, Input, Processing, and Output, Displaying Output with the print Function, Comments, Variables, expressions, Operators and operands, Reading Input from the Keyboard, Performing Calculations.	4
2	<b>Conditional Execution and Iteration:</b> The if Statement, the if-else Statement, Comparing Strings, Nested Decision Structures and the if-elif-else Statement, Logical Operators, Boolean Variables, Introduction to Repetition Structures, the while Loop: A Condition-Controlled Loop, The for Loop: A Count-Controlled Loop, Calculating a Running Total, Sentinels, Input Validation Loops, Nested Loops, Loop patterns.	8
3	<b>Functions:</b> Introduction to Functions, Defining and Calling a Void Function, designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Introduction to Value-Returning Functions: Generating Random Numbers, Writing Your Own Value-Returning Functions, the math Module, Storing Functions in Modules.	8
4	<b>Data structures and Files:</b> Basic string operations, String slicing, Testing, searching, and manipulating strings, Sequences, Introduction to lists, List slicing, Finding items in lists with the in operator, List methods and Useful built-in functions, Copying lists, Processing lists, Tuples and Dictionaries, Introduction to file input and output.	6

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1	Starting Out with Python	5 <sup>th</sup>	Tony Gaddis	Pearson	2021
2	Python for Everybody: Exploring Data Using Python 3 ( <a href="http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf">http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf</a> )	1 <sup>st</sup>	Charles R. Severance	Independent Publishing Platform	2017

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Think Python: How to Think Like a Computer Scientist ( <a href="http://greenteapress.com/thinkpython2/thinkpython2.pdf">http://greenteapress.com/thinkpython2/thinkpython2.pdf</a> )	2 <sup>nd</sup>	Allen B. Downey	Green Tea Press	2015

<b>Title of the Course: Applied Chemistry</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSBS0112 / UHSBS0212</b>	3	-	-	3

**Course Pre-Requisite:**

Students should have knowledge about basic chemistry related to periodic table, properties of elements, electrochemistry, properties of electromagnetic radiations, energy storage and energy conversion devices, properties of water, fuel, metallic materials, composite materials, etc.

**Course Description:**

This course aims to impart fundamentals knowledge of engineering materials (metallic, composite, polymer materials), and applied knowledge of water purification techniques, instrumental methods, energy conversion devices, corrosion prevention techniques. Students will be expected to communicate knowledge to society and industry.

**Course Objectives:**

1. To provide and demonstrate chemistry concepts relevant to technological field.
2. To understand various quality parameters of water, chemical fuel, metallic materials, polymeric materials, composite materials.
3. To train students to effectively use knowledge of instrumental techniques for the analysis of chemical samples.
4. To introduce chemical phenomenon involved in corrosion and corrosion control techniques.
5. To understand the chemistry of energy storage and energy conversion devices.

**Course Outcomes:**

CO	After the completion of the course the student should be able to
CO1	State concepts and principles used in various modern chemical technologies.
CO2	Illustrate the quality of water, chemical fuel, engineering materials for engineering applications.
CO3	Understand working of different techniques such as pH meter, spectrophotometer used for analysis of chemical samples.
CO4	Analyze problems related to metallic materials, composite materials and design practical solution.
CO5	Determine the quality of water and efficiency of fuel from given data.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2				1					1		
CO2	3	2			2							1		
CO3	3	2										1		
CO4	3	2										1		
CO5	3	2										1		

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

MSE is based on 50% of course content (first three units).

ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

### Course Contents

Unit No.	Unit Title and Contents	Hours
1	<p><b>Water Technology</b></p> <p>Introduction, Impurities in natural water, water quality parameters-acidity, alkalinity, chlorides, dissolved oxygen (BOD and COD), and hardness of water (causes, types, determination procedure, significance and units) (WHO standards), numerical on hardness calculation, Disadvantages of hard water in steam generation boilers, Water treatment methods-Reverse osmosis and Ion exchange process.</p>	07
2	<p><b>Polymers</b></p> <p>Introduction, Classification of Polymers- based on origin (natural, semi synthetic and synthetic), based on backbone chain (organic and inorganic) based on polymerization (addition and condensation) thermo-softening and thermosetting plastics, use and disposal of polymers, industrially important plastics-phenol formaldehyde polymer and urea formaldehyde polymer, biodegradable plastics.</p>	07
3	<p><b>Electrochemistry and Instrumental techniques</b></p> <p>An introduction to various analytical techniques as qualitative and quantitative analysis, advantages and disadvantages of instrumental methods, cell potentials, Nernst equation, reference electrodes, electrolyte concentration cells, ion selective electrodes, glass electrode measurement using glass electrode, applications of pH-metry. Ultraviolet-Visible Spectroscopy:Lamberts and Beer-Lambert's law, Single beam spectrophotometer: instrumentation and working, numerical.</p>	07
4	<p><b>Corrosion and Its Prevention</b></p> <p>Introduction, dry corrosion (corrosion due to oxygen and other gases), wet corrosion: electrochemical theory of corrosion (hydrogen evolution and oxygen absorption), differential metal corrosion, differential aeration corrosion: pitting corrosion and water line corrosion, stress corrosion, factors affecting rate of corrosion; Corrosion control: Proper design and material selection, metal coating-galvanizing and tinning, metal spraying, organic coatings.</p>	07
5	<p><b>Fuel and Energy conversion devices</b></p> <p>A) Fuel: Introduction, classification, characteristics of good fuel, calorific value-definition, units, gross calorific value, net calorific value, Calculation of calorific value by Dulong's formula, Bomb calorimeter and Boy's calorimeter-basic instrumentation, working, Numerical.</p> <p>B) Fuel Cells: Principle, components, classification of fuel cell, H<sub>2</sub>-O<sub>2</sub> Fuel Cell, Phosphoric Acid Fuel Cell (PAFC), Molten Carbonate Fuel Cell (MCFC).</p>	07
6	<p><b>Engineering Materials</b></p> <p>A) <b>Alloys:</b> Introduction, definition and classification, purposes of making alloys. Ferrous alloys: Plain carbon steels-(mild, medium and high carbon steel), stainless steel, Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico)</p> <p>B) <b>Composite materials:</b> Introduction, composition, Industrial composites-fiber reinforced plastics (FRP) and glass reinforced plastic (GFRP).</p> <p>C) <b>Cement</b>-Chemical constitutes and composition of Portland cement, setting and hardening of cement.</p>	07

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1	A Textbook of Engineering Chemistry	5	S. S. Dara and S. S. Umare	S. Chand and Company Ltd., New Delhi	2014
2	A Textbook of Engineering Chemistry	5	Shashi Chawla	Dhanpat Rai & Co. (Pvt.) Ltd, Delhi	2013
3	A Textbook of Environmental Chemistry	1	V. Subramanian	Wiley	2020
4	Engineering Chemistry	3	Godbole, Pendse, Joshi	Nirali publication, Pune	2009
5	Engineering Chemistry	1	Jayshree Parikh	Tech-Max Publication, Pune	2013

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Instrumental Methods of Chemical Analysis	5	Chatwal and Anand	Himalaya Publishing House, New Delhi	2019
2	Engineering Chemistry	2	Renu Gupta	S K Kataria and Sons, New Delhi	2010
3	Engineering Chemistry	3	O. G. Palanna	Tata McGraw Hill Education Pvt. Ltd., New Delhi	2009
4	Environment Chemistry	5	B. K. Sharma	Goel Publication, Meerut	2019
5	Fundamentals of Analytical Chemistry	9	D. A. Skoog, D. M. West	Cengage Learning	2013

**Unit wise Measurable students Learning Outcomes:**

1. To understand different quality parameters of water and working of water purification techniques.
2. To describe different types of polymers and applications of advanced polymeric materials.
3. To demonstrate the working of different instrumental methods of chemical analysis.
4. To analyze the degree of corrosion and study of its preventative techniques.
5. To illustrate the characteristics properties of an ideal fuel and fuel cells.
6. To calculate the calorific value of chemical fuels.
7. To state properties and applications of various alloys and composite materials.

<b>Title of the Course: Basic Civil Engineering</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0113 / UHSES0213</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Pre-Requisite:**

Students shall have the knowledge of:

- Fundamentals of basic science
- Basic mathematical ability
- Unit's engineering systems

**Course Description:** The Course Basic Civil Engineering provides an overview of the fundamental principles and concepts of civil engineering. It is typically designed as an introductory course for students pursuing engineering disciplines. The course aims to familiarize students with the essential knowledge and skills required to understand the built environment and the role of civil engineers in designing and constructing various infrastructure projects.

