KOLHAPUR INSTITUTE OF TECHNOLOGY'S
COLLEGE OF ENGINEERING
(AUTONOMOUS),
KOLHAPUR

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

Structure and Curriculum

for

First Year B.Tech.

(Computer Science & Engineering / Computer Science & Engineering (*Artificial Intelligence & Machine Learning*) / Computer Science & Engineering (*Data Science*) / Electronics & Telecommunication Engineering / Electrical Engineering)

To be Effective from Academic Year 2023-2024

Chairperson
BOS, BSH Dept

Dean Academics,
KITCOEK

Director
KITCOEK

List of Abbreviations

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

KOLHAPUR INSTITUTE OF TECHNOLOGY'S COLLEGE OF ENGINEERING (AUTONOMOUS), KOLHAPUR

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

Teaching and Evaluation Scheme for First Year B. Tech.

(Computer Science & Engineering / Computer Science & Engineering (*Artificial Intelligence & Machine Learning*) / Computer Science & Engineering (*Data Science*) / Electronics & Telecommunication Engineering / Electrical Engineering)

SEMESTER-I (Group-1)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
UHSBS0101	Engineering Mathematics-I	BSC	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0102	Optics and Modern Physics	BSC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSAE0103	Communication Skills	AEC	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0104	Digital Electronics	ESC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0105	Programming in "C" Language	ESC	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0121	Optics and Modern Physics Lab	BSC	-	-	2	1	ISE	50	20	
UHSAE0122	Communication Skills Lab	AEC	-	-	2	1	ISE	50	20	
UHSES0123	Digital Electronics Lab	ESC	-	-	2	1	ISE	50	20	
UHSES0124	Programming in "C" Language Lab	ESC	-	-	2	1	ISE	25		20
							ESE (POE)	25	10	
UHSVS0125	Web Design Lab	VSEC	-	-	2	1	ISE	50	20	
UHSIK0136	Ecology, Energy & Environment	IKS	2	-	-	2	ISE	100	40	
	Total		**15**	**1**	**10**	**21**		**850**		
Total Contact Hours – 26							**Total Credits - 21**			

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SEMESTER-II (Group-1)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for	
UHSBS0201	Engineering Mathematics-II	BSC	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0206	Modern Chemistry	BSC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0207	Basic Electrical Engineering	ESC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0215	Python programming	ESC	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSPC0205	Data Structure	PCC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0226	Modern Chemistry Lab	BSC	-	-	2	1	ISE	50	20	
UHSES0227	Basic Electrical Engineering Lab	ESC	-	-	2	1	ISE	50	20	
UHSPC0224	Data Structure Lab	PCC	-	-	2	1	ISE	50	20	
UHSVS0237	Computer Aided Engineering Graphics	VSEC	1	-	2	2	ISE-I	25	20	
							ISE-II	25		
UHSCC0239	Co-Curricular Course	CC	1	-	-	1	ISE	50	20	
	Total		**16**	**1**	**8**	**21**		**750**		
Total Contact Hours – 25 Total Credits - 21										

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(Computer Science & Engineering / Computer Science & Engineering (*Artificial Intelligence & Machine Learning*) / Computer Science & Engineering (*Data Science*) / Electronics & Telecommunication Engineering / Electrical Engineering)

SEMESTER-I (Group-2)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for Passing	
UHSBS0101	Engineering Mathematics-I	BSC	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0106	Modern Chemistry	BSC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSAE0103	Communication Skills	AEC	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0107	Basic Electrical Engineering	ESC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0105	Programming in "C" Language	ESC	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0126	Modern Chemistry Lab	BSC	-	-	2	1	ISE	50	20	
UHSAE0122	Communication Skills Lab	AEC	-	-	2	1	ISE	50	20	
UHSES0127	Basic Electrical Engineering Lab	ESC	-	-	2	1	ISE	50	20	
UHSES0124	Programming in "C" Language Lab	ESC	-	-	2	1	ISE	25		20
							ESE (POE)	25	10	
UHSVS0137	Computer Aided Engineering Graphics	VSEC	1	-	2	2	ISE-I	25	20	
							ISE-II	25		
	Total		**14**	**1**	**10**	**20**		**750**		
Total Contact Hours – 25 Total Credits - 20										

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SEMESTER-II (Group-2)

Course Code	Course Name	Curriculum Component	Teaching Scheme				Evaluation Scheme			
			L	T	P	Cr	Components	Max	Min for	
UHSBS0201	Engineering Mathematics-II	BSC	3	1	-	4	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0202	Optics and Modern Physics	BSC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0204	Digital Electronics	ESC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSES0215	Python programming	ESC	2	-	-	2	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSPC0205	Data Structure	PCC	3	-	-	3	ISE-I	10		40
							MSE	30		
							ISE-II	10		
							ESE	50	20	
UHSBS0221	Optics and Modern Physics Lab	BSC	-	-	2	1	ISE	50	20	
UHSES0223	Digital Electronics Lab	ESC	-	-	2	1	ISE	50	20	
UHSPC0224	Data Structure Lab	PCC	-	-	2	1	ISE	50	20	
UHSVS0225	Web Design Lab	VSEC	-	-	2	1	ISE	50	20	
UHSIK0236	Ecology, Energy and Environment	IKS	2	-	-	2	ISE	100	40	
UHSCC0239	Co-curricular Course	CC	1	-	-	1	ISE	50	20	
	Total		**17**	**1**	**8**	**22**		**850**		
Total Contact hours – 26 Total Credits - 22										

