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

Structure and Curriculum for First Year Bachelor of Technology

(To be Implemented from Academic Year 2021-2022)

UG Programmes in

- **Civil Engineering**
- **Civil and Environmental Engineering**
- **Mechanical Engineering**
- **Biotechnology Engineering**

Structure and Curriculum
for
First Year B.Tech.
(Civil Engineering / Civil and Environmental Engineering / Mechanical Engineering / Biotechnology Engineering)
Teaching and Evaluation Scheme for First Year B. Tech. Program
Group 3: (Division: J, K, & L)   **Semester I**

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme		
			L	T	P	Cr	Components	Max	Min for passing
Induction program as per AICTE guidelines									
UHSC0101	Engineering Mathematics-I	BS	3	1	-	4	ISE-I	10	20
							MSE	30	
							ISE-II	10	40
							ESE	50	20
UHSC0102	Communication Skills	HS	2	-	-	2	ISE-I	10	20
							MSE	30	
							ISE-II	10	40
							ESE	50	20
UHSC0108	General Physics and Optics	BS	3	-	-	3	ISE-I	10	20
							MSE	30	
							ISE-II	10	40
							ESE	50	20
UHSC0109	Basic Civil Engineering	ES	3	-	-	3	ISE-I	10	20
							MSE	30	
							ISE-II	10	40
							ESE	50	20
UHSC0110	Computer Aided Engineering Graphics	ES	2	-	-	2	ISE-I	10	20
							MSE	30	
							ISE-II	10	40
							ESE	50	20
UHSC0121	Communication Skills Lab	HS		-	2	1	ISE	50	20
UHSC0129	General Physics and Optics Lab	BS	-	-	2	1	ISE	50	20
UHSC0130	Basic Civil Engineering Lab	ES	-	-	2	1	ISE	50	20
UHSC0131	Computer Aided Engineering Graphics Lab	ES	-	-	4	2	ISE	50	20
UHSC0132	Workshop Practice Lab (Mechanical)	ES	-	-	2	1	ISE	50	20
UHSA0151	Audit Course-I (Entrepreneurship Development)	AU	2	-	-	-	ISE	100	40
Total			**15**	**1**	**12**	**20**			
Total Contact hours – 28, Total Credits - 20									

Curriculum is distributed in 62% theory and 38% practical

BS	Basic Sciences	ISE	In Semester Evaluation	L	Theory	Cr	Credits
ES	Engineering Sciences	MSE	Mid Semester Examination	T	Tutorial	AU	Audit Course
HS	Humanities	ESE	End Semester Examination	P	Practical	POE	Practical & Oral Exam

SEMESTER-II

Course Code	Course Name	Curriculum Component	L	T	P	Cr	Components	Max	Min for passing	
UHSC0201	Engineering Mathematics-II	BS	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0211	Applied Chemistry	BS	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0212	Engineering Mechanics	ES	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0213	Basic Mechanical Engineering	ES	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0214	Introduction to Programming	ES	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0233	Applied Chemistry Lab	BS	-	-	2	1	ISE	50	20	
UHSC0234	Engineering Mechanics Lab	ES	-	-	2	1	ISE	50	20	
UHSC0235	Basic Mechanical Engineering Lab	ES	-	-	2	1	ISE	50	20	
UHSC0236	Basic Electrical Engineering Lab	ES	-	-	2	1	ISE	50	20	
UHSC0137	Introduction to Programming Lab	ES	-	-	2	1	ISE	50	20	40
							ESE (POE)	50	20	
UHSA0252	Audit Course-II (Human Values and Professional Ethics)	AU	2	-	-	-	ISE	100	40	
Total			**16**	**1**	**10**	**20**				
Total Contact hours – 27, Total Credits - 20										

Curriculum is distributed in 62% theory and 38% practical

BS	Basic Sciences	ISE	In Semester Evaluation	L	Theory	Cr	Credits
ES	Engineering Sciences	MSE	Mid Semester Examination	T	Tutorial	AU	Audit Course
HS	Humanities	ESE	End Semester Examination	P	Practical	POE	Practical & Oral Exam

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

Group 4: (Division: M, N & P) **SEMESTER-I**

Course Code	Course Name	Curriculum Component	L	T	P	Cr	Components	Max	Min for passing	
		Teaching Scheme					**Evaluation Scheme**			
induction	**Induction program as per AICTE guidelines**									
UHSC0101	Engineering Mathematics-I	BS	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0111	Applied Chemistry	BS	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0112	Engineering Mechanics	ES	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0113	Basic Mechanical Engineering	ES	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0114	Introduction to Programming	ES	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0133	Applied Chemistry Lab	BS	-	-	2	1	ISE	50	20	
UHSC0134	Engineering Mechanics Lab	ES	-	-	2	1	ISE	50	20	
UHSC0135	Basic Mechanical Engineering Lab	ES	-	-	2	1	ISE	50	20	
UHSC0136	Basic Electrical Engineering Lab	ES	-	-	2	1	ISE	50	20	
UHSC0137	Introduction to Programming Lab	ES	-	-	2	1	ISE	50	20	40
							ESE (POE)	50	20	
UHSA0152	Audit Course-II (Human Values and Professional Ethics)	AU	2	-	-	-	ISE	100	40	
	Total		16	1	10	20				
total	**Total Contact hours – 27, Total Credits - 20**									

Curriculum is distributed in 62% theory and 38% practical

BS	Basic Sciences	ISE	In Semester Evaluation	L	Theory	Cr	Credits
ES	Engineering Sciences	MSE	Mid Semester Examination	T	Tutorial	AU	Audit Course
HS	Humanities	ESE	End Semester Examination	P	Practical	POE	Practical & Oral Exam

SEMESTER-II

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for passing	
UHSC0201	Engineering Mathematics-II	BS	3	1	-	4	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0202	Communication Skills	HS	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0208	General Physics and Optics	BS	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0209	Basic Civil Engineering	ES	3	-	-	3	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0210	Computer Aided Engineering Graphics	ES	2	-	-	2	ISE-I	10	20	40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSC0221	Communication Skills Lab	HS		-	2	1	ISE	50	20	
UHSC0229	General Physics and Optics Lab	BS	-	-	2	1	ISE	50	20	
UHSC0230	Basic Civil Engineering Lab	ES	-	-	2	1	ISE	50	20	
UHSC0231	Computer Aided Engineering Graphics Lab	ES	-	-	4	2	ISE	50	20	
UHSC0232	Workshop Practice Lab (Mechanical)	ES	-	-	2	1	ISE	50	20	
UHSA0251	Audit Course-I (Entrepreneurship Development)	AU	2	-	-	-	ISE	100	40	
	Total		**15**	**1**	**12**	**20**				
Total Contact hours – 28, Total Credits - 20										

Curriculum is distributed in 62% theory and 38% practical

BS	Basic Sciences	ISE	In Semester Evaluation	L	Theory	Cr	Credits
ES	Engineering Sciences	MSE	Mid Semester Examination	T	Tutorial	AU	Audit Course
HS	Humanities	ESE	End Semester Examination	P	Practical	POE	Practical & Oral Exam

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

Title of the Course: ENGINEERING MATHEMATICS-I	L	T	P	Credit
Course Code: UHSC0101	3	1	-	4

Course Pre-Requisite: Basics of matrix algebra, rules and formulae of derivative and preliminary concepts of vector algebra.

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

Course Objectives:
1. To learn mathematical methodologies and models since mathematics is the foundation of engineering and technology.
2. To develop mathematical skills and enhance logical thinking power of students.
3. To enhance student's skills in linear algebra, differential calculus of single and multivariable functions this would enable them to devise engineering solutions for given situations.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Demonstrate an understanding of the concepts of linear algebra, single and multivariable calculus.
CO2	Find the rank of matrix, series expansion of a function, partial derivatives, gradient of scalar function, divergence and curl of vector function.
CO3	Solve the linear system equations, eigenvalue and eigenvector problems and test the convergence of series.
CO4	Apply the knowledge of single and multivariable calculus and obtain solution of various mathematical problems.

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.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Matrices and Linear System Equations** ➢ Revision of matrix and determinant operation. ➢ Rank of matrix: definition, echelon form ➢ Consistency of linear system equations ➢ System of linear homogeneous equations ➢ System of linear non-homogeneous equations	7

2	**Eigen Values and Eigen Vectors**	6
	➢ Linear dependence and independence of vectors ➢ Eigen values and their properties. ➢ Eigen vectors and their properties ➢ Cayley-Hamilton's theorem (without proof) ➢ Inverse and higher powers of matrix by using Cayley-Hamilton's theorem	
3	**Differential Calculus**	8
	➢ Functions of single variable, continuity and differentiability. ➢ Fundamental theorems : Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem. ➢ Expansion of functions: Taylor's and Maclaurin's series. ➢ Methods of expansion: standard series, substitution, differentiation and integration. ➢ Inderminate forms.	
4	**Sequence and Series**	8
	➢ Sequences and convergence of sequence ➢ Convergence of series ➢ Comparison tests ➢ Integral test ➢ Comparison of ratios ➢ D'Alembert's ratio test ➢ Raabe's test ➢ Cauchy's root test	
5	**Partial Differentiation**	7
	➢ Partial derivatives: definition and partial derivatives of higher orders ➢ Total derivatives and differentiation of implicit function ➢ Change of variables ➢ Euler's theorem on homogeneous function of two variables ➢ Jacobian, properties of jacobian, jacobian of implicit function ➢ Errors and approximations ➢ Maxima and minima of functions of two variables	
6	**Vector Differential Calculus**	6
	➢ Differentiation of vectors ➢ Velocity and acceleration ➢ Gradient of scalar point function and directional derivative ➢ Divergence of vector point function ➢ Curl of a vector point function ➢ Solenoidal and irrotational vector fields	

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** |

Unit wise Measurable students Learning Outcomes:

1. Solve simultaneous linear system of equations arising in engineering problems by matrix method.
2. Illustrate the linear dependence and independence of vectors.
3. Find eigen values and corresponding eigen vectors of given square matrix.
4. State and verify Cayley Hamilton theorem and apply it to find various matrix expressions.
5. Use Taylor's and Maclaurin's series to expand the function and to find the approximate values.
6. Use L'Hospital's rule to evaluate limit.
7. Use appropriate test to determine convergence of series.
8. Find partial derivatives of first and higher orders of given multi variable functions.
9. Apply Euler's theorem on Homogeneous function.
10. State and verify properties of Jacobin.
11. Apply knowledge of partial derivatives to find approximate value, errors and the maximum and minimum values of functions of two variables.Understand concept of the differentiation of vectors.
12. Apply the knowledge of divergence and curl to describe the nature of vector field such as solenoidal and irrotational vector fields.