**Course Objectives:**

1. To introduce surveying and levelling methods, instruments, and techniques used to measure and map the land for engineering projects.
2. Disseminate basics of modern civil engineering instruments.
3. Impart basics of building components, building materials and building services
4. To introduce about different construction materials used in civil engineering projects and understand their properties, applications, and limitations.

**Course Outcomes:**

CO	After the completion of the course the student should be able to
CO1	Describe the significance, objectives and principles of Surveying and levelling.
CO2	Discuss basics of modern infrastructure and modern civil engineering tools.
CO3	Explain different types of planning principles, building components and building bye-laws.
CO4	Summarise types, properties and uses of Building materials.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			1				1	2		1	1		
CO2	2				2				1			1		
CO3	1											1		
CO4	1		1	1						2		1		1

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.  
MSE is based on 50% of course content (first two units).  
ESE is based on 100% course content with 60-70% weightage for course content (last two units) covered after MSE.

### Course Contents

Unit No.	Unit Title and Contents	Hours
1	<p><b><u>Introduction to Surveying and Levelling</u></b></p> <p><b>Surveying:</b> Principles of surveying, Classification &amp; types of surveys, Linear Measurement: electronic distance measurements (EDM). Angular Measurements: Compass &amp; its types, Meridian &amp; its types, Bearing and its types, System of bearing, Calculation of included angles, local attraction &amp; its correction.</p> <p><b>Levelling:</b> Terms in levelling, Types of bench marks, Types of Levels such as Dumpy level, Auto Level, Temporary adjustments of level instruments, Types of levelling, Methods of reduction of levels.</p>	7
2	<p><b><u>Infrastructure Development and Modern Civil Engineering Tools</u></b></p> <p><b>Role of Civil Engineering in infrastructure development:</b> Infrastructure and its types, significance for nations economy, significance of civil engineering in Infrastructural development, Sustainability in Infrastructural development, nationally important civil engineering structures and their significance.</p> <p><b>Modern Civil Engineering Tools:</b> Introduction, classification. Modern mapping instruments-Digital level, Total station GPS, DGPS, UAV principles, components and users, Basics of Remote Sensing and Geographic Information System. Introduction to automation and robotics in civil engineering applications.</p>	7
3	<p><b><u>Building Planning and Building Components</u></b></p> <p>Principles of planning, introduction to Building Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per the local authority. Elements of Sub structure &amp; super-structures and their functions. Types of foundations- shallow and deep and their suitability. Types of buildings- Load bearing &amp; framed structure, Introduction to types of loads, Factor of Safety, Concept of Stability.</p>	7
4	<p><b><u>Building Materials and Building Services</u></b></p> <p><b>Types, properties and uses of building materials:</b> Stone, Brick, Cement, Sand, Aggregate, Steel, Aluminium, timber, etc.</p> <p><b>Roofing types and materials:</b> Types Roofing Tiles, Aluminium-Galvanized Iron Polycarbonate Sheets etc.</p> <p><b>Flooring materials:</b> Types of Flooring Tiles-Kadappa, Shahabad, Marble, Granite etc.</p> <p><b>Types of Bonds:</b> Introduction to English &amp; Flemish bonds.</p> <p><b>Building Services:</b> Electrification, Plumbing and Firefighting.</p> <p><b>Sustainable Construction Materials:</b> Introduction, need, significance, some Sustainable Construction Materials like bamboo, green cement, plastic waste bricks etc.</p>	7

### Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	Basic Civil Engineering	First	S. S. Bhavikatti	New Age International Publications	2009

2.	Basic Civil Engineering	First	Gopi S	Pearson Publication	2009
3.	Basic Civil and Environmental Engineering	First	G. K. Hiraskar, C. P. Kaushik and A. Kaushik	New Age International Publications	2010

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Surveying	Vol-III	B.C. Punmia	Laxmi Publication	1990
2	Irrigation Engineering	Sixteenth	B. C. Punmia	Dhanpat Rai Publications	2009
3	The Civil Engineering Handbook	Second	W. F. Chen and J. Y. R. Liew	CRC press (Taylor and Francis)	2003
4	Essentials of civil engineering	First	K. R. Dalal	Charotar Publishing House	2012

**Unit wise Measurable students Learning Outcomes:**

- **UO 1:** Explain concepts of Surveying and levelling as well as to understand working and use of Surveying and levelling instruments.
- **UO 2:** To understand role of Civil Engineering in infrastructure development of the nation as well as to gain knowledge of modern civil engineering tools.
- **UO 3:** Explain various building construction materials available and their properties.
- **UO 4:** Explain various building components and their basic planning.

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<b>Title of the Course: Fundamentals of Electrical Engineering</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSPC0114 / UHSPC0214</b>	<b>2</b>	-	-	<b>2</b>

**Course Pre-Requisite:** Modern Physics, Electro-magnetism, fundamental concepts of Electrical Engineering, Semiconductor Devices.

**Course Description:** Basic knowledge of Electrical Engineering is very essential for all the Engineers. In this course the analysis of DC and AC Electric Circuits, and the fundamentals of magnetic circuits are dealt with. A comprehensive study of Electrical Machines such as DC Motor and Transformer is included. Also, this course has been designed to introduce students with construction, theory and characteristics of various electronics devices.

**Course Objectives:**

1. To learn the basics of DC Circuit with Magnetic Circuit and analyze typical circuits.
2. To learn the AC circuits and analyze typical circuits.
3. To study the construction and working of DC Motor.
4. To study the construction and working Single-Phase Transformer.
5. To impart knowledge of semiconductor diodes and transistors with their characteristics & applications.
6. To become Familiarize and understand various types of transducers.

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	<b>Study &amp; Analyze</b> the DC circuits, AC circuit and Magnetic Circuits.
<b>CO2</b>	<b>Study</b> performance characteristics and working of DC Motor & Transformer.
<b>CO3</b>	<b>Examine</b> performance of electronic devices like diode, transistors etc.
<b>CO4</b>	<b>Illustrate</b> the knowledge of transducers and selection of suitable transducer for application.

**CO-PO Mapping:**

	CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	3	2	1				1	1					2	1	
<b>CO2</b>	3	3	1	1			1	1							1
<b>CO3</b>	1	3		1											
<b>CO4</b>	3			2											1

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

**ISE 1 and ISE 2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

**MSE** is based on 50% of course content (first two units).

**ESE** is based on 100% course content with 60-70% weightage for course content (last two units) covered

after MSE.

**Course Contents**

Unit No.	Unit Title and Contents	Hours
1	<p><b>Electric Circuit &amp; its Fundamentals:</b></p> <p><b>DC Electric Circuit:</b> Kirchoff's laws, Concept of constant voltage source, Analysis of series and parallel DC circuit with resistances, Voltage rating, Power rating of resistive devices, Numerical treatment on DC electric circuit.</p> <p><b>Magnetism:</b> Review Magnetism, B H curve, Magnetic leakage &amp; fringing.</p> <p><b>Single Phase AC Fundamentals:</b> Generation of Sinusoidal Voltage, RMS value, Average value, Form factor, Peak factor, Phasor representation, Impedance of AC circuit, Powers- Active, Reactive &amp; Apparent, Power Factor and its Significance, Power Factor Improvement by Capacitive bank.</p>	08
2	<p><b>DC Motor &amp; Single Phase Transformers:</b></p> <p><b>DC Motor:</b> Basic principle of any electric motor, Construction and Working of DC motor, Types of DC motors and their Speed Torque characteristics with Applications.</p> <p><b>Single Phase Transformer:</b> Principle, Construction &amp; Working, Classifications, EMF equation, voltage ratio, current ratio, Losses &amp; Efficiency.</p>	06
3	<p><b>Diode &amp; Transistors:</b></p> <p><b>Diode:</b> Review of PN junction diode, Review of Zener Diodes, Light-Emitting Diodes, Types of Rectifiers (Half Wave &amp; Full Wave), Clippers, Clampers.</p> <p><b>Transistors:</b> Types of Transistor (NPN &amp; PNP), Transistor Configuration, Characteristics of Transistors, Transistor operation and amplifying action.</p>	07
4	<p><b>Transducers:</b> Introduction, Need of transducers, Classification of Transducers, Selection Factors and General Applications of Transducers like: LVDT, RTD, Strain Gauge (Load Cell), Capacitive Proximity Sensor, Vacuum Phototube, Photo Diode, Photo voltaic, Piezo Electric devices.</p>	07

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1	Electrical Technology	Vol-II	B. L. Theraja	S. Chand	
2	Basic Electrical Engineering	4th	S. K. Sahadev	Peaeson	
3	Elements of Electrical Engineering	10th	P. V. Prasad	Cengage Learning	
4	Electronic Devices and Circuits	4th	David A. Bell	PHI	
5	Electronic Devices and Circuits	11th	RobertBoylestad, Louis Nashelsky	Pearson	2015

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Basic Electrical Engineering	3rd	D.P.Kothari, I.J.Nagrath	Tata Mc Graw Hill.	
2	Electronics Devices & Circuits		Allen Mottershead	PHI	

3	Electronic Instrumentation	3rd	H.S.Kalsi	MGH	
4	Electrical Engineering concepts and Applications		P.V.Prasad and S.Shivan Raju	Cengage learning	

**Unit wise Measurable students Learning Outcomes:**

1. Analyze DC Electric & Magnetic Circuit
2. Analyze AC circuits and to explain effect of power factor on energy saving.
3. Explain construction & working of DC Motor and Transformer.
4. Explain construction & working of single phase Transformer.
5. Understand principle operation of various types of diodes and transistors.
6. Understand principle of operation of transducers & Apply knowledge of transducer and sensor for various applications.