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

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

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

Course Objectives:

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

Course Outcomes:

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

CO-PO Mapping:

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

Assessment Scheme:

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

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

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

Course Contents		
Unit No.	**Unit Title and Contents**	**Hours**
1	**Complex Numbers and Hyperbolic Functions** ➢ complex number ➢ DeMoivre's theorem ➢ Roots of complex numbers ➢ Circular and hyperbolic functions, functions of a complex variable - definitions ➢ Relation between circular & hyperbolic functions. ➢ Inverse hyperbolic functions. ➢ Separation into real and imaginary parts.	**6**
2	**Differential Calculus** ➢ 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 by using series of standard functions, substitution, differentiation, and integration. ➢ Inderminate forms.	**7**
3	**Partial Differentiation** ➢ First and higher order partial derivatives ➢ 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.	**8**
4	**Solution of Algebraic and Transcendental Equations** ➢ Properties of roots, Synthetic Division Method. ➢ Bisection Method ➢ Regula False Method ➢ Secant Method ➢ Newton Raphson Method	**6**
5	**Matrices and Linear System Equations** ➢ Rank of matrix: echelon form ➢ Consistency of linear system equations ➢ System of linear homogeneous equations ➢ System of linear non-homogeneous equations.	**8**
6	**Eigen Values and Eigen Vectors** ➢ Linear dependence and independence of vectors ➢ Eigen values, eigen vectors and their properties ➢ Cayley-Hamilton's theorem (without proof) ➢ Inverse and higher powers of matrix by using Cayley-Hamilton's theorem.	**7**

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

Title of the Course: Engineering Mathematics-II **Course Code: UHSBS0201**	**L**	**T**	**P**	**Credit**
	3	**1**	**-**	**4**

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

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

Course Objectives:

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

Course Outcomes:

CO	After the completion of the course the student should be able to:
CO1	understand the concepts of improper integrals, multiple integrals and differential equations.
CO2	solve the first order differential equations and find numerical solution of Ordinary differential equations by various methods, 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.

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	**Special Functions** ➢ Gamma function and its properties ➢ Beta function and its properties ➢ Differentiation under integral sign	6
2	**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
3	**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
4	**Ordinary Differential Equations of First Order and First Degree and Its Applications** ➢ Linear differential equations ➢ Exact differential equations	8

	➢ 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	
5	**Numerical Solution of Ordinary differential equation of First Order and First Degree** ➢ Picard's method ➢ Taylor's series method ➢ Euler's method ➢ Modified Euler's method ➢ Runge Kutta Fourth Order method. ➢ Simultaneous first order differential equations by Runge Kutta fourth order method.	**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:

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2.	A Text Book of Applied Mathematics Vol. I & II	**6**	P. N. Wartikar & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune	**Reprint 2007**

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

Title of the Course: Optics and Modern Physics	L	T	P	Credit
Course Code: UHSBS0102 / UHSBS0202	3	-	-	3

Course Pre-Requisite: 1. To know different properties and nature of light
2. To have basic ideas of solid state physics and modern physics.

Course Description: In this course, different properties and theory about nature of light, principles of solid state physics, quantum physics and their applications in different engineering branches are discussed at length.

Course Objectives:

1. To study phenomena of light like interference, diffraction, polarization and their engineering applications.
2. To discuss various characteristics viz monochromaticity, coherence, directionality of laser and their applications in Medical, industrial field, 3 –D photography and to study concept of virtual reality.
3. To explain principle, structure of optical fibre and its advantages and applications in different fields.
4. To derive Maxwell's equations and study electromagnetic wave nature of light.
5. To study principles of quantum mechanics, properties of matter wave, derive Schrodinger equation and discuss applications of quantum mechanics in modern technology.
6. To explain formation of bands in solids using Kronig Penny model and to study significance of Fermi level.
7. To discuss formation of P-N junction and study characteristics of different semiconductor devices.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Define** fundamental properties of light, concepts of solid state physics and principles of quantum physics.
CO2	**Demonstrate** competencyandunderstanding of the concepts of optical phenomena, electro-magnetic theory, quantum mechanics, band theory and semiconductor devices.
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										1	-	-
CO2	3	3			2							1	-	-
CO3	3	3	1		2							1	-	-
CO4	3	3										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	**Unit 1 : 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 **Diffraction:** Introduction, Diffraction Grating – theory, Resolving power of grating, Applications of Diffraction grating. **Polarization:** Introduction, Double refraction, Optical activity – Laurent's half shade polarimeter, Photoelasticity, Electro-optic effects, applications of polarization	8
2	**Unit 2: Lasers & Optical Fibers** **LASER:** Introduction, Interaction of radiation with matter (induced absorption, spontaneous emission and stimulated emission), condition for laser production, Ruby laser, Characteristics of lasers, Applications of Laser, Holography, Holography and virtual reality (Conceptual Discussion) **Fiber Optics:** Introduction – principle, construction, Propagation of light through an optical fiber – Acceptance angle – Numerical aperture (No derivation) –fractional Refractive Index change, Types of optical fibers, Advantages and applications of optical fiber.	7
3	**Unit 3: Electromagnetic Theory** Introduction, Derivation of Maxwell's equations in free space and dielectric medium, velocity of EM wave, EM wave propagation in free space (Transverse wave) and dielectric medium, Boundary conditions- Dielectric-Dielectric boundary (Derivation), Poynting Vector.	6
4	**Unit 4:Quantum mechanics** Introduction, de Broglie's hypothesis, Heisenberg's uncertainty principle and its applications, wave function and Max Born interpretation of wave function, Schrödinger time dependent and time independent wave equations, Applications of Schrödinger wave equation - infinite deep well potential (particle in a box), Quantum states, Superposition principle, Quantum entanglement (Conceptual Discussion), Applications of Quantum Mechanics – Tunneling, Quantum Computation (Conceptual Discussion).	8
5	**Unit 5: Band Theory of Solids** Introduction, Bloch Theorem, Kronig-Penny Model, Formation of bands in solids, Fermi- Dirac distribution, Fermi level in intrinsic semiconductor (Derivation), and extrinsic semiconductors (only qualitative description), law of mass action, Effective mass of Electron.	7
6	**Unit 6:--- Semiconductor Devices** Formation of P-N junction, charge flow in P-N junction, Diode Equation, Energy band diagram for junction, Solar Cell and its applications, JFET and MOSFET - structure and characteristics and applications, CMOS - structure and characteristics.	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

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1.	Engineering Physics	1	Dattu R Joshi	Tata Mc. Graw Hills Pub. Co. Ltd.	2010
2.	A Text Book of Optics	22	Subramanyam & Brij Lal,	S. Chand & Company (P.) Ltd.	1995
3.	Introduction to Solid State Physics	7	Charles Kittle	Wiley India Pvt. Ltd	1996
4.	Basic Quantum Mechanics	1	Ajoy Ghatak,	Laxmi Publications	
5.	Electricity and Magnetism	1	A.S.Mahajan and A.A.Rangwala	Tata Mc. Graw Hills Pub. Co. Ltd.	1988
6.	Elements of Electromagnetics	4	Matthew N.O.Sadiku	Oxford University Press	2008
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 **illustrate** applications of interference to study surface characteristics, use of diffraction grating to measure wavelength of given source of light and analysis of crystal structure using x- ray diffraction.

2 To **explain** phenomenon of polarization and applications of polarization in engineering.

3 To **state** characteristics, applications of laser and optical fibre and **calculate** acceptance angle of optical fibre.

4 To **derive** Maxwell's equations and explain electromagnetic nature of light.

5 To **explain** wave particle duality, derive Schrodinger's equation and relation of principles of quantum mechanics with modern technology.

6 To **explain** band theory of solids and **demonstrate** dependence of Fermi level on temperature and carrier concentration.

7 To **explain** formation of P-N junction and characteristics and applications of semiconductor devices.

Title of the Course: Communication Skills	**L**	**T**	**P**	**Credit**
Course Code: UHSAE0103	**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 hone their listening and reading comprehension skills
3. To introduce them to techniques to improve their spoken English and to provide them a platform for practicing these skills
4. To enable them to write correct and effective business letters, official letters and covering letter with resume
5. To introduce students to effective techniques to participate in GD and face the interviews.

Course Outcomes:

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

CO-PO Mapping:

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

Assessment Scheme:

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

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

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

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Communication Theory** • Communication basics: Importance, process, levels • Forms/methods: verbal and non-verbal • Barriers and solutions • Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions	6
2	**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 Art of précis writing, Techniques to comprehend and summarize a given technical, scientific, or industry-oriented text • **Thinking** as a learning skill	8
3	**Formal Business Correspondence** • Principles, structure (elements) • Layout (complete block, modified block, semi-block), Types (enquiry and replies, claim and adjustment)	7
4	**Employment skills** • Covering letter and resume • Group discussion • Interviews • Introduction to soft skills	7

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 be able to apply different strategies of LSRWT skills

Unit 4. They will learn different types and formats of official letters and draft various types of letters applying the knowledge gained

Unit 5. They will understand the techniques for effective participation in GD and tips for successful interviews.

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

Title of the Course: Digital Electronics.	**L**	**T**	**P**	**Credit**
Course Code: UHSES0104 / UHSES0204	03	--	--	03

Course Pre-Requisite: Basic knowledge of numbering system.

Course Description:

It is a core and fundamental subject. The course focuses on basic understanding of digital system concepts like boolean algebra, logic gates, combinational and sequential logic, memory