Title of the Course: ENGINEERING MATHEMATICS-II Course Code: UHSC0201	L	T	P	Credit
	3	1	-	4

Course Pre-Requisite: Algebra of complex numbers, basics of differential equations, rules and formulae of integration and conics

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

Course Objectives:
1. To learn mathematical methodologies and models since mathematics is the foundation of engineering and technology.
2. To develop mathematical skills and enhance logical thinking power of students.
3. To enhance student's skills in complex algebra, integral calculus and differential equations this would enable them to devise engineering solutions for given situations.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the concepts of complex algebra, improper integrals, multiple integrals and differential equations.
CO2	Solve the first order differential equations, problems consisting complex numbers and hyperbolic functions and evaluate improper integrals using special functions.
CO3	Apply the knowledge differential and integral calculus for curve tracing, rectification and evaluation of multiple integrals.
CO4	Select the appropriate method or technique for solving problems in applications of differential equations, applications of multiple integrals and simplification of 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.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Complex Numbers and Hyperbolic Functions** ➢ Revision of algebra of complex number and De Moivre's theorem. ➢ Roots of complex numbers. ➢ Circular functions of a complex variable - definitions ➢ Hyperbolic functions, relation between circular & hyperbolic functions. ➢ Inverse hyperbolic functions. ➢ Separation into real and imaginary parts	7
2	**Ordinary Differential Equations of First Order and First Degree and Its Applications** ➢ Linear differential equations (Revision) ➢ Exact differential equations ➢ Reducible to exact differential equations ➢ Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. ➢ Applications to orthogonal trajectories (cartesian and polar equations) ➢ Applications to simple electrical circuits	6
3	**Special Functions** ➢ Gamma function and its properties ➢ Beta function and its properties ➢ Differentiation under integral sign ➢ Error function and its properties	8
4	**Curve Tracing and Rectification** ➢ Tracing of curves in Cartesian form a) Semi cubical parabola, b) Cissiod of Diocles, c) Strophoid, d) Astroid, e) Witch of Agnesi, f) Common Catenary, g) Folium of Descartes, ➢ Tracing of curves in polar form a) Cardioid, b) Pascal's Limacon, c) Lemniscate of Bernoulli, d) Parabola, e) Hyperbola, f) Rose curves ➢ Rectification of plane curves (Cartesian and Polar form)	8
5	**Multiple Integration** ➢ Double integration ➢ Double integral evaluation in cartesian and polar. ➢ Change of order of integration ➢ Change of variable ➢ Change into polar ➢ Triple integral evaluation with given limits	7
6	**Applications of Multiple Integration** ➢ Area enclosed by plane curves ➢ Mass of a plane lamina ➢ Center of gravity of plane lamina ➢ Moment of inertia of plane lamina ➢ Volume of solid of revolution.	6

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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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-II		G. V. Kumbhojkar	C. Jamnadas & Co	
6.	Mathematics for Engineers Volume-I	1	Rakesh Dube	Narosa Publishing House, New Delhi	2009

Unit wise Measurable students Learning Outcomes:
1. Define the De Moiver's theorem and use it to find the roots of complex numbers.
2. Separate Complex quantity into Real and Imaginary Parts.
3. Define basic concepts and terminologies of differential equations.
4. Solve ODE of first order and first degree by using various methods.
5. Define special functions like Gamma and Beta function.
6. Evaluate improper integrals by using special functions.
7. Use the rule of differentiation under integral sign to evaluate the integrals.
8. Demonstrate the procedure of tracing curves in cartesian and polar form.
9. Trace the curves of given functions.
10. Find the length of given curves.
11. Evaluate double integrals in cartesian and polar form.
12. Find area, mass of lamina, center of gravity & moment of inertia of plane lamina using double integrals

Title of the Course: Communication Skills	L	T	P	Credit
Course Code: UHSC0102/ UHSC0202	2	-	-	2

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 make students better in English grammar to perform best in verbal aptitude assessment
3. To hone their listening and reading comprehension skills
4. To introduce them to techniques to improve their spoken English and to provide them a platform for practicing these skills
5. To enable them to write correct and effective business and official letters

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Recall** basic English grammar to strengthen their verbal aptitude
CO2	**Demonstrate** communication process, methods of communication and flow of communication in business context
CO3	**Apply** acquired LSRW skills into real life situations and in professional context
CO4	**Compose** effective business letters using standard language, style and structure

CO-PO Mapping

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

CO5													

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	**Communication Theory** • Communication basics: Importance, process, levels • Forms/methods: verbal and non-verbal • Barriers and solutions	6
2	**Communication in Business Context** • Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions • Inter-cultural communication	2
3	**Verbal Aptitude** • Grammar: parts of speech-using articles, conjunctions and prepositions; using appropriate tenses, degree, voice • Vocabulary: Affixation, synonyms and antonyms, idioms, confusables-homophones and homonyms • Syntax: word order, types of sentences, spotting errors in sentences with justification, Punctuation marks	6
4	**Enhancing Language Learning Skills (LSRWT)** • **Effective listening**: Process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers • **Effective speaking**: Importance, various oral business contexts/situations, group communication, preparing effective public speeches • **Effective reading**: Importance, types, overcoming common obstacles, tips and strategies • **Effective writing**: Importance, paragraph writing techniques, diary/blog writing • **Thinking** as a learning skill	6
5	**Formal Business Correspondence** • Principles, structure (elements) • Layout (**complete block**, modified block, semi-block), Types (Job application, enquiry and replies, claim and adjustment)	6
6	**Summarization and Comprehension** • Art of précis writing • Techniques to comprehend and summarize a given technical, scientific, or industry-oriented text	2

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	*Communication Skills*	Third	Meenakshi Raman and Sangeeta Sharma	Oxford University Press (OUP)	2013
2	*Communication Skills*	Second	Sanjay Kumar and Pushpa Lata	Oxford University Press (OUP)	2015
3	*Business Communication*	Second	Urmila Rai and S.M. Rai	Himalaya	2014

| 4 | *Communication skills for Engineers and Scientists* | | S. Sharma and B. Mishra | PHI Learning | 2015 |

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	*Business Communication*	Third	S. Kalia and S. Agarwal	Wiley	2015
2	*Technical Communication*	Fourth	Meenakshi Raman and Sangeeta Sharma	OUP	2013
3	*Business Communication*	Second	Meenakshi Raman and Prakash Singh	OUP	2013
4	*Business Communication*	Second	Raymond Lesikar et al.	McGraw Hill	2015
5	*Communication Skills for Professionals*	First	Nira Konar	PHI Learning	2011
6	*High School English Grammar and Composition*	Latest	Wren and Martin	Blackie	2000
7	*A University Grammar of English*	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 strengthen their verbal aptitude

Unit 4. They will be able to apply different strategies of LSRWT skills

Unit 5. They will learn different types and formats of official letters and draft various types of letters applying the knowledge gained

Unit 6. They will be able to comprehend and summarize given technical/ scientific passages

Title of the Course: Communication Skills (Lab/Practical)	L	T	P	Credit
Course Code: UHSC0121/ UHSC0221	-	-	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:

CO	After the completion of the course the student should be able to
CO1	**Comprehend** English Sounds, stress patterns and intonation and English grammar to perform better professionally
CO2	**Use** listening and reading comprehension techniques to comprehend technical discourse
CO3	**Construct** 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
ISE: ISE is based on practical performance/ Quiz/ Presentation/ Group Discussion/Role plays/Assignments/Demonstration, etc. **Distribution of Marks:** ▪ Lab Manual ▪ Lab Tests and Practical Performance ▪ Public Speech (extempore and prepared) ▪ Attendance	
Total Marks	**50**

Course Contents

Practical No.	Practical Title and Contents	Hours
1	**Ice breaking: Introducing self and others** Adjectives, phrases and clauses to describe oneself and others Introducing oneself and others-demonstration	**2**
2	**Phonetics-1** Introduction to Phonetics-Consonants, Vowels and Diphthongs in English with videos samples	**2**
3	**Phonetics-2** Identifying syllables and techniques of RP (received pronunciation)	**2**
4	**Phonetics-3** Stress, tone and intonation, pronunciation practice with audio-video samples	**2**
5	**Verbal Aptitude -1** Vocabulary building games, practicing affixation, confusables, homonyms, homophones, using idioms	**2**
6	**Verbal Aptitude -2** Using proper tenses, correct use of articles, conjunctions and prepositions Types of sentences and conversion, active and passive voice, spotting errors in sentences with justification, word order, punctuation marks	**2**
7	**Listening practice** Listening comprehension, Strategies for effective listening with audio/video samples	**2**
8	**Speaking practice-1** Video samples of effective and ineffective public speeches, Extempore (JAM), prepared speeches	**2**
9	**Speaking practice-2** Prepared speeches	**2**
10	**Situational Conversations** Role play: practicing various situational conversations, telephonic conversations	**2**
11	**Reading practice** Aloud reading of novella/ technical news paper articles in turns with sequence	**2**
12	**Writing practice** Paragraph writing, creative writing – story building through pictures/ word triggers Practicing summarization and comprehension	**2**