<b>Title of the Course: Communication Skills</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSAE0203</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Pre-Requisite: English subject at HSC**

**Course Description:**

The course intends to make learners understand and develop various communication skills required in day today life as well as in professional contexts. As domain knowledge and skills have become equally important in today's technology driven world, the current course and the one being offered in Third Year will provide the learners a great opportunity to strengthen their English communication and soft skills. Keeping in mind the current competence of the learners, the course aims to provide them revision and ample practice in the skills essential for their professional life. It includes six modules which cover basic concepts and theory of communication, business communication, verbal aptitude (English grammar), language learning skills, letter writing and comprehension. In addition to LSRW, the course sees **Thinking** as an essential language learning skill.

**Course Objectives:**

- 1 Making students understand the fundamentals of communication theory and its relevance in professional context
- 2 To hone their listening and reading comprehension skills
- 3 To introduce them to techniques to improve their spoken English and to provide them a platform for practicing these skills
- 4 To enable them to write correct and effective business letters, official letters and covering letter with resume
- 5 To introduce students to effective techniques to participate in GD and face the interviews.

**Course Outcomes:**

CO	After the completion of the course the student should be able to	Blooms Levels
CO1	<b>Demonstrate</b> communication process, methods of communication and flow of communication in business context	2
CO2	<b>Apply</b> acquired LSRW skills into real life situations and in professional context	3
CO3	<b>Compose</b> effective business and cover letters using standard language, style and structure	6
CO4	<b>Use/ Apply</b> the techniques for effective participation in GD and tips to face interviews successfully.	3

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	2	3		1		
CO2								2	2	2		1		
CO3								1	-	2	1			
CO4								2	2	2		1		

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

**ISE 1** and **ISE 2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

**MSE** is based on 50% of course content (first three units).

**ESE** is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

### Course Contents

Unit No.	Unit Title and Contents	Hours
1	<b>Communication Theory</b> <ul style="list-style-type: none"> <li>• Communication basics: Importance, process, levels</li> <li>• Forms/methods: verbal and non-verbal</li> <li>• Barriers and solutions</li> <li>• Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions</li> </ul>	6
2	<b>Enhancing Language Learning Skills (LSRWT)</b> <ul style="list-style-type: none"> <li>• <b>Effective listening:</b> Process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers</li> <li>• <b>Effective speaking:</b> Importance, various oral business contexts/situations, group communication, preparing effective public speeches</li> <li>• <b>Effective reading:</b> Importance, types, overcoming common obstacles, tips and strategies</li> <li>• <b>Effective writing:</b> Importance, paragraph writing techniques, diary/blog writing Art of précis writing, Techniques to comprehend and summarize a given technical, scientific, or industry-oriented text</li> <li>• <b>Thinking</b> as a learning skill</li> </ul>	8
3	<b>Formal Business Correspondence</b> <ul style="list-style-type: none"> <li>• Principles, structure (elements)</li> <li>• Layout (complete block, modified block, semi-block), Types (enquiry and replies, claim and adjustment)</li> </ul>	7
4	<b>Employment skills</b> <ul style="list-style-type: none"> <li>• Covering letter and resume</li> <li>• Group discussion</li> <li>• Interviews</li> <li>• Introduction to soft skills</li> </ul>	7

### Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	<i>Business Communication</i>	Third	S. Kalia and S. Agarwal	Wiley	2015

2	<i>Technical Communication</i>	Fourth	Meenakshi Raman and Sangeeta Sharma	OUP	2013	
3	<i>Business Communication</i>	Second	Meenakshi Raman and Prakash Singh	OUP	2013	
4	<i>Business Communication</i>	Second	Raymond Lesikar et al.	McGraw Hill	2015	
5	<i>Communication Skills for Professionals</i>	First	Nira Konar	PHI Learning	2011	
6	<i>High School English Grammar and Composition</i>	Latest	Wren and Martin	Blackie	2000	
7	<i>A University Grammar of English</i>	Latest	Randolph Quirk and S Greenbaum	Pearson	2007	

**Unit wise Measurable students Learning Outcomes:**

- Unit 1.** Students will understand definitions, process, and cycle of communication and will be able to select appropriate type and method of communication.
- Unit 2.** They will understand communication process in business context
- Unit 3.** They will be able to apply different strategies of LSRWT skills
- Unit 4.** They will learn different types and formats of official letters and draft various types of letters applying the knowledge gained
- Unit 5.** They will understand the techniques for effective participation in GD and tips for successful interviews.
- Unit 6.** They will be able to comprehend and summarize given technical/ scientific passages

<b>Title of the Course: General Physics and Optics Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSBS0128 / UHSBS0228</b>	-	-	2	1

**Course Pre-Requisite:**

- 1.To calculate least count of measuring instrument
2. Requisite theoretical concepts related to that experiment.

**Course Description:** This course includes Experiments to verify the laws studied in ‘General Physics and Optics’ course are included.

**Course Objectives:**

1. To study phenomenon of light like interference, diffraction, polarization and their engineering applications.
2. To understand properties of laser.
3. To study Rayleigh’s criteria and determine resolving power of telescope and diffraction grating.
4. To demonstrate use of optical bench and biprism in wavelength determination.
5. To analyze and obtain various crystal parameters from the XRD pattern.
6. To study motion of body and verify Newton’s laws of motion.
7. To determine acceleration due to gravity using pendulum.
8. To demonstrate application of atomic absorption spectrometer to analyze the analyte.

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	<b>Demonstrate</b> different phenomenon of light and their applications
<b>CO2</b>	<b>Analyze</b> motion of body under influence of gravity and applications of pendulum
<b>CO3</b>	<b>Analyze</b> properties of material using modern techniques.
<b>CO4</b>	<b>Demonstrate</b> experimental set up and models for tools applicable in engineering.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	3	2												
CO3	3	2			1									
CO4	3	2			2			2	3	3		1		

**Assessment Scheme:**

Assessment Component	Marks
Practical Performance	10
Journal	20
Group Presentation/Oral/Quiz	20
Total	50

**Course Contents**

Practical No.	Practical/Experiment Title and Contents	Hours
1	<b>Title of the practical/Experiment No. 1:</b> Photo cell. <b>Aim and Objectives:</b> To study photoresponse of photocell.	2

2	<b>Title of the practical/Experiment No. 2:</b> Divergence of LASER beam <b>Aim and Objectives:</b> To determine Divergence of LASER beam and study directionality of LASER.	2
3	<b>Title of the practical/Experiment 3:</b> Diameter of cylindrical obstacle <b>Aim and Objectives:</b> To determine thickness of given obstacle using diffraction.	2
4	<b>Title of the practical/ExperimentNo.4:</b> Diffraction grating using mercury vapour lamp <b>Aim and Objectives:</b> To study mercury spectrum and determine wavelength of different colours in light emitted by mercury vapour lamp using diffraction grating.	2
5	<b>Title of the practical/Experiment No. 5:</b> Resolving power of plane transmission grating. <b>Aim and Objectives:</b> To determine Resolving power of plane transmission grating.	2
6	<b>Title of the practical/Experiment No. 6:</b> Biprism experiment <b>Aim and Objectives:</b> To study phenomenon of interference and determine wavelength of light using biprism.	2
7	<b>Title of the practical/Experiment No. 7:</b> Study of crystal structure. <b>Aim and Objectives:</b> To analyze crystal structure from X-ray diffraction pattern using Bragg's law.	2
8	<b>Title of the practical/Experiment No. 8:</b> Newton's ring <b>Aim and Objectives:</b> To find the unknown wavelength of monochromatic source of light using Newtons rings.	2
9	<b>Title of the practical/Experiment No. 9:</b> Planck's Constant <b>Aim and Objectives:</b> To determine the value of Plancks constant	2
10	<b>Title of the practical/Experiment No. 10:</b> Polarimeter <b>Aim and Objectives:</b> To calculate specific rotation of sugar solution.	2
11	<b>Title of the practical/Experiment No. 11:</b> Resolving power of telescope <b>Aim and Objectives:</b> To find resolving power of telescope	2
12	<b>Title of the practical/Experiment No. 12:</b> Torsional Pendulum <b>Aim and Objectives:</b> To find modulus of rigidity of material of wire	2
13	<b>Title of the practical/Experiment No. 13:</b> Kater's Pendulum <b>Aim and Objectives:</b> To find acceleration due to gravity using Kater's pendulum.	2
14	<b>Title of the practical/Experiment No. 14:</b> Atomic Absorption Spectrometer <b>Aim and Objectives:</b> To demonstrate working of Atomic Absorption Spectrometer for analysis of analyte.	2

*\*Any 9 practical/experiments to be completed*

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1.	An Advanced Course In Practical Physics	8	D. Chattopadhyay, P.C. Rakshit	New Central Book Agency(P) Ltd	2007

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Experiments in Engineering Physics		M.N.Avadhanulu, A.A. Dani, P.M. Pokley.	S. Chand & Company Ltd., Delhi	
2	Principles and Practice of Analytical Chemistry	5	F.W. Fifield, D. Kealey	Blackwell Science Ltd	2000

**Practical wise Measurable students Learning Outcomes:**

1. To **relate** the intensity of light and distance of detector from source and verify inverse square law.
2. To **measure** angle of divergence of Laser and study its directionality.
3. To **demonstrate** relation between size of obstacle and diffraction and use of diffraction in thickness measurement.
4. To **demonstrate** relation between wavelength and angle of diffraction and use of diffraction grating in determination of wavelength of light.
5. To **define** the resolving power and **verify** its dependency on order of diffraction and number of lines on grating.
6. To **demonstrate** interference fringes using biprism and determine wavelength of beam of light.
7. To **analyze** crystal structure and obtain various crystal parameters from the XRD pattern using Bragg's law.
8. To **find** the wavelength of monochromatic source of light using interference phenomenon.
9. To **determine** the value of planks constant
10. To **explain** phenomenon of optical activity and determine specific rotation of sugar solution.
11. To **explain** Rayleigh's criterion and determine resolving power of telescope.
12. To **find** modulus of rigidity of material of wire using torsional pendulum.
13. To **find** acceleration due to gravity using Kater's pendulum.
14. To **demonstrate** working of Atomic Absorption Spectrometer for analysis of analyte.

<b>Title of the Course: Engineering Mechanics Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0129 / UHSES0229</b>	-	-	2	1

**Course Pre-Requisite:** Preliminary knowledge of Physics and Mathematics

**Course Description:**

Engineering mechanics forms a core subject which is taught to students of all disciplines of engineering. The study of this subject is aimed at developing a thorough understanding of basic concepts and principles of mechanics and their application to solve engineering problems.

**Course Objectives:**

1. To explain the application of fundamental laws of mechanics in practice.
2. To explain the graphical techniques for confirming the analytical solution of problems in mechanics.

**Course Learning Outcomes:**

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		level	Descriptor
CO1	Experiment with the principles of engineering mechanics practically.	3	Applying
CO2	Conclude the observations in practice with the expected theoretical results of concept application.	4	Analysing
CO3	Solve examples on force systems using graphical tools.	3	Applying

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	2	3	-	-	-	-	-	-	2	-	-	-	-	-	
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	
CO3	2	3	-	-	-	-	-	-	2	-	-	-	-	-	

**Assessments :**

**Teacher Assessment:**

One component of In Semester Evaluation (ISE) having 100%, weights respectively.

Assessment	Marks
ISE	50

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

**Course Contents:**

Experiment No. 1: Verification of Law of Polygon of Forces	<b>02 Hrs.</b>
Experiment No. 2: Determination of Forces In the Members of Simple Jib Crane.	<b>02 Hrs.</b>
Experiment No. 3: Verification of Law of Moment	<b>02 Hrs.</b>
Experiment No.4: Determination of Reaction at the Simply Supported Beam.	<b>02 Hrs.</b>
Experiment No.5:Composition of Concurrent and Non concurrent force system by Graphical method. (One numerical on each).	<b>02 Hrs.</b>
Experiment No.6:Analysis of beam by Graphical method.(One numerical on each).	<b>02 Hrs.</b>

Experiment No. 7: Analysis of Truss by Graphical method. (One numerical on each).	<b>02 Hrs.</b>
Experiment No.8: Determine the Coefficient of Friction for motion on Horizontal Plane.	<b>02 Hrs.</b>
Experiment No.9: Determine the Coefficient of Friction for motion on Inclined Plane.	<b>02 Hrs.</b>
<b>Textbooks:</b>	
1. P.G. Deshpande, Applied Mechanics, Mahalaxmi Publication.	
2. R.S. Khurmi, Text book of Engineering Mechanics, S. Chand Publications.	
<b>References:</b>	
10. S. S. Bhavikattis, Engineering Mechanics, New Age International Pvt. Ltd.	
11. R. K. Bansal and Sanjay Bansal, Engineering Mechanics.	
<b>Experiment wise Measurable students Learning Outcomes:</b>	
1. Be able to find the resultant of coplanar and non-coplanar force systems.	
2. Be able to apply the concept of equilibrium.	
3. Be able to apply the principle of moment.	
4. Be able to find beam reaction.	
5. Be able to find the resultant coplanar and non coplanar force systems by graphical method.	
6. Be able to find beam reaction by graphical method.	
7. Be able to find member of forces of truss by graphical method.	
8. Be able to find coefficient of friction for motion on horizontal plane.	
9. Be able to find coefficient of friction for motion on inclined plane.	

<b>Title of the Course: Basic Mechanical Engineering Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0130 / UHSES0230</b>	-	-	2	1

**Course Description:** This course aims to impart preliminary knowledge of various mechanical systems like heat engines, refrigeration and air conditioning systems, power plants, energy conversion devices, power transmission devices and manufacturing processes.

**Course Objectives:**

1. Acquire basic knowledge of mechanical engineering
2. Understand principle of energy conversion system.
3. Understand and identify power transmission devices with their functions
4. Learn and understand manufacturing process.

**Course Learning Outcomes:**

CO	After the completion of the course the student should be able to
CO1	Show the components of various work producing, absorbing devices and power plants with their functions.
CO2	Demonstrate the components of energy conversion and mechanical power transmission devices with their functions.
CO3	Show the main elements of an automobile with state their function.
CO4	Demonstrate the components of machine tools and state their functions.
CO5	Develop a prototype/ working model for identified problem using knowledge of mechanical engineering.

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	2											
CO3	2											
CO4	2											
CO5	2	2	2	2		2			2	2	2	2

**Assessments:**

**Teacher Assessment:**

In Semester Evaluation (ISE)

Assessment	Marks
ISE	25

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

**Course Contents:**

<b>Experiment No. 1:</b> Study of steam thermal power plant	<b>02 Hrs.</b>
<b>Experiment No. 2:</b> Demonstration and identification of components of internal combustion engine with their functions.	<b>02 Hrs.</b>
<b>Experiment No. 3:</b> Identification of main elements of an automobile and understanding their functions	<b>02 Hrs.</b>
<b>Experiment No. 4:</b> Identification of functions and components of domestic refrigerator and window air conditioner.	<b>02 Hrs.</b>
<b>Experiment No. 5:</b> Demonstration of pumps, air compressor and hydraulic turbines.	<b>02 Hrs.</b>

<b>Experiment No. 6:</b> Performing basic hydraulic circuit for obtaining liner and rotary motion of actuator.	<b>02 Hrs.</b>
<b>Experiment No. 7:</b> Demonstration of mechanical power transmission devices	<b>02 Hrs.</b>
<b>Experiment No. 8:</b> Identification and demonstration of elements of centre lathe, drilling machine and milling machine and understanding their functions.	<b>02 Hrs.</b>
<b>Experiment No. 9:</b> Presentation and report preparation on course level problem-based learning activities.	<b>04 Hrs.</b>
<b>Experiment No. 10:</b> Assignment- numerical treatment on applications of first law of thermodynamics to steady flow process	<b>02 Hrs.</b>
<b>Experiment No. 11:</b> Report preparation on general specifications of given type of an automobile.	<b>02 Hrs.</b>
<b>Textbooks:</b>	
5. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., Basic Mechanical Engineering, Scitech Publications.	
6. Sadhu Singh, Elements of Mechanical Engineering, S.Chand (G/L) & Company Ltd (1 December 2010)	
7. Basant Agrawal and C. M. Agrwal, Basic Mechanical Engineering, Wiley India Pvt. Ltd.	
8. Pravin Kumar, Basic Mechanical Engineering, Pearson India Education Ltd, 2018	
<b>References:</b>	
7. Hajara and Choudhari, Workshop Technology Vol. 1 and 2, Standard Publishers.	
8. V.B.Bhandari, Design of Machine Element, Tata McGraw-Hill Publication	
9. Dr. P.C.Sharma, Production Technology, S. Chand Publications, New Delhi.	
10. Dr. Kripal Singh, Automobile Engineering Volume I and II, Standard Education and Publishers.	
11. N P Mahalik, Mechatronics- Principles, Concepts and Applications- Tata McGraw-Hill Publication, New Delhi.	
12. R.K. Rajput, a Text book of Thermal Engineering, Laxmi Publication, Delhi.	
<b>Experiment wise Measurable students Learning Outcomes:</b>	
1. Explain construction and working of steam thermal power plant.	
2. Explain and demonstrate the constructional details of I.C.Engine.	
3. Identify various components of an automobile and state their functions.	
4. Identify various components of domestic refrigerator and window air conditioner and state their functions.	
5. Explain and demonstrate the construction and working of energy conversion devices	
6. Identify various components of fluid power system and state their functions.	
7. Demonstrate types of gears, gear trains, couplings and bearings.	
8. Identify various parts of centre lathe, drilling machine and milling machine with their functions.	
9. Evaluate the power transmitted by mechanical power transmission devices.	
10. Create a prototype/ model for identified problem using knowledge of mechanical engineering.	