Textbooks/Software:
Orell Talk Digital Language Software – Professional Version with 1+50 users subscription

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	*Better English Pronunciation*	Second	J.D. O'Connor	OUP	1980
2	*A Practical Course in Spoken English*	First	J.K. Gangaj	PHI Learning Pvt. Ltd	2014
3	*English Language Laboratories*	Second	Nira Konar	PHI Learning	2014

Practical wise Measurable students Learning Outcomes:
Practical 1: Students will understand how to introduce oneself and others in professional context
Practical 2,3,4: They will be able to use proper pronunciation, tone and intonation
Practical 5,6: Their verbal ability will be enhanced
Practical 7,8,9: Along with improved listening comprehension, students will be able to prepare and deliver effective public speeches
Practical 10: They will learn how to converse in different professional situations
Practical 11,12: They will have improved their reading comprehension and writing skill

Title of the Course: General Physics and Optics	L	T	P	Credit
Course Code: UHSC0108/ UHSC0208	03	-	-	03

Course Pre-Requisite:
1. To know basic concepts of vector analysis and laws of motion.
2. 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:
1. To study motion of body in two dimensions and solve related problems.
2. To discuss different theories of fluid dynamics and their applications.
3. To Study phenomena of light like interference, diffraction, polarization and their engineering applications.
4. To explain various characteristics viz monochromaticity, coherence, directionality of laser and their applications in Medical, industrial field and to study concept of virtual reality.
5. To study principles of quantum mechanics, properties of matter waves and derive Schrödinger equations and discuss applications of quantum mechanics in modern technology.
6. 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									

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	**Kinematics in two dimensions** Introduction, Centre of mass, CM and Translational motion, Conditions for equilibrium, Forces on objects – beam and support, inclined beam, Elasticity – Stress and Strain, factor of safety, Resilience, Factors affecting elasticity, Bending of beam, Fracture, Forces on Muscles and Joint, Arches and Domes.	7
2	**Fluid Dynamics** 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.	6

3	**Interference, Diffraction and Polarization** **Interference**: Introduction, Interference from thin films (reflected light, uniform and wedge shaped film), Interference in sound, Applications of Interference – Testing of flatness, lens surface. **Diffraction:** Introduction, Diffraction Grating – theory, Resolving power of grating, Applications of Diffraction – Analysis of crystal structure using x-ray diffraction. **Polarization:** Introduction, Double refraction, Optical activity – Laurent's half shade polarimeter, Photoelasticity, Electro-optic affects, applications of polarization.	8
4	**Lasers** Introduction, Interaction of radiation with matter (induced absorption, spontaneous emission and stimulated emission), condition for laser production, Ruby laser, He – Ne Laser, CO_2 laser, Semiconductor laser, Characteristics of lasers, Modes in Laser (Longitudinal and Transverse), Applications of Laser, Holography, Holography and virtual reality	7
5	**Quantum mechanics** Introduction, de Broglie's hypothesis, Heisenberg's uncertainty principle and its applications, wave function and probability interpretation, Schrödinger time dependent and time independent wave equations, Eigen Function and Eigen values, applications of Schrödinger wave equation - infinite square well potential (particle in a box), Harmonic Oscillator, Quantum states, Superposition principle, Quantum entanglement (Conceptual Discussion), Applications of Quantum Mechanics – Tunneling, Quantum Computation (Conceptual Discussion).	8
6	**Advanced Materials and Analytical Instruments** Metallic glass, Biomaterials, Nanomaterials, Aerogel, Shape Memory Alloys Atomic absorption spectroscopy, Scanning Electron Microscope, NMR spectroscopy, ESR 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.

Title of the Course: General Physics and Optics (Lab Course) Course Code: UHSC0129/ UHSC0229	L	T	P	Credit
			02	01

Course Pre/Co-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:

CO	After the completion of the course the student should be able to
CO1	**Demonstrate** different phenomenon of light and their applications
CO2	**Analyze** motion of body under influence of gravity and applications of pendulum
CO3	**Analyze** properties of material using modern techniques.
CO4	**Demonstrate** 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	
Journal	
Group Presentation	
Total	50

Course Contents

Practical No.	Practical/Experiment Title and Contents	Hours
1	**Title of the practical/Experiment No. 1:** Inverse square law of intensity of light. **Aim and Objectives:** To verify inverse square law of intensity of light.	2
2	**Title of the practical/Experiment No. 2:** Divergence of LASER beam **Aim and Objectives:** To determine Divergence of LASER beam and study directionality of LASER.	2
3	**Title of the practical/Experiment 3:** Diameter of cylindrical obstacle **Aim and Objectives:** To determine thickness of given obstacle using diffraction.	2
4	**Title of the practical/Experiment No.4:** Diffraction grating using mercury vapour lamp **Aim and Objectives:** To study mercury spectrum and determine wavelength of different colours in light emitted by mercury vapour lamp using diffraction grating.	2

5	**Title of the practical/Experiment No. 5:** Resolving power of plane transmission grating. **Aim and Objectives:** To determine Resolving power of plane transmission grating.	2
6	**Title of the practical/Experiment No. 6:** Biprism experiment **Aim and Objectives:** To study phenomenon of interference and determine wavelength of light using biprism.	2
7	**Title of the practical/Experiment No. 7:** Study of crystal structure. **Aim and Objectives:** To analyze crystal structure from X-ray diffraction pattern using Bragg's law.	2
8	**Title of the practical/Experiment No. 8:** Newton's second law of motion **Aim and Objectives:** To find the acceleration of the body and find the distance covered by the body in the given time interval.	2
9	**Title of the practical/Experiment No. 9:** Projectile Motion. **Aim and Objectives:** To find the Time of flight, Horizontal range and maximum height of a projectile for different velocity and calculate acceleration due to gravity.	2
10	**Title of the practical/Experiment No. 10:** Polarimeter **Aim and Objectives:** To calculate specific rotation of sugar solution.	2
11	**Title of the practical/Experiment No. 11:** Resolving power of telescope **Aim and Objectives:** To find resolving power of telescope	2
12	**Title of the practical/Experiment No. 12:** Torsional Pendulum **Aim and Objectives:** To find modulus of rigidity of material of wire	2
13	**Title of the practical/Experiment No. 13:** Kater's Pendulum **Aim and Objectives:** To find acceleration due to gravity using Kater's pendulum.	2
14	**Title of the practical/Experiment No. 14:** Atomic Absorption Spectrometer **Aim and Objectives:** To demonstrate working of Atomic Absorption Spectrometer for analysis of analyte.	2

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	An Advanced Course In Practical Physics	8	D. Chattopadhay, 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 acceleration of the body and the distance covered by the body in the given time interval.

9. To **demonstrate** effect of acceleration due to gravity on height and range of body in projectile motion..

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.

Title of the Course: Basic Civil Engineering	L	T	P	Credit
	3	-	-	3
Course Code: UHSC0109/ UHSC209				

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 is designed to enrich the preliminary conceptual knowledge about civil engineering to the students of civil/non-civil branches of engineering. The subject involves surveying activities of taking various measurements on ground that promote habit of working ingroups, neatness and care in documentation and also involves introduction of engineering building materials, building planning and services and subbranches of civil engineering.

Course Objectives:
1. Understand the overview of profession of civil engineering
2. Understand and solve basic surveying and levelling numerical problems
3. Understand the building components, building materials and building services
4. Acquire knowledge of Water resources, Environmental and Transportation Engineering

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Recall** importance and applications of civil engineering.
CO2	**Solve** basic surveying and levelling numerical problems.
CO3	**Summarise** the building components, building materials and building services.
CO4	**Illustrate** significance of Water resources, Environmental and Transportation Engineering.

CO-PO Mapping:

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

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	**Introduction to Civil Engineering** Significance of Civil Engineering Introduction, application of Civil Engineering in various branches of engineering, Role of Civil Engineer in various construction activities, significance in Infrastructural and sustainable development and economy ofthe Country, various sub branches of civil engineering, important national projects.	4
2	**Surveying** Principles of surveying, Classification & types of surveys, Linear Measurement: marking instruments **Chain Surveying:** Chaining, Ranging, Offsetting error in chaining, **Angular Measurements**: Compass & its types, Meridian & its types, Bearing and its types, System of bearing, Calculation of included angles, local attraction & its correction, Introduction to GIS and GPS, Introduction to centre line plan.	8

3	**Levelling**	
	Terms in levelling, Types of bench marks, Types of Levels such as Dumpy level,Auto Level, and electronic distance measurements (EDM), Introduction to Total station, Temporary adjustments of level instruments, Types of levelling, Methods of reduction of levels, Contours and its characteristics, Measurement of area by planimeter – mechanical and digital.	8
4	**Building Planning and Components**	
	Principles of planning, introduction to 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 & super-structures and their functions. Types of foundations- shallow and deep and their suitability. Types of buildings- Load bearing & framed structure, Introduction to types of loads, Factor of Safety, Concept of Stability.	8
5	**Building Materials and Services**	
	Types and properties of building materials: Stone, Brick, Cement, Sand, Aggregate, Steel, Aluminium, timber, etc. **Roofing types and materials:** Types Roofing Tiles, Aluminium-Galvanized Iron Polycarbonate Sheets etc. **Flooring materials**: Types of Flooring Tiles-Kadappa, Shahabad, Marble, Granite etc. **Types of Bonds:** Introduction to English & Flemish bonds. **Building Services**: Electrification, Plumbing and Firefighting.	7
6	**Water resources, Environmental and Transportation Engineering**	
	Water Resources engineering: Sources of Water and need of management, Types of Dams (Earthen and Gravity Dam), irrigation water supply. **Environmental Engineering:** Components of water supply scheme (flow diagram), Solid Waste Management, Effects of Air, Water, Soil and Noise Pollution. **Transportation Engineering:** Modes of Transportation, Types of Roads (NH, SH, MDR, VR, Express Way) & Types of Pavements (rigid and flexible) Typical cross section of Road (Cutting & Embankment), Introduction to components of railway track & Rail Gauges. Introduction to automation in civil engineering applications.	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 (Tailor 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 importance of civil engineering and its applications.
- **UO 2:** Explain concept of Surveying and its instruments.
- **UO 3:** Explain concept of Levelling and its instruments.
- **UO 4:** Explain various building components and their basic planning.
- **UO 5:** Explain various building construction materials available and their properties.
- **UO 6:** Explain basic elements of Water resources, Environmental and Transportation Engineering.