<b>Title of the Course: Introduction to Python Programming Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0131</b>	-	-	2	1

**Course Pre-Requisite:** Introduction to programming theory

**Course Description:** This course covers practical programming assignments need to be solved by students based on the theory course.

**Course Objectives:**

1. Apply concepts of input and output streams for developing interactive programs.
2. Develop a solution using loops and conditional statements.
3. Build a program to process data efficiently using Tuples and Dictionaries.
4. Develop a program with persistent data storage capability.

**Course Outcomes:**

CO	After the completion of the course the student should be able to	Bloom Level
CO1	Apply concepts of input and output streams for developing interactive programs.	3
CO2	Develop a solution using loops and conditional statements.	3
CO3	Build a program to process data efficiently using List, Tuples and Dictionaries.	6
CO4	Develop a program with persistent data storage capability.	6

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1								1				
CO2	1													
CO3	1													
CO4	2	2	2	1	2							2		

**Assessment Scheme:**

*ISE will be a quiz and assignment submission evaluation. ESE will be a practical and Oral examination.*

Assessment Component	Marks
ISE (Quiz/Oral/Assignments/App Development)	25

**Course Contents**

Practical No.	Practical Title and Contents	Hours
1	Introduction to Python, Demo on IDE, Keywords, Identifiers, I/O Statements, Simple Program to display Hello world in Python.	2
2	Write a program to perform different Arithmetic Operations on numbers in Python.	2
3	Program based on different types of operators	2

4	Program based on the decision structures and Boolean logic	2
5	Program to demonstrate use of different types of looping statements	2
6	Program to write and use different types of user defined function	2
7	Programs to demonstrate use of various built in functions in python	2
8	Write a Python program to construct the given pattern, using a nested for loop	2
9	Write a program to create, append, and remove lists in python	2
10	Write a program to demonstrate working with tuples and dictionaries in python	2
11	Program based on strings and its operations	2
12	Program based on files and its operations	2

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1	Starting Out with Python	5 <sup>th</sup>	Tony Gaddis	Pearson	202
2	Python for Everybody: Exploring Data Using Python 3 ( <a href="http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf">http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf</a> )	1 <sup>st</sup>	Charles R. Severance	Independent Publishing Platform	201

<b>Title of the Course: Workshop Practice Laboratory</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>									
<b>Course Code: UHSVS0132/ UHSVS0232</b>		--	--	<b>2</b>	<b>1</b>									
<b>Course Pre - Requisite: Nil</b>														
<b>Course Description:</b>														
<b>Course Description: Being a Practice – oriented course, this course focuses on Practicing various skills and acquires knowledge for making different components/Jobs using various workshop activities</b>														
<b>Course Objectives:</b>														
<ol style="list-style-type: none"> <li>To train the students to use different tools and equipments involved in manufacturing processes.</li> <li>To develop the skills to handle the basic hand tools required to manufacture sheet metal model for specific application</li> <li>Introduce to different materials in engineering practices with respect to their workability, formability and machinability with different equipments.</li> </ol>														
<b>Course Outcomes:</b>														
<b>CO</b>	<b>After the completion of the course the student should be able to</b>													
<b>CO1</b>	Identify Basic engineering workshop practices and safety measures.													
<b>CO2</b>	Identify different tools used for Metal forming, plastic moulding operations													
<b>CO3</b>	Enhance their knowledge skill sets with hand-on experience and teamwork inculcating analysis and lifelong learning by making a component with fitting tools at a defined accuracy.													
<b>CO4</b>	Perform different types of Welding (Arc, Gas) and Brazing, Soldering operations													
<b>CO5</b>	Develop Sheet Metal model for specific application													
<b>CO-PO Mapping:</b>														
<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	1	2	1				2			2				
<b>CO2</b>	2	3								2		1		
<b>CO3</b>	2	3								2		1		
<b>CO4</b>	2	3								2		1		
<b>CO5</b>	2	3								2		1		
<b>Assessment Scheme:</b>														
<b>Assessment Component</b>					<b>Marks</b>									
ISE is based on practical performed/ Quiz/ Job assigned/ Presentation/ Group Discussion/ Internal oral etc.					50									
<b>Course Contents</b>														
<b>Practical No.</b>	<b>Practical/Experiment Title and Contents</b>				<b>Hours</b>									
<b>1</b>	Safety in Workshop – Fire Hazards, Electric short circuit, Accident prevention methods. Introduction to Plumbing – Types of pipe joints, Threading Dies, Pipe fittings – G.I. and PVC <b>Demonstration of Die Threading process</b>				<b>2</b>									
<b>2</b>	Introduction to Metal Forming process such as Smithy, Extrusion, Wire drawing, Rolling etc and its tools and equipments, <b>One Job of any one Forming Process – One Job for each student.</b>				<b>2</b>									

3	<b>Job Completion</b> - operation execution and job completion	2
4	Introduction to Plastic Molding, Types of molding machines and Dies, Applications <b>One job for each student On Plastic Injection Machine</b>	2
5	<b>Injection moulding job</b> - operation execution and job completion	2
6	<b>Joining Process</b> - Permanent joint. Introduction to Welding Processes. Types of Welding, Arc and Gas Welding. Practice on Arc welding and edge preparation for welding and Tacking.	2
7	Operation execution for Arc welding. Introduction to soldering and Brazing process. <b>Job completion ( one job for welding and one job for soldering/Brazing for each student)</b>	2
8	<b>One job for each student on Gas Welding Process</b>	2
9	Demonstration of fitting operation and its tools. Temporary joint preparation – Drilling and Tapping operation.	2
10	Operation execution of fitting job involving drilling, Tapping cutting and Filling operation. Introduction to Precision and accuracy. <b>One Job per student</b>	2
11	Introduction to sheet metal operation.	2
12	To make small job like Pan, Tray, Box etc. Using sheet metal operation like Cutting, Bending, Folding etc( Spot welding, Seam Welding process can be introduced for completion of job) <b>One Job per student</b>	2

*\*Any 10 practical/experiments will be completed.*

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1.	“Elements of Workshop Technology Vol-1”. ISBN: 9788185099149, 9788185099149	16	Hajra & Choudhary S. K.	Media Promoters and Publishers Pvt. Ltd.	2008

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1.	“Production Technology ISBN: 9788174090997,	18	R.K.Jain	Khanna	2016
2.	Introduction To Basic Manufacturing Processes And Workshop Technology”. ISBN 8122418465, 9788122418460	11	Rajender Singh	New Age International	2006
3	Workshop Technology Vol-1 ISBN:9788185099156, 8185099154	9	Raghuvanchi B. S	Dhanpat Rai & Sons,	2010

**Practical wise Measurable students Learning Outcomes:**

1. Students should be able to Understand Basic Manufacturing Processes used in industry and Importance of safety.
2. Students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different material.
3. Upon completion of this laboratory course students will be able to fabricate components.

Title of the Course: Applied Chemistry Laboratory		L	T	P	Credit																																																																											
Course Code: UHSBS0133 / UHSBS0233		-	-	2	1																																																																											
<p><b>Course Pre-Requisite:</b> Students should have preliminary knowledge about the handling of glass wares, apparatus and preparation of chemicals. Students should have basic knowledge about fundamental principles used in various analytical techniques.</p>																																																																																
<p><b>Course Description:</b> The course intends to train students to enhance experimental skills and apply fundamental chemical principles to solve chemistry related problems in engineering. The course providing experience to students about qualitative and quantitative analysis of different samples using instrumental and non-instrumental techniques.</p>																																																																																
<p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>1.To understand various quality parameters of water and cement using volumetric quantitative analysis.</li> <li>2. To determine the quality of polymeric materials and cement.</li> <li>3. To analyze various analytical samples by using conductometer, potentiometer and spectrophotometer.</li> <li>4. To study the mechanism and estimation of corrosion rate of metals as well as corrosion preventative techniques.</li> </ol>																																																																																
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1	Determination of pH of industrial waste water using pH meter.																																																																															

2	Determination of Acid dissociation constant (pKa) of acetic acid by pH metric titration with NaOH solution.	2
3	Estimation of strong acid and weak acid from given mixture by conductometric titration.	2
4	Estimation of ferrous ammonium sulfate (FAS) from given solution by potentiometric titration.	2
5	Estimation of copper from given solution using spectrophotometer.	2
6	Identification of basic radicals from given binary mixture of inorganic salts by paper chromatography.	2
7	Determination of rate of corrosion of Aluminium metal.	2
8	Determination of hardness of given water sample by EDTA method.	2
9	Determination of chemical oxygen demand (COD) from waste water.	2
10	Determination of percentage of copper in brass alloy using standard sodium thiosulfate solution.	2
11	Determination of molecular weight of polymer by viscosity measurements.	2
12	Estimation of calcium oxide from cement sample.	
13	Drawing chemical structures using ChemDraw/ChemSketch software.	2

**\*Any 08 practical/experiments will be completed.**

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1	A Textbook on Experiments and Calculations in Engineering Chemistry	2 <sup>nd</sup>	Dara S.S	S. Chand Limited	2008
2	Laboratory Manual on Engineering Chemistry	3 <sup>rd</sup>	S.K. Bhasin, Sudha Rani	Dhanpat Rai Publishing Company	2012
3	Textbook of Engineering Chemistry with Lab Manual of Chemistry and Environmental Studies	9 <sup>th</sup>	Shashi Chawla	Dhanpat Rai Publishing Company	2013
4	Engineering Chemistry Laboratory Manual	3 <sup>rd</sup>	Manoj Kumar Solanki	Educreation Publishing	2019

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Vogels Qualitative Inorganic Analysis	7 <sup>th</sup>	A. I. Vogel, Revised by G. Svehla, B. Sivasankar	Pearson Education India	2012
2	Instrumental Methods Of Chemical Analysis	5 <sup>th</sup>	Gurdeep R. Chatwal, Sham K.Anand	Himalaya Publishing House	2019
3	Environmental Chemistry	4 <sup>th</sup>	B. K. Sharma	Goel Publishing House	2014
4	Instrumental Methods of Chemical Analysis	9 <sup>th</sup>	H. Kour	Pragati Prakashan	2021

Practical wise Measurable students Learning Outcomes:

1. To illustrate the operation of different instrumental methods for the analysis of analytical samples.
2. To demonstrate the method for the separation of components of mixtures.
3. To analyze different quality parameters of water.
4. To elaborate different techniques of corrosion prevention.
5. To determine the quality of polymer for domestic and industrial use.
6. To represent graphically different chemical structures.
7. To estimate amount of CaO in cement.

<b>Title of the Course: Basic Civil Engineering Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSES0134 / UHSES0234</b>	-	-	2	1

**Course Pre/Co-Requisite:**

- Students must have knowledge about fundamentals of Civil Engineering, Geometry.
- Applications of various instruments in field.
- Knowledge about basic science, basic mathematical ability various units etc.

**Course Description:** The course "Basic Civil Engineering Laboratory" is designed to complement the theoretical knowledge gained in the Basic Civil Engineering theory course with hands-on practical experience. The laboratory component of this course allows students to apply the concepts they have learned in real-world scenarios, conduct experiments, and gain skills in using various instruments and tools commonly used in civil engineering.

**Course Objectives:**

1. To develop skills in using surveying instruments like prismatic compass, levels, and total stations to measure distances, angles, and elevations in the field.
2. To understand the concept of brick bonds used in construction.
3. To understand the concept of planning for small residential building.

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	<b>Determine</b> linear and angular measurements using surveying and levelling instruments.
<b>CO2</b>	<b>Demonstrate</b> different types of bonds and their uses through hands on practice.
<b>CO3</b>	<b>Prepare</b> detail drawing of a residential building using planning principles and building bye laws

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1	3	1				1	1	1	1		1
CO2	2			1					1			1		
CO3	2								1		1	1		

**Assessment Scheme:**

**Teacher Assessment:**

In Semester Evaluation (ISE) having 100%.

Assessment Component	Marks
ISE (in components)	25

ISE components are based on practical performed/ maintaining the Field book/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

**Course Contents**

Practical No.	Practical/Experiment Title and Contents	Hours
1	Unit conversion Exercise.	2
2	Study and use of prismatic compass to measure bearing of survey lines for open traverse.	2

3	Study and use of prismatic compass to measure bearing of survey lines for closed traverse.	2
4	Determination of elevation of various points with dumpy level by simple levelling procedure.	2
5	Determination of elevation of various points with dumpy level by differential levelling procedure.	2
6	To Study and use of total station for various measurements	2
7	To study and construct English bond for brick masonry.	2
8	To study and construct Flemish bond for brick masonry.	2
9	Planning of a residential building (plan, elevation & section of simple 1 room)	2
10	To understand and use Global Positioning System (GPS) for navigation.	2

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1.	Surveying & Levelling	First	N. Basak	Tata Mc-Graw Hill Publication	2014
2.	Basic Civil Engineering	First	G. K. Hiraskar	Dhanpat Rai Publication	2004

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	The Civil Engineering Handbook	Second	W. F. Chen and J. Y. R. Liew	CRC press (Taylor and Francis)	2003
2	Essentials of civil engineering	First	K. R. Dalal	Charotar Publishing House	2012

**Practical wise Measurable students Learning Outcomes:**

1. Plot closed traverse of survey lines using prismatic compass.
2. Plot open traverse of survey lines using prismatic compass.
3. Determination of elevation of various points with dumpy level by simple levelling procedure.
4. Determination of elevation of various points with dumpy level by differential levelling procedures.
5. Determination of difference in elevation of various points with dumpy level by fly levelling procedures.
6. Study and use total station for various measurements
7. Understand English bond its correct practices of construction of brick masonry.
8. Understand Flemish bond its correct practices of construction of brick masonry.
9. To make lineout of a small residential building.
10. Use Basic GPS applications.

<b>Title of the Course: Fundamentals of Electrical Engineering Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSPC0135 / UHSPC0235</b>	-	-	2	1

**Course Pre-Requisite:** Modern Physics, Electro-magnetism, theoretical concepts & Semiconductor devices required for performing the experiments listed below.

**Course Description:**

This course gives hands on experience to operate and comprehend characteristic performance of various electrical devices. This course is designed for verification of basic theoretical concepts in Electrical Engineering and to introduce students with construction, theory and characteristics of various electronics devices.

**Course Objectives:**

1. To verify practically the properties of typical Electrical Circuits (DC and AC).
2. To operate typical electric machines (DC motor and single-phase transformer) safely.
3. To wire and use safety devices (fuse, MCB, starter) in a typical electrical installation.
4. To explain the working principles and applications of diode, transistor and transducers

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	<b>Connect</b> typical electrical circuits as a member of diverse group
<b>CO2</b>	<b>Demonstrate</b> use of safety electrical equipment.
<b>CO3</b>	<b>Use</b> dc motors and single-phase transformer safely in real life.
<b>CO4</b>	<b>Analyze</b> the performance of rectifiers, filters and voltage regulator.
<b>CO5</b>	<b>Demonstrate</b> the working of amplifier and traducers.