Title of the Course: Basic Civil Engineering (Laboratory)	L	T	P	Credit
	-	-	2	1
Course Code: UHSC0130/ UHSC0230				

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 Basic Civil Engineering laboratory is designed to give exposure to students in practical works carried out in different areas of civil engineering such as Surveying and Levelling. The students will be introduced to various Civil Engineering instruments like compass, level instrument, GPS device etc. Also, the students will be introduced to center line plan and lineout drawing for small residential buildings.

Course Objectives:
1. Understand surveying and levelling instruments and their field use for various civil engineering works.
2. Perform field practical works in surveying, levelling and use of GPS and its recording in field book.
3. Develop centre line plan and building layout of a small residential building.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Demonstrate** instruments used in surveying and levelling operations.
CO2	**Perform** practical works carried out in surveying and levelling procedures and its recording in field book.
CO3	**Illustrate** construction of English and Flemish bonds.
CO4	**Develop** center line plan and building layout of a small residential building.

CO-PO Mapping:

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

Assessment Scheme:
Teacher Assessment:
In Semester Evaluation (ISE) having 100%.

Assessment Component	Marks
ISE (in components)	50

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

Course Contents

Practical No.	Practical/Experiment Title and Contents	Hours
1	Plotting the Outlines of Building by Chaining, Ranging and Offsetting.	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	Determination of difference in levels of various points with dumpy level by fly levelling procedure.	2
7	To understand and use Global Positioning System (GPS) for navigation.	2
8	To Study and use of total station for various measurements	2
9	To study and construct English bond for brick masonry.	2
10	To study and construct Flemish bond for brick masonry.	2
11	To draw Centre line plan of single room with different columns orientations.	2
12	To make lineout of a residential building.	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 (Tailor and Francis)	2003
2	Essentials of civil engineering	First	K. R. Dalal	Charotar Publishing House	2012

Practical wise Measurable students Learning Outcomes:
1. Plot outline of building by chaining, ranging and offsetting procedure
2. Plot closed traverse of survey lines using prismatic compass.
3. Plot open traverse of survey lines using prismatic compass.
4. Determination of elevation of various points with dumpy level by simple levelling procedure.
5. Determination of elevation of various points with dumpy level by differential levelling procedures.
6. Determination of difference in elevation of various points with dumpy level by fly levelling procedures.
7. Use Basic GPS applications.
8. Study and use total station for various measurements
9. Understand English bond its correct practices of construction of brick masonry.
10. Understand Flemish bond its correct practices of construction of brick masonry.
11. Draw Centre line plan for small residential building.
12. To make lineout of a small residential building.

Title of the Course: Computer Aided Engineering Graphics	L	T	P	Credit
Course Code: UHSC0110/ UHSC0210	2	-	-	2

Course Pre-Requisite: Knowledge of Geometry at SSC Level and Computer basics

Course Description: Course consists of engineering drawing of Projections of Lines, Planes and Solids, Orthographic Projections, Isometric projections along with introduction to computer aided sketching

Course Objectives:
1. To create awareness and emphasize the need of Engineering Drawing for an engineer.
2. To follow basic drawing standards and conventions.
1. To inculcate the habits of logical analysis of the problem using engineering drawing.
2. To develop skills in visualizing 3-Dimensional engineering components and documenting related information by using computer software.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Recall different types of lines, dimensioning method and BIS conventions
CO2	Demonstrate projection of points, lines and planes inclined to both reference planes
CO3	Construct projections of regular Solids like prism, cylinder, pyramid and cones
CO4	Develop and interpret the isometric and orthographic views of an object.

CO-PO Mapping:

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

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.

Note- 1) attainment of CO1 should be achieved only through In semester evaluation(ISE).

2) MSE and ESE examinations must be conducted online using computer drafting software.

3) Unit -1 is only for practice and Internal Assessment and not for examination.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Introduction to Engineering Drawing** Graphical user interface of the CAD software, standard tool bars/menus and description of most commonly used tool bars, navigational tools. Study and use of drawing and modify commands. Drawing instruments, Geometrical constructions, Lettering, Title block, Sheet sizes, Scale, Line types, Dimensioning.	2
2	• **Methods of projection**- Projection concept, Orthographic Projection, Projection of points in all quadrants, first angle vs third angle method of projection. • **Projection of Lines-** (only 1st Angle method referred henceforth) Horizontal, Frontal and oblique lines; Rotation method for determining true length and angles of a line; determining true length view and point view of a line and applying the same for problems on parallel lines, intersecting lines so as to determine distance and angle between lines.	4
3	**Orthographic Projections** Conversion of pictorial view of a three dimensional object into orthographic views.	7
4	**Projection of Planes** Projection of planes (only regular polygons like Triangular, Square, Rectangular, Pentagonal, Hexagonal and circle) inclined to both HP and VP.	4
5	**Projections of Solids** Projection of regular Solids such as Prisms, pyramids, cylinder and cone with their axis inclined to both HP and VP.	5
6	**Isometric projections** Concept of isometric projection, Isometric scale and isometric drawing. Conversion of orthographic views of simple 3D objects into single isometric drawing.	4

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Engineering Graphics with AutoCAD	Revised Edition ISBN : 9788120337831	D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar,	PHI	2010
2	Engineering Drawing	53rd Edition	N.D.Bhatt	Charotar Publishing	2019

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	Engineering Drawing & Design	7th Edition	Cencil Jensen, Jay D.Helsel , Dennis R. Short, "	TATA McGRAWHILL	2012
2	Engineering Graphics	7th Edition,	Basant Agrawal and C M Agrawal	Tata McGraw Hill Education Pvt. Ltd.	2012

Websites: (optional; but if given, must have been very carefully verified by ALL the course teachers.)

Unit wise Measurable students Learning Outcomes:

1. To Understand fundamental of engineering drawing, instruments and use of computer software for engineering drawing

2. To trace the projection of points, lines

3. To understand method of orthographic projections and draw various views

4. To trace the projection of and planes.

5. To understand elements of basic solids and their position.

6. To comprehend orthographic projections of component and draw its isometric drawing.

Title of the Course: Computer Aided Engineering Graphics Lab	L	T	P	Credit
Course Code: UHSC0131/ UHSC0231	-	-	4	2

Course Pre/Co-Requisite: Knowledge of Geometry at SSC Level and Computer basics

Course Description:
Course consists of engineering drawing of Projections of Lines, Planes and Solids, Orthographic Projections of objects and building plans, Isometric projections along with introduction to computer aided sketching

Course Objectives:
1. To create awareness and emphasize the need of Engineering Drawing for an engineer.
2. To follow basic drawing standards and conventions.
3. To inculcate the habits of logical analysis of the problem using engineering drawing.
4. To develop skills in visualizing 3-Dimensional engineering components/ Buildings and documenting related information by using computer software.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Recall different types of lines, dimensioning, lettering and BIS conventions
CO2	Demonstrate projection of points, lines and planes inclined to both reference planes
CO3	Construct projections of regular Solids like prism, cylinder, pyramid and cones
CO4	Develop and interpret the isometric, orthographic and sectional views of an object.

CO-PO Mapping:

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

Assessment Scheme:

Assessment Component	Marks
ISE	50
ISE are based on creating TEN submission drawing sheets described in list of experiments.	
All odd sheets (1, 3, 5, 7 & 9) will be evaluated by Civil Engineering and Civil Environmental Engineering Faculty for 25 marks. All Even sheets (2, 4, 6, 8 & 10) will be evaluated by Mechanical Engineering Faculty for 25 marks.	

Course Contents-
Lab will starts with 4hrs of Auto Cad Introduction:
Use and practice of basic and Advanced CAD commands. Practicing sketches with dimensioning and labeling,

Practical No.	Practical/Experiment Title and Contents	Hours
1	Draw plan of a room	2
2	Projection of Points and Lines	4
3	Draw Front and Side Elevation of a room	4
4	Orthographic Projections	4
5	Layer Manager and Annotation for the room	4

6	Projections of Planes	4
7	Sectional Views of Room	4
8	Projections of Solids	4
9	Scale conversion & PDF output	4
10	Isometric projections	4

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Engineering Graphics with AutoCAD	Revised Edition ISBN : 9788120337831	D. M.Kulkarni, A. P. Rastogi, A. K. Sarkar,	PHI	2010
2	Engineering Drawing	53rd Edition	N.D.Bhatt	Charotar Publishing	2019

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	Engineering Drawing & Design	7th Edition	Cencil Jensen, Jay D.Helsel , Dennis R. Short, "	TATA McGRAWHILL	2012
2	Engineering Graphics	7th Edition,	Basant Agrawal and C M Agrawal	Tata McGraw Hill Education Pvt. Ltd.	2012

Practical wise Measurable students Learning Outcomes:
After the completion of the each unit the student should be able to
1. Use and practice of basic drawing commands of CAD software like AutoCAD (line, rectangle, polygon, point, arc, plane) and draw plan of a room.
2. To trace the projection of points and lines.
3. To draw front and side elevation of a room.
4. To draw orthographic projections of component.
5. To. understand layer manager and annotation for the room
6. To trace the projection of planes.
7. To draw sectional views of room.
8. To understand elements of basic solids and their position.
9. To perform Scale conversion and output PDF.
10. To draw isometric drawing.