**CO-PO Mapping:**

	<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
	<b>CO1</b>	3	2	1						3	2		3	1	
	<b>CO2</b>	1	2				3		2	3	2		2		
	<b>CO3</b>	3					1		1	3			2		1
	<b>CO4</b>	1	3		1									1	
	<b>CO5</b>	3	2	1						3	2		3	1	

**Assessment Scheme:**

<b>Assessment Component</b>	<b>Marks</b>
<b>ISE (Journal Writing, Practical Performance, Oral)</b>	
<b>Journal Writing(10), Practical Performance(10), Oral(5)</b>	<b>25</b>

ISE are based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

**Course Contents**

<b>Practical No.</b>	<b>Practical/Experiment Title and Contents</b>	<b>Hours</b>
<b>1</b>	Verification of Kirchoff's Laws for DC Circuit by using MATLAB	<b>2</b>
<b>2</b>	Power Factor improvement by using Capacitor bank	<b>2</b>
<b>3</b>	Load test on single phase transformer for finding Efficiency & Voltage Regulation	<b>2</b>
<b>4</b>	Load test on DC motor.	<b>2</b>
<b>5</b>	Demonstration of use of fuse, MCB, starter, energy meter etc. in electrical installation.	<b>2</b>
<b>6</b>	Residential & Commercial Electricity Energy bill verification	<b>2</b>
<b>7</b>	Study of Half wave rectifier (HWR) with & without filter	<b>2</b>

8	Study of Full wave rectifier (FWR) with & without filter	2
9	Study of Zener Diode as Voltage regulator	2
10	Study of output characteristics of Transistors.	2
11	Study of Strain Gauge (Load Cell).	2
12	Study of speed measurement using proximity switch & photoelectric pick up	2

**Textbooks:**

SN	Title	Edition	Author/s	Publisher	Year
1	Electrical Technology	Vol-II	B. L. Theraja	S. Chand	
2	Elements of Electrical Engineering	10th	P. V. Prasad	Cengage Learning	

**Reference Books:**

SN	Title	Edition	Author/s	Publisher	Year
1	Laboratory courses in Electrical Engineering	--	S G Tarnekar and P. K Kharbanda	S Chand	
2	Basic Electrical Engineering	3rd	D.P. Kothari, I.J.Nagrath	TMH PublishingCo. Ltd., New Delhi	

**Practical wise Measurable students Learning Outcomes:**

1. To verify Kirchhoff's laws.
2. To improve power factor of a circuit by using static condenser.
3. To explain effect of load on the efficiency, current and secondary terminal voltage of a single-phase transformer.
4. To explain effect of load on efficiency, current and speed of dc motor
5. To wire electric circuits using fuse, MCB, starter, energy meter.
6. To calculate energy bill from given data and verify with energy bill received from MSEDCL
7. Students will be able to analyze the performance of rectifiers, filters and voltage regulator.
8. Students will be able to explain operation of RTD proximity switch & photoelectric pick up for measurement of speed.

<b>Title of the Course: Ecology, Energy and Environment</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSIK0136 / UHSIK0236</b>	2	-	-	2

**Course Pre-Requisite:**

Students shall have the knowledge of:

- Fundamentals of Science (Basic Physics and Chemistry)
- Basic mathematical ability
- Unit's engineering systems

**Course Description:** The National Education Policy 2020 lays special emphasis on the promotion of Indian Languages, Arts and Culture, and tries to remove this discontinuity in the flow of **Indian Knowledge System** by integrating IKS into curriculums at all levels of education. The course "**Ecology, Energy and Environment**" has been adapted from the set of courses mentioned in "**Indian Science and Technology.**" The course "Ecology, Energy and Environment " is designed to provide students with a comprehensive understanding of the interconnections between the natural environment, human activities, and energy resources within the framework of the Indian Knowledge System. This interdisciplinary course aims to foster an appreciation of ecological principles, environmental challenges, and sustainable energy solutions relevant to the Indian context.

**Course Learning Objectives:**

**At the end of the course, students will**

- Understand the importance of Ecology, Environment, Environmental Ethics and role of humans.
- Understand the evolution of Indian agriculture, water scarcity issues and the importance of water conservation.
- Describe the importance of environmental resources and its conservation.
- Describe basic energy concepts, the consequences of today's energy consumption and understand non-conventional and renewable energy technologies and their application

**Course Outcomes:**

COs	After the completion of the course, the students will be able to	Bloom's Cognitive
		Descriptor
CO1	Explain the importance of Ecology, Environment and role of humans.	Cognitive Understanding (L2)
CO2	Discuss how agriculture originated during Neolithic times and discover the diffusion of agriculture today.	Cognitive Understanding (L2)
CO3	Identify the measures for Environmental resources management.	Cognitive Applying (L3)
CO4	List the Energy conservation measures to achieve Sustainability in energy use.	Cognitive Analysing (L4)

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	1			2		
CO2						1						2		
CO3		1					1				1		2	1
CO4	1	1					2				1			1

<b>Assessments:</b>	
<b>Assessment</b>	<b>Weightage (Marks)</b>
ISE	100
<ul style="list-style-type: none"> <li>• <b>ISE:</b>Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.</li> </ul>	
<b>Course Contents:</b>	
<p><b>Unit 1: Studying Ecology &amp; Environment</b> Defining Nature, Social, Cultural and Religious Structure and values of Environment, Ecological consciousness, developed and developing nation's views, philosophy of environment, Environmental governance, Integrating ethical values and knowledge, <b>Nature-human interface:</b> Introduction, Defining Nature, Social Animal, Nature-Human Interface: Changing Concerns.</p>	<b>07 Hrs.</b>
<p><b>Unit 2: Environment, Early Societies and Agricultural Societies</b> <b>Origins of Agriculture:</b> Neolithic Revolution, Early Agriculture and Environment, Early Agriculture: Regional Dispersal, Baluchistan, Indus System, Northern Valleys, East Peninsular India. Nomadic Pastoralism, Hunting-Gathering, Resource Use and Human Societies, Agricultural Diffusion and Regional Specificities, River Valley Civilization. <b>Importance of water:</b> Water uses and dependency, water scarcity, consumption in industries, water conservation practices from ancient times, Indian water policy, Sustainability in water conservation.</p>	<b>07 Hrs.</b>
<p><b>Unit 3: Colonialism, Environment and Modern Concerns</b> History of Colonialism and Industrialism in India, Traditional Wisdom, Indigenous/traditional Communities and Livelihood Security, Industrial Society, Modernization and Adaptations to Natural and Anthropogenic variations <b>Resource Management:</b> Water and Forests, Environmental Agenda, Understanding of Environment, Alternatives, Environmental Resources, Biodiversity, Development and Environmental Concerns, Urban Planning.</p>	<b>07 Hrs.</b>
<p><b>Unit 4: Energy and its conservation</b> Importance of energy and its related issues. Quantifying energy, types of energy sources and end uses. Conventional energy sources. Non-conventional energy sources, Energy Consumption: Historical Patterns, energy conservation practices, non-conventional energy generation potential of India, Earth's global energy balance, energy budget - past and present, energy conservation, energy efficiency and sustainable energy systems.</p>	<b>07 Hrs.</b>
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Coping with Water Scarcity: Addressing the Challenges by Iacovos Iacovides, Ian Cordery, and Luis Santos Pereira (2009)</li> <li>2. Water Security in India: Hope, Despair, and the Challenges of Human Development by Ashok Chandra Shukla and Vandana Asthana (2014)</li> <li>3. Energy Management and Conservation by K. V. Sharma and P. Venkateshaiah (2011)</li> <li>4. Energy Engineering and Management (Second Edition) by Amlan Chakrabarti (2011).</li> <li>5. 2021-22 Syllabus of IIT Delhi for subjects "ESL727 Energy and Environment", "ESL740 Non-conventional Sources of Energy" and "HSL703 Perspectives on climate change: Implications"</li> <li>6. World Commission non-Environment and Development. 1987. <i>Our Common Future</i>. Oxford University Press.</li> <li>7. Khanduri, I., Pandey, M., Maikhuri, R. 2006. <i>Environment and Ecology</i>, Trans media Publication Srinagar Garhwal</li> <li>8. P.D. Sharma, 2012 Ecology and Environment. Rastogi Publication</li> <li>9. Singh, J. S., Singh, S. P. and Gupta, S. R. 2014. <i>Ecology, Environmental Science and recourse Conservation</i>. Anamaya Publishers.</li> <li>10. Robert A. Ristinen, Jack J, Kraushaar, Jeffery Brack, Energy and the Environment, Wiley Publication</li> </ol>	

<b>Title of the Course: COMPUTER AIDED ENGINEERING DRAWING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSVS0138 / UHSVS0238</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>3</b>

**Course Pre-Requisite:** General Awareness, Knowledge of Geometry at SSC Level

**Course Description:** Course consists of Basics of AutoCAD, Geometrical constructions using AutoCAD & Conversion of pictorial views in to orthographic view, Isometric Projections & Dimensioning techniques

**Course Objectives:**

5. To learn Manual as well as computer based Engineering Drawing.
6. To project line, plane and solids by using 1<sup>st</sup> angle method of projections.
7. To understand and develop lateral surfaces of cut sections of different standard solids
8. To understand and project orthographic and isometric Projections

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	Understand basic commands of CAD and use of AutoCAD 3D Modeling Workspace for practicing lines, solids, lettering and dimensioning in Engineering Drawing.
<b>CO2</b>	Visualize and project Orthographic and Isometric drawings of simple machine components
<b>CO3</b>	Demonstrate and projections of points, lines, planes and Solids by appropriate method
<b>CO4</b>	Develop lateral surfaces of solid cut sections and their projections

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1												1		
CO2	1		1	2	2					1				
CO3			1	2	2					1			1	1
CO4			1		1								1	1

**Assessment Scheme:**

Two components of In Semester Evaluation (ISE), and one End Semester Examination (ESE) having External POE.

SN	Assessment	Marks	Remark
1	In Semester Evaluation (ISE-1)	25	Assignment, Quiz, Practice Sheets, Oral
2	In Semester Evaluation (ISE-2)	25	Assignment, Quiz, Practice Sheets, Oral
3	ESE (POE) External	50	POE ( Batch wise with Manual & Software Based Drawing)

ISE is based on Assignment/Declared test/Quiz/Oral etc.

ESE is based on POE (External) Weightage is 40% Manual Drawing & 60% Software based Engineering Drawing

<b>Course Contents</b>		
<b>Unit No.</b>	<b>Unit Title and Contents</b>	<b>Hours</b>
<b>Unit 1</b>	<p><b>Introduction to Computer Aided Drawing</b></p> <p>Introduction to CAD &amp; Graphical user interface of the CAD software. Drawing instruments, Geometrical constructions, Lettering, Title block, Sheet sizes, Line types, Dimensioning.</p> <p><b>Methods of projection-</b> Projection concept, Orthographic Projection, Projection of points in all quadrants, first angle Vs. third angle method of projection.</p> <p><b>Projection of Lines</b> ( Line inclined to both plane Rotation Method Only)</p>	<b>6Hrs.</b>
<b>Unit 2</b>	<p><b>Projections of Planes &amp; Solids</b></p> <p>Projection of planes (only regular polygons like Triangular, Square, Rectangular, Pentagonal, Hexagonal and circle) inclined to HP. Projection of regular Solids such as Prisms, pyramids, cylinder and cone with their axis inclined to HP (3 stage problems).</p>	<b>8 Hrs.</b>
<b>Unit 3</b>	<p><b>Development of Lateral Surfaces</b></p> <p>Development of plane and curved lateral surfaces of regular Prisms, Pyramids, Cylinders and Cones (cutting planes specified via figure).</p>	<b>6Hrs.</b>
<b>Unit 4</b>	<p><b>Orthographic &amp; Isometric Projections</b></p> <p>Conversion of pictorial view of a three dimensional object into orthographic views. Concept of isometric projection, Isometric scale and isometric drawing. Conversion of orthographic views of simple 3D objects into single isometric drawing. Introduction of 3D Modeling workspace of AutoCAD. 3D Modelling of Simple Object using AutoCAD.</p>	<b>8Hrs.</b>
<b>Lab Contents:</b>		
<b>Practical 1</b>	<p><b>Submission Sheet on Geometrical Constructions &amp; Projections of Line</b></p> <p>Introduction of AutoCAD GUI &amp; Basic Commands: at least 4 Figures are to be drawn in sketch book and redraw using AutoCAD and Line Problems for submission sheets</p>	<b>4 Hrs.</b>
<b>Practical 2</b>	<b>Submission Sheet on Projections of Planes</b>	<b>4 Hrs.</b>
<b>Practical 3</b>	<b>Submission Sheet on Projections of Solids</b>	<b>4 Hrs.</b>
<b>Practical 4</b>	<b>Submission on Development of Lateral Surfaces</b>	<b>4 Hrs.</b>
<b>Practical 5</b>	<b>Submission Sheet on Orthographic Projections</b>	<b>4 Hrs.</b>
<b>Practical 6</b>	<b>Isometric Projections &amp; 3D Modelling</b>	<b>4 Hrs.</b>
<b>Practical 7</b>	<b>Practice &amp; Internal Oral</b>	<b>4 Hrs.</b>
<p><b>Textbooks:</b>Engineering Graphics with AutoCAD - D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, (PHI) Publisher 2010.</p> <p>1. N.D.Bhatt, "Engineering Drawing", Charotar Publisher, 41th Edition, 2016  2. Luzzerder, "Graphics for Engineering", Prentice Hall International, 1st Edition,1964  3. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi.</p>		
<b>Reference Books:</b>		
<p>1. Cencil Jensen, Jay D.Helsel , Dennis R. Short, "Engineering Drawing &amp; Design", TATA McGRAWHILL,7th Edition, 2012.  2. Basant Agrawal and C M Agrawal, "Engineering Graphics", Tata Mc Graw Hill Education Pvt. Ltd.,New Delhi, 7<sup>th</sup> Edition, 2012  3. Computer Aided Engineering Drawing, Prof. M. H. Annaiah, New Age International Publisher, New Delhi, 2009</p>		

<b>Title of the Course: Communication Skills Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: UHSAE0222</b>	-	-	2	1

**Course Pre/Co-Requisite: Communication Skills –Theory**

**Course Description:**

This is a practice-oriented course, laying importance on application of various skills being learnt in the Communication Skills theory course such as grammar, techniques and strategies for improving English sub-skills and vocabulary, etc. In addition, this course focuses on English Phonology so that the learners will be able to use correct pronunciation, stress pattern and intonation.

**Course Objectives:**

1. To acquaint students with English phonology and make them practice correct pronunciation
2. To provide them ample practice for developing their LSRW skills
3. To strengthen their grammatical competence through practice

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	<b>Comprehend</b> English Sounds, stress patterns and intonation and English grammar to perform better professionally
<b>CO2</b>	<b>Use</b> listening and reading comprehension techniques to comprehend technical discourse
<b>CO3</b>	<b>Construct</b> effective speeches and technical paragraphs

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					1			1	1	1		1		
CO2					1			-	1	3		2		
CO3					-			1	2	3		-		
CO4														
CO5														

**Assessment Scheme:**

Assessment Component	Marks
<b>ISE:</b> ISE is based on practical performance/ Quiz/ Presentation/ Group Discussion/Story telling/Assignments/Demonstration, etc.	
<b>Distribution of Marks:</b>	
▪ Lab Manual	10
▪ Grammar tests and exercises	10
▪ Lab Tests and Practical Performance	10
▪ Group Discussion	05
▪ Personal Interviews	05
▪ Public Speech (extempore and prepared)	05
▪ Attendance	05
<b>Total Marks</b>	<b>50</b>

Course Contents					
Practical No.	Practical Title and Contents				Hours
1	<b>Ice breaking: Introducing self and others</b> Adjectives, phrases and clauses to describe oneself and others Introducing oneself and others-demonstration				2
2	<b>Phonetics-1</b> Introduction to Phonetics-Consonants, Vowels and Diphthongs in English with videos samples				2
3	<b>Verbal Aptitude 1 (Discussion on applications of grammar)</b> Using proper tenses, correct use of articles, conjunctions and prepositions				2
4	<b>Verbal Aptitude 2 (Watching videos and solving grammar exercises )</b> Using proper tenses, correct use of articles, conjunctions and prepositions				2
5	<b>Listening practice</b> Listening comprehension, Strategies for effective listening with audio/video samples				2
6	<b>Speaking practice-1</b> Video samples of effective and ineffective public speeches, Extempore (JAM), prepared speeches				2
7	<b>Speaking practice-2</b> Prepared speeches				2
8	<b>Group Discussion-1</b> Group discussion tips, Do's and Don'ts, video samples Mock GD-1, analysis and comments on individual performances				2
9	<b>Group Discussion -2</b> Final GD participation				2
10	<b>Interview 1</b> Discussing interview FAQs in detail, video samples				2
11	<b>Interview 2</b> Mock interviews (prepared and formal)				2
12	<b>Incident Narration or Story telling</b> Practicing narration methods and techniques for effective narration.				2
*Any 10 practical/experiments will be completed.					
<b>Textbooks/Software:</b> Orell Talk Digital Language Lab Software– Professional Version with 1+50 users subscription					
<b>Reference Books:</b>					
SN	Title	Edition	Author/s	Publisher	Year
1	<i>Better English Pronunciation</i>	Second	J.D. O'Connor	OUP	1980
2	<i>A Practical Course in Spoken English</i>	First	J.K. Gangaj	PHI Learning Pvt. Ltd	2014
3	<i>English Language Laboratories</i>	Second	Nira Konar	PHI Learning	2014
<b>Practical wise Measurable students Learning Outcomes:</b>					
<b>Practical 1:</b> Students will understand how to introduce oneself and others in professional context					
<b>Practical 2</b> They will be able to use proper pronunciation, tone and intonation					

**Practical 3,4:** Their verbal ability will be enhanced

**Practical 5:** Students will improve their listening comprehension skills

**Practical 6,7:** Along with, students will be able to prepare and deliver effective public speeches

**Practical 8,9:** They will be able to participate effectively in a group discussion

**Practical 10, 11:** They will learn how to face an interview effectively.

**Practical 12:** They will have improved their presentation and narration skills