Title of the Course: Applied Chemistry	L	T	P	Credit
Course Code: UHSC0111/ UHSC0211	3	-	-	3

Course Pre-Requisite:
Students should have knowledge about basic chemistry related to periodic table, properties of elements, electrochemistry, physical and chemical properties of Water, Fuel and Metallic Materials, etc.

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

Course Objectives:
1. To develop confidence among students about the chemistry applications in technological field.
2. To develop an interest among students regarding applied and engineering chemistry.
3. To analyze quality parameters of water and metallic materials.
4. To train students to effectively use knowledge of instrumental techniques.
5. To understand the concept of chemistry related to various branches of engineering.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**State** the basic properties of water that determine its domestic and industrial use.
CO2	**Illustrate** the different analytical samples by using instrumental methods.
CO3	**Analyze** engineering problems related to corrosion and metal finishing in achieving a practical solution.
CO4	**Discuss** the major role of chemistry that plays in various engineering fields and advanced materials.
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	**Water Technology** Introduction, Basic chemistry of water, Impurities in natural water, water quality parameters: acidity, alkalinity, chlorides, dissolved oxygen, and hardness of water (causes, types, determination procedure, significance and units) (WHO standards), Disadvantages of hard water in hard water in steam generation boilers, numerical on hardness, Water treatment methods (Reverse osmosis, Electrodialysis and Ion exchange process).	07
2	**Advanced Materials** Introduction of polymers, Classification of Polymers, based on origin, based on polymer type, polymerisation mechanism, Characteristics of polymers, thermosoftening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde; Applications of polymers, biodegradable plastics; Smart Materials.	07
3	**Instrumental and Analytical Techniques** An introduction of various analytical techniques, advantages and disadvantages of instrumental methods and classical methods. A) pH-metry: Introduction, pH measurement using glass electrode, applications of pH-metry. B) Spectrometry: Introduction of spectroscopy, UV-Vis. Spectrophotometer, (Lamberts and Beer-Lambert's law), Single beam spectrophotometer (schematic, working and applications). C) Chromatography: Introduction, types, i) TLC and Paper chromatography ii) Gas-liquid chromatography (GLC), basic principle, instrumentation and applications.	07
4	**Fuel and Energy conversion devices** A)　　Fuel: Introduction, classification, properties of ideal fuel, calorific value, Calculation of calorific value by Dulong's formula, Determination of calorific value by Bomb calorimeter and Boy's calorimeter. B)　　Fuel Cells: Fuel cell classification, H2-O2 Fuel Cell, Phosphoric Acid Fuel Cell (PAFC), Polymer Electrolyte Membrane Fuel Cell (PEMFC), Molten Carbonate Fuel Cell (MCFC), Microbial Fuel Cell	07
5	**Alloys and Composite materials** **A) Alloys:** Introduction, alloy-definition and classification, purposes of making alloys. Ferrous alloys: Plain carbon steels (mild, medium and high), stainless steels. Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminium alloy (Duralumin and Alnico)	07

	B) Composite materials: Introduction, types of composites, composition, Industrial composites- fiber reinforced plastics (FRP) and glass reinforced plastic (GRP). Cement-Types, chemical constitutes and composition, setting and hardening of cement; Ceramic materials: Introduction, Properties, Applications	
6	**Corrosion and Its Prevention** Introduction, types- atmospheric corrosion (oxidation corrosion) and electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting on the rate of corrosion. Prevention of corrosion by proper design and material selection, hot dipping process (Galvanizing and Tinning), metal spraying, metal cladding, organic coatings	**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 define different quality parameters of water and 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 illustrate the characteristics properties of an ideal fuel and fuel cells. Along with to calculate the calorific value of chemical fuels.
5. To state properties and applications of various alloys and composite materials.
6. To analyze the degree of corrosion and study of its preventative techniques.

Title of the Course: Applied Chemistry (Lab)	L	T	P	Credit
Course Code: UHSC0133/ UHSC0233	-	-	2	1

Course Pre-Requisite: Students should have preliminary knowledge about the handling of glass wares, apparatus and preparation of chemicals.

Course Description: This course aims to study qualitative and quantitative chemical laboratory techniques and sampling. Also course providing experience with instrumental techniques viz., pH meter, Spectrophotometer, Chromatography, etc.

Course Objectives:

1. To understand water quality parameters and water purification processes.

2. To describe the importance of polymeric materials in domestic and industrial purposes.

3. To analyze various analytical samples of by using instrumental methods.

4. To study the mechanism and estimation of corrosion rate of metals as well as preventative techniques.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Determine the different water quality parameters.
CO2	Synthesize advanced materials viz. Novolac, Bakelite and Urea Formaldehyde polymer.
CO3	Demonstrate the operation of different modern tools and its techniques for the analysis of different materials.
CO4	Demonstrate the skill to solve societal problems using practical knowledge of chemistry.

CO-PO Mapping:

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

Assessment Scheme:
ISE are based on Practical Performance/Journal Submission/Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.

Assessment Component	Marks
Component 1: Practical Performance and Journal Submission	
Component 2: Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral	
Total	50

Course Contents

Experiment No.	Experiment Title and Contents	Hours
1	**Title of the Experiment: To determine the acidity of water.** Aims and Objectives, Theoretical Background, Experimental procedure, Chemical Reactions, Observations, Calculations, Result and Conclusion	2
2	**Title of the Experiment: To determine the alkalinity of water.** Aims and Objectives, Theoretical Background, Experimental procedure, Chemical Reactions, Observations, Calculations, Result and Conclusion	2
3	**Title of the Experiment: To determine the chloride content of water by Mohr's method.** Aims and Objectives, Theoretical Background, Experimental procedure, Chemical Reactions, Observations, Calculations, Result and Conclusion	2
4	**Title of the Experiment: To determine the hardness of water by EDTA method.** Aims and Objectives, Theoretical Background, Experimental procedure, Chemical Reactions, Observations, Calculations, Result and Conclusion	2
5	**Title of the Experiment: To prepare urea-formaldehyde resin from urea and formaldehyde.** Aims and Objectives, Theoretical Background, Experimental procedure, Chemical Reactions, Observations, Result and Conclusion	2
6	**Title of the Experiment: To prepare phenol-formaldehyde resin from phenol and formaldehyde.** Aims and Objectives, Theoretical Background, Experimental procedure, Chemical Reactions, Observations, Result and Conclusion	2
7	**Title of the Experiment: To determine the pH of industrial waste water using pH meter.** Aims and Objectives, Theoretical Background, Standardization, Experimental procedure, Observations, Conclusion and Significance	2
8	**Title of the Experiment: Separation and identification of components present in the sample by paper chromatography.** Aims and Objectives, Theoretical Background, Experimental procedure, Observations, Calculations, Result and Conclusion	2
9	**Title of the Experiment: To determine the percentage of copper in brass alloy.** Aims and Objectives, Theoretical Background, Preparation of Brass Alloy Solution, Experimental procedure, Chemical Reactions, Observations, Calculations, Result and Conclusion	2

10	**Title of the Experiment: To determine the rate of corrosion of Aluminium metal.** Aims and Objectives, Theoretical Background, Experimental procedure, Observations, Calculations, Result and Conclusion	2
11	**Title of the Experiment: To determine the moisture, volatile and ash content in a given coal sample by proximate analysis.** Aims and Objectives, Theoretical Background, Experimental procedure, Observations, Calculations, Result and Conclusion	2
12	**Title of the Experiment: To demonstrate photo-colorimeter/spectrophotometer for analysis of water**. Aims and Objectives, Theoretical Background, Working, Experimental procedure, Observations, Result and Conclusion	2

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Laboratory Manual on Engineering Chemistry	3rd	S.K. Bhasin, Sudha Rani	Dhanpat Rai Publishing Company (P) Ltd. New Delhi.	2008
2	Drinking water chemistry a laboratory manual	4th	Barbara A. Hauser	T&F India	2017
3	Engineering chemistry lab manual	2nd	Suchi Tiwari	Scitech Publications (India) Pvt. Ltd.	2013
4	Practical Chemistry	2nd	D.N. Pandey, D.N. Bajpai , S Chand	S Chand & Co Ltd	2010

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	Vogels Qualitative Inorganic Analysis	7th	A. I. Vogel, Revised by G. Svehla	Pearson India	2002
2	Instrumental Methods Of Chemical Analysis	5th	Gurdeep R. Chatwal, Sham K. Anand	Himalaya Publications	2020
3	Environmental Chemistry	4th	B. K. Sharma	Goel Publishing House	2014
4	Engineering Chemistry	1st	Renu Bapna, Renu Gupta,	MacMillan Publishers Ltd, Delhi. (India)	2010

Practical wise Measurable students Learning Outcomes:

1. To define the water quality parameters for domestic and industrial use.

2. To determine different water quality parameters using qualitative and quantitative chemical analysis.

3. To synthesize advanced polymeric materials for engineering applications.

4. To demonstrate the working of different instrumental methods for the analysis of analytical samples.

5. To demonstrate the modern techniques for the separation of components of mixtures.

6. To evaluate the composition of metallic materials.

7. To illustrate the mechanism of different techniques of corrosion control methods.

Title of the Course: Engineering Mechanics	L	T	P	Credit
Course Code: UHSC0112/ UHSC0212	3	-	-	3

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 Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Interpret** the equivalence of force systems and resultant.
CO2	**Infer** the effect of a force system on matter.
CO3	**Apply** the conditions of equilibrium to a system of bodies in equilibrium.
CO4	**Analyse** the relation between the motion parameters of moving body / bodies.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS
CO1	2	2	2	-	-	-	-	-	-	-	-	-	-	
CO2	2	2	2	-	-	-	-	-	-	-	-	-	-	
CO3	3	3	2	-	-	-	-	-	-	1	-	-	-	
CO4	3	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	**Concept of Force and Force Systems** 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.	07 Hrs
2	**Moment of Inertia** Center of Gravity, Moment of Inertia of Standard shapes, Parallel and perpendicular axis theorem, Moment of Inertia of composite figures, Radius of Gyration, Concept of mass moment of inertia	06 Hrs
3	**Equilibrium and Friction** Equilibrium of systems/bodies, Conditions of Equilibrium, Lamis' Theorem, Free Body Diagram, Friction: Friction for bodies on horizontal and inclined planes and their applications.	07 Hrs
4	**Analysis of Beams and Plane Frames** Beam, Types of supports, Types of beams, Types of loads, Analysis of Simple and Compound beams, Virtual work method for support reactions. Statically Determinate Pin Jointed Plane Trusses, Perfect Truss, Deficient Truss, Redundant Truss, Assumptions, Analysis of Statically determinate plane trusses :- Method of Joints, Method of Section, Analysis of Simple truss with maximum seven members.	08 Hrs
5	**Rectilinear and Curvilinear motion** Kinematics: Introduction to basic terminologies. Equations of motion for uniform and variable acceleration, Motion under Gravity for Linear motion, Study of motion curves, Kinetics of Linear motion: Newton's Laws, Alembert's Principle, Work- Energy Principle, Impulse	08 Hrs

	Momentum Principle, Kinetics of Circular Motion, Banking of roads, Super elevation.				
6	**Impact and Collision** Impact, Types of Impact, Law of Conservation of Momentum, Coefficient of Restitution, Direct and Indirect Impact and their applications.				**04 Hrs**

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	Text book of Engineering Mechanics	06	R.S.khurmi	S. Chand Pub	2018
2.	Text book of Engineering Mechanics	22	R.K.Bansal	Laxmi Pub	2015

Reference Books:

SN	Title	Edition	Author/s	Publisher	Y
1.	Engineering Mechanics	8	S. S. Bhavikattis	New Age International Pvt. Ltd.	2
2	Vector Mechanics for Engineers Statics & Dynamics	12	F. P. Beer and E. R. Johnston	Tata Mc-Graw Hill Publication	2
3	Engineering Mechanics		Dr. D.S. Kumar	S.K. Kataria & Son	2
4	Engineering Mechanics	4	K.L.Kumar,Veenu Kumar	McGraw Hill Education	2
5	Engineering Mechanics	18	S.B.Junnarkar and H. J. Shah	Charotar Publishing House	2
6	Engineering Mechanics		N.H.Dubey	McGraw Hill Education	2
7	Engineering Mechanics	02	D.S. Bedi	Khanna Publishing	2
8	Engineering Mechanics		D P Sharma	Pearson Education India	2
9	Fundamentals of Engineering Mechanics	03	S. Rajasekaran, G. Sankarasubramanian	Vikas Publishing House	2

Unit wise Measurable students Learning Outcomes:
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.

Title of the Course: Engineering Mechanics (Lab)	**L**	**T**	**P**	**Credit**
Course Code: UHSC0134/ UHSC0234	**-**	**-**	**2**	**1**

Course Pre/Co-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 Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Experiment** with the principles of engineering mechanics practically.
CO2	**Conclude** the observations in practice with the expected theoretical results of concept application.
CO3	**Solve** examples on force systems using graphical tools.

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 Component	Marks - 50	
Experimental Performance & Write-Up	60%	
Graphical Assignments	40%	

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

Course Contents

Practical No.	Practical/Experiment Title and Contents	Hours
1	**Verification of Law of Polygon of Forces** **Aim and Objectives:** To verify the polygon law of forces.	**2**
2	**Determination of Forces In the Members of Simple Jib Crane.** **Aim and Objectives:** To verify the forces in the members of a Jib Crane.	**2**
3	**Verification of Law of Moment** **Aim and Objectives:** To verify the Principle of Moments using the Bell Crank Lever apparatus.	**2**
4	**Determination of Reaction at the Simply Supported Beam.** **Aim and Objectives:** To verify the reactions at the support of a simply supported Beam.	**2**
5	**Determination of Center of Gravity of Irregular Lamina body** **Aim and Objectives:** To Find the center of Gravity of Irregular Lamina body	**2**
6	**Composition of Concurrent and Non concurrent force system by Graphical method. (One numerical on each).** **Aim and Objectives:** To Determine the Resultant of Non-Concurrent & Parallel Force System by using Graphical Method.	**2**
7	**Analysis of beam by Graphical method. (One numerical on each).** **Aim and Objectives:** To Determine the Beam Reaction for Equilibrium Condition by using Graphical Method.	**2**
8	**Analysis of Truss by Graphical method. (One numerical on each).** **Aim and Objectives:** To Determine the Forces in the Member of Truss for Equilibrium Condition by using Graphical Method.	**2**
9	**Determine the Coefficient of Friction for motion on Horizontal Plane.** **Aim and Objectives:** To Determine the Coefficient of Friction for motion on Horizontal Plane.	**2**
10	**Determine the Coefficient of Friction for motion on Inclined Plane.** **Aim and Objectives:** To Determine the Coefficient of Friction for motion on Inclined Plane.	**2**

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	Text book of Engineering Mechanics	06	R.S.khurmi	S. Chand Pub	2018
2.	Text book of Engineering Mechanics	22	R.K.Bansal	Laxmi Pub	2015

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1.	Engineering Mechanics	8	S. S. Bhavikattis	New Age International Pvt. Ltd.	2021
2	Vector Mechanics for Engineers Statics & Dynamics	12	F. P. Beer and E. R. Johnston	Tata Mc-Graw Hill Publication	2018
3	Engineering Mechanics		Dr. D.S. Kumar	S.K. Kataria & Son	2013
4	Engineering Mechanics	4	K.L.Kumar,Veenu Kumar	McGraw Hill Education	2017
5	Engineering Mechanics	18	S.B.Junnarkar and H. J. Shah	Charotar Publishing House	2013
6	Engineering Mechanics		N.H.Dubey	McGraw Hill Education	2017
7	Engineering Mechanics	02	D.S. Bedi	Khanna Publishing	2019
8	Engineering Mechanics		D P Sharma	Pearson Education India	2011
9	Fundamentals of Engineering Mechanics	03	S. Rajasekaran, G. Sankarasubramanian	Vikas Publishing House	2011

Experiment wise Measurable students Learning Outcomes:
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 the CG of irregular lamina body.
7. Be able to find beam reaction by graphical method.
8. Be able to find member of forces of truss by graphical method.
9. Be able to find coefficient of friction for motion on horizontal plane.
10. Be able to find coefficient of friction for motion on inclined plane.

Title of the Course: Basic Mechanical Engineering	L	T	P	Credit
Course Code: UHSC0113/ UHSC0213	3	-	-	3

Course Pre-Requisite: Chemistry, Mathematics

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 Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain construction and working of various works producing, work absorbing, energy conversion and power transmission devices.
CO2	Explain the main components of an automobile.
CO3	Explain various types of manufacturing processes and elements of robotic and mechatronic system.
CO4	Apply steady flow energy equation to various work producing and work absorbing devices in thermal engineering to find heat or work transfer.
CO5	Calculate the power transmitted by mechanical power transmission devices.

CO-PO Mapping:

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

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	**Engineering Thermodynamics** 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).	6
2	**Applications of Thermal Engineering** *Introduction to I. C. Engines:* Constructional details of I C Engine, Construction and working of two stroke, four stroke S.I. and C.I. engines, comparison between SI-CI engines, two stroke-four stroke engines, applications of I.C. Engines.	7

	Introduction to Refrigeration and Air Conditioning: Vapour compression refrigeration system, refrigerant types and properties, construction and working of household refrigerator and window air conditioner	
3	**Automotive Engineering** Definition of automobile, classification of vehicles on the basis of load, wheels, drive line arrangement, fuel used, axles, position of engine, body and load, main elements of an automobile with layouts, block diagrams of MPFi and CRDi engines indicating the sensors and actuators, their location and function, alternative fuels, block diagram of Electric Vehicles, comparative chart for BS IV and BS VI pollution norms.	6
4	**Energy Conversion Devices** *Hydraulic pumps:* Construction, working and applications of reciprocating (single and double acting) pump, centrifugal pump and submersible pump. *Air compressors*: Construction, working and applications of reciprocating, and axial compressors. *Hydraulic turbines:* construction and working of Pelton wheel, Francis turbine and Kaplan turbine. *Fluid Power systems:* Basic elements of fluid power system, layouts of oil hydraulic and pneumatic systems, comparison between hydraulic and pneumatic system.	7
5	**Mechanical Power Transmission Devices** **Machine elements**: Sketch and functions of axle, shaft, keys and pulleys. **Power transmission devices:** belt drives, types of belts, equation of length of open and cross belt, numerical treatment on power transmitted by belt drive, sleep and creep in belt, chain drive, types of gears and gear trains, Couplings: Construction, working and applications of rigid and flexible couplings, universal joint, Bearings: Construction, working and applications of ball and Journal bearing.	7
6	**Manufacturing Processes and Mechatronic Systems** 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.	7

Textbooks:
1. Basic Mechanical Engineering, 2nd edition, Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S, Scitech Publications, Chennai, 2000.
2. Elements of Mechanical Engineering, 2nd edition, Sadhu Singh, S. Chand Publications, New Delhi, 2010.
3. Basic Mechanical Engineering, 1st Edition, Basant Agarwal and C. M. Agarwal, Wiley India Pvt. Ltd, 2008.
4. Basic Mechanical Engineering, 2nd Edition, Pearson India Education Services Ltd., 2018.

Reference Books:
1. Thermal Engineering, 5th Edition, R K Rajput, Laxmi Publishers, New Delhi, 2006.
2. Automobile Engineering Volume I and II, 7th Edition, Kripal Singh, Standard Publishers, 2007.
3. Manufacturing Technology, Volume I, 5th Edition, P N Rao, McGraw Hill Education (India) Pvt. Ltd. Chennai, 2019.
4. Theory of Machines, 14th Edition, R S Kurmi and J K Gupta, S. Chand Publications, 2007.

Unit wise Measurable students Learning Outcomes:
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 main components of an automobile with help of block diagram.
4. Explain the construction and working of energy conversion devices like hydraulic pump, air compressor, hydraulic turbines and fluid power systems.
5. Explain the construction and working of power transmission devices.
6. Explain various types of manufacturing processes and elements of robotic and mechatronic system.

Title of the Course: Basic Mechanical Engineering (Lab)	L	T	P	Credit
	-	-	2	1
Course Code: UHSC0135/ UHSC0235				

Course Pre-Requisite: Chemistry, Mathematics

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, automotive systems 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 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

Assessment Scheme:

Assessment Component	Marks
ISE (Detailed components)	
1. **Lab experiments**	
2. **Course level project based learning project**	
Total	**50**

Course Contents

Practical No.	Practical/Experiment Title and Contents	Hours
1	Study of steam thermal power plant	2
2	Demonstration and identification of components of internal combustion engine (four stroke and two-stroke engine) with their functions.	2
3	Identification of main elements of an automobile and understanding their functions	2
4	Identification of functions and components of domestic refrigerator and window air conditioner.	2
5	Demonstration of pumps, air compressor and hydraulic turbines.	2
6	Performing basic hydraulic circuit for obtaining liner and rotary motion of actuator	2
7	Demonstration of mechanical power transmission devices.	2
8	Identification and demonstration of elements of centre lathe, drilling machine and milling machine and understanding their functions.	2
9**	Presentation and report preparation on course level problem based learning activities	4

10	Assignment- numerical treatment on applications of first law of thermodynamics to steady flow process (steady flow energy equation).	2
11	Assignment-numerical treatment on power transmitted by belt drive	2
12	Report preparation on general specifications of given type of an automobile.	2

Textbooks:
1. Basic Mechanical Engineering, 2nd edition, Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S, Scitech Publications, Chennai, 2000.
2. Elements of Mechanical Engineering, 2nd edition, Sadhu Singh, S. Chand Publications, New Delhi, 2010.
3. Basic Mechanical Engineering, 1st Edition, Basant Agarwal and C. M. Agarwal, Wiley India Pvt. Ltd, 2008.
4. Basic Mechanical Engineering, 2nd Edition, Pearson India Education Services Ltd., 2018.

Reference Books:
1. Thermal Engineering, 5th Edition, R K Rajput, Laxmi Publishers, New Delhi, 2006.
2. Automobile Engineering Volume I and II, 7th Edition, Kripal Singh, Standard Publishers, 2007.
3. Manufacturing Technology, Volume I, 5th Edition, P N Rao, McGraw Hill Education (India) Pvt. Ltd. Chennai, 2019.
4. Theory of Machines, 14th Edition, R S Kurmi and J K Gupta, S. Chand Publications, 2007.

Practical wise Measurable students Learning Outcomes:
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. Create a prototype/ model for identified problem using knowledge of mechanical engineering and present it in front of experts.
10. Apply steady flow energy equation to various work producing and work absorbing devices in thermal engineering to find heat or work transfer
11. Calculate the power transmitted by mechanical power transmission devices.
12. Prepare a report on general specifications of selected automobile.

Title of the Course: Introduction to Programming (Python)	L	T	P	Credit
Course Code: UHSC0114/ UHSC0214	2	-	-	2

Course Pre-Requisite: Basic Knowledge of computers

Course Description:
This subject covers basic principles of programming through the 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, touples, dictionaries etc. for solving given problem

Course Outcomes:

CO	After the completion of the course the student should be able to	Blooms Level
CO1	Identify working principles of computers and programming languages	1
CO2	Demonstrate use of decision and repetition structure in order to solve specific problem	2
CO3	Model a given big problem statement in to smaller parts to provide modular approach.	3
CO4	Choose proper data structure like list, touples, dictionaries etc. for solving given problem	5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3											2	
CO3						3								
CO4			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	**Background & Introduction:** What is programming, Evolution of programming, How Computers Store Data, How a Program Works, Compilation, Interpretation, **Input, Processing, and Output**: Designing a Program Input, Processing, and Output, Displaying Output with the print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, More About Data Output	4
2	**Decision Structures and Boolean Logic:** The if Statement, The if-else Statement, Comparing Strings, Nested Decision Structures and the if-elif-else Statement, Logical Operators, Boolean Variables	5
3	**Repetition Structures:** 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	4
4	**Functions:** 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	4
5	**Lists and Tuples:** 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, Two-Dimensional Lists, Tuples, **Dictionaries and Sets:** Operations and use	4
6	**Strings, Files & Exceptions:** Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings, Introduction to File Input and Output Using Loops to Process Files, Processing Records, Exceptions	5

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Starting Out with Python	5th	Tony Gaddis	Pearson	March 17th 2021

| 2 | Core Python Programming | 3rd | R. Nageswara Rao | Dreamtech Press | 1 Jan 2018 | |

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	Python: The Complete Reference	Indian Edition	Martin C. Brown	MGH	March 2018

Title of the Course: Introduction to Programming (Lab)	**L**	**T**	**P**	**Credit**
Course Code: UHSC0137/ UHSC0237	-	-	1	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 Touples 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 Touples 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	3													2
CO2		2	2										2	
CO3				3	1									
CO4														

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)	
ESE (POE)	50

Course Contents

Practical No.	Practical Title and Contents	Hours
1	Writing hello world program in compiled and interpreted language & understanding the difference between compilation and interpretation	2
2	Program to perform demonstration of input and output operation	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	Program to create and use own module	2
9	Program demonstrating operations and use of List and Touple	2
10	Program to perform CURD operations in file using file handling	2
11	Program to demonstrate exception handling	2
12	Experiment for installing external modules though pip and building application (Music Player)	2

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Starting Out with Python	5th	Tony Gaddis	Pearson	March 17th 2021
2	Core Python Programming	3rd	R. Nageswara Rao	Dreamtech Press	1 Jan 2018

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1	Python: The Complete Reference	Indian Edition	Martin C. Brown	MGH	March 2018

Websites:

1. https://docs.python.org/3/

Title of the Course: WORKSHOP PRACTICE (LAB) Mechanical	L	T	P	Credit
Course Code: UHSC0132/ UHSC0232	--	--	2	1

Course Pre - Requisite: Nil

Course Description:
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

Course Objectives:
1. To train the students to use different tools and equipments involved in manufacturing processes.
2. To develop the skills to handle the basic hand tools required to manufacture sheet metal model for specific application
3. Introduce to different materials in engineering practices with respect to their workability, formability and machinability with hand tools.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Identify Basic engineering workshop practices and safety measures.
CO2	Identify different tools used in Carpentry, Fitting and Smithy operations
CO3	Enhance their knowledge skill sets with hand-on experience and teamwork inculcating analysis and lifelong learning
CO4	Perform Welding and Soldering operations
CO5	Develop Sheet Metal model for specific application

CO-PO Mapping:

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

Assessment Scheme:

Assessment Component	Marks
ISE is based on practical performed/ Quiz/ Job assigned/ Presentation/ Group Discussion/ Internal oral etc.	25

Course Contents

Practical No.	Practical/Experiment Title and Contents	Hours
1	Safety in Workshop – Fire Hazards, Electric short circuit, Accident prevention methods.	2
2	Introduction to Plumbing – Types of pipe joints, Threading Dies, Pipe fittings – G.I. and PVC **Demonstration of Die Threading process**	2
3	Introduction to Wood Working, Types of Wood, Hand tools and machines, Types of Joints **One job involving any one type of joint and/or article using woodturning operation**	2
4	**Carpentry job** - operation execution and job completion	2
5	Introduction to smithy and Forging process and its tools and equipments, **Demonstration of Smithy Process – One Job for every batch.**	2
6	Joining Process - Permanent joint. Introduction to Welding Processes. Practice on Arc welding and edge preparation for welding and Tacking.	2
7	Operation execution for welding and soldering process. **Job completion (one job for welding and one job for soldering for each student)**	2
8	Demonstration of fitting operation and its tools. Temporary joint preparation – Drilling and Tapping operation.	2
9	Operation execution of fitting job involving drilling, Tapping cutting and Filling operation. **One Job per student**	2
10	Introduction to sheet metal operation.	2
11	To make small job like Pan, Tray, Box etc. Using sheet metal operation like Cutting, Bending, Folding etc **One Job per student**	2
12	Assembly and Disassembly of some products, such as Three Jaw Chuck, Two wheeler sub-assembly, Hydraulic Power Pack, CPU of computer, Home Appliances etc Introduction to tools used.	2

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 with their own hands.
4. By assembling disassembling different components, they will be able to produce small devices of their interest.

Title of the Course: Basic Electrical Engineering (Lab)	L	T	P	Credit
	-	-	2	1
Course Code: UHSC0136				

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

Course Description:
This course gives hands on experience to operate and obtain performance pattern of various electrical devices. This course is designed for verification of theoretical concepts in Electrical Engineering.

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.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Demonstrate** use of assorted electrical equipment.
CO2	**Utilize** transformer and motors
CO3	**Analyze** typical electrical circuits.

CO-PO Mapping:

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

Assessment Scheme:

Assessment Component	Marks
ISE (Journal Writing, Practical Performance, Oral)	
Journal Writing(10), Practical Performance(10), Oral(5)	50

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

Course Contents

Practical No.	Practical/Experiment Title and Contents	Hours
1	Familiarization with Electrical Engineering Laboratory installation, Electric drawing with symbols and Safety Precautions, first aid on electric shock.	2
2	Wiring of loop wiring, Staircase wiring, Godown wiring.	2
3	Calibration of Single-Phase Energy Meter.	2
4	Demonstration of LT Switchgears- Fuse, Miniature Circuit Breaker, Moulded Case Circuit Breaker & Earth Leakage Circuit Breaker, Starters of Motors.	2
5	Selection of motor/heater and power rating calculation for typical application.	2
6	Analysis of Residential and commercial Electricity Energy bill**.**	2
7	Energy Audit of a building.	2
8	Visit to institute's distribution substation and 3 phase generators.	2

9	Use of Megger, Wattmeter, Tester, energy meter to get hands on experience.	2
10	Power factor improvement using static condenser.	2
11	Verification of Kirchhoff's Laws for DC Circuit by using MATLAB	2
12	Study of single line diagram of electrical power system- Case study & Report writing	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 Publishing Co. Ltd., New Delhi	

Practical wise Measurable students Learning Outcomes:

1. State the use of familiarized components of Electrical Engineering.

2. To connect the circuit for loop wiring, staircase wiring and godown wiring.

3. To calibrate a single-phase Energy Meter.

4. To demonstrate the operation of FUSE, MCB, MCCB, ELCB.

5. To select a motor for mechanical application and select a heater for heating application.

6. To calculate energy bill from given data and verify with energy bill received from MSEDCL.

7. To undertake Energy Audit for the given building.

8. To State the use of familiarized components of a substation

9. To demonstrate the use of Megger, Wattmeter & Tester.

10. To improve power factor of a circuit using static condenser.

11. To verify Kirchhoff's law's using MATLAB

12. To study single line diagram with any one case study

Title of the Course: Entrepreneurship Development (Audit Course)	L	T	P	Credit
Course Code: UHSA0151	2	--	--	--

Course Pre-Requisite: General Awareness

Course Description: This course introduces students to the nature of business and entrepreneurship as the vehicle for making money by creating wealth and producing goods and services for a profit in a free enterprise economy. Emphasis is on different forms of business organizations including sole proprietorships, partnerships, corporations, joint ventures and not-for-profit enterprises.

Course Objectives:
1. To develop conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur.
2. To develop the ability of analyzing and understanding business situations in which entrepreneurs act and to master the knowledge necessary to plan entrepreneurial activities.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive level	Descriptor
CO1	**Relate** the concept of Entrepreneurship & describe the role of entrepreneurship within society.	I	Remembering
CO2	**Classify** businesses by type of sector & Explain the process and nature of entrepreneurship.	II	Understanding
CO3	**Explain** institutional & government funding & support policies	II	Understanding
CO4	**Demonstrate** the meaning and triggers of idea generation	II	Understanding

CO-PO Mapping:

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

Assessments :

In Semester Examination (ISE) will be for 100 Marks

Assessment	Marks
ISE1	50
ISE2	50
	100

ISE: Assessment is based on presentation of Innovative Idea/ Business Case presentation through PPT/ Assignments/Prototype Model etc.

Course Contents:

Unit 1:---Introduction to Entrepreneurship Understanding the Meaning of Business and Business Environment, Business strategy & Entrepreneurship; Types of Entrepreneurship, Characteristics and Qualities of an Entrepreneur; Entrepreneurs Vs. Intrapreneurs and Managers; Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.	**5 Hrs.**
Unit 2:--- Types of Enterprises and Ownership Structure: Introduction to various forms of business organizations Small scale, medium scale and large scale enterprises; proprietorship, partnership, Limited Liability companies and Co-operatives: their formation, capital structure and source of finance, udyog adhar, licenses, certifications & registration process etc., Micro, Small and Medium Enterprises, MSME rules, schemes and programs, DPIIT and Its Functions (Department for Promotion of Industry and Internal Trade, Govt. of India), Meaning of Start-up, Start-up India initiative, registration process, Incubators & Accelerators in India, Investors & Start-ups.	**6 Hrs.**
Unit 3:--- E-Cell & Institutional Support and Policies: Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell on creativity & innovativeness, incentives & rewards, Interdisciplinary collaboration, Start-ups & mentorship, Institutional support towards the development of entrepreneurship in India, technical consultancy organizations, government policies for small scale enterprises.	**5 Hrs.**
Unit 4:-- Exploring Business Opportunity Idea generation: Sources of business ideas, how to find & assess ideas? Where to find data for ideation? What is a good problem? Opportunity recognition. Idea validation & Evaluation: Design thinking for finding solutions, prototyping, idea evaluation, entrepreneurial Outlook, overview of bankable project report, new venture planning & venture creation, funding, value proposition design, ideas development, Markets & customer insight, capstone project presentation.	**8 Hrs.**

Textbooks:

1. Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi
2. Saini, J. S., 'Entrepreneurial Development Programmes and Practices' , Deep & Deep Publications (P)
3. Khanka, S S. 'Entrepreneurial Development', S Chand & Company Ltd. New Delhi
4. Poornima M Charantimath, "Entrepreneurship development small business enterprises", Pearson,2013

References:

1. Badhai, B 'Entrepreneurship for Engineers', Dhanpat Rai & co. (p) Ltd.
2. Desai, Vasant, ' Project Management and Entrepreneurship', Himalayan Publishing House, Mumbai, 2002.
3. Gupta and Srinivasan, 'Entrepreneurial Development', S Chand & Sons, New Delhi.
4. Drucker.F, Peter, "Innovation and Entrepreneurship, Harper business, 2006.

Learning Outcomes: After learning the course the students should be able to

1. Develop awareness about entrepreneurship and successful entrepreneurs.
2. Develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication.
3. Develop idea generation, creative and innovative skills
4. Aware of different opportunities and successful growth stories
5. Understand entrepreneurial process by way of studying different case studies and find exceptions to the process model of entrepreneurship.

Title of the Course: Human Values and Professional Ethics	L	T	P	Credit
Course Code: UASA0152/UHSA0252	02			-

Course Pre-Requisite: Basic ideas about human values, fundamental duties and rights.

Course Description: In this course concept and need for value based education are discussed and it includes information about engineering profession, fundamental duties and ethics in this professions and sustainable development.

Course Objectives:
1. To understand human values and its implications in life.
2. To be aware of fundamental right, responsibilities of engineer and concept of professional ethics.
3. To develop awareness about sustainable development.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**State** system human values, sub values &concepts related to professional ethics.
CO2	**Demonstrate** understanding of harmony at various levels and core qualities of professional engineer.
CO3	**Demonstrate** Professional responsibilities of engineering towards sustainable development.
CO4	**Analyze** the social problems using Ethical theories.

CO-PO Mapping:

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

Assessment Scheme:
Two components of In Semester Evaluation (ISE),

Assessment Component	Marks
ISE 1	10
ISE 2	10

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

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Value Based Education** Objective of Education, Four pillars of Education (Delors Report), Education as a medium to transform society, Role of teacher, System values & sub values, Understanding happiness, prosperity, Right understanding, relationship, service learning, civic virtues.	8
2	**Harmony at various levels** Coexistence of self & body – self development, harmony in the family and society, harmony in the nature and existence, social heredity, Rectitude of conduct, social values – Democracy, secularism, oneness of	6

3	**Professional Ethics**	8
	Personal Vs Professional ethics, Work ethics, factors that lead to moral issues, profession and professionalism, core qualities of professional practitioners – Ability to utilize the professional competence for augmenting universal human order, ability to identify people friendly and eco-friendly production system, ability to identify and develop appropriate technologies and management pattern for above production system, code of ethics, Ethical theories & uses of ethical theory to solve the problems, Rights of engineer.	
4	**Sustainable Development: -**	6
	Globalization, intercultural work ethics, Environment and Engineering, invisible hand and tragedy of commons, goals defined by UNESCO, Role of Engineering in sustainable development.	

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	Engineering Ethics includes Human Values	11	M. Govindarajan, S.Natarajan and V.S.Senthil Kumar,	PHI Learning Pvt. Ltd.	2018
2.	Human Values and Professional Ethics	1	R.R.Gaur, R. Sangal, G.P. Bagaria	Excel Books Private Limited	2010

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1.	Ethics in Engineering	1	M.W.Martin & R.Schinzinger	Tata Mc. Graw Hills Pub. Co. Ltd.	
2.	Professional Ethics and Morals,	22	Prof.A.R.Aryasri	Dharanikota Suyodhana-Maruthi Publications	
3.	Moral Capabilities – Unit 1 - Fundamentals			FUNDAEC	2003

Unit wise Measurable students Learning Outcomes:

1. To **list** various human values and explain significance of human values.
2. To **Demonstrate** understanding of harmony at various levels
3. To **discuss** rights and responsibilities of engineers towards society.
4. To **discuss** changing perspective of environmental issues and sustainable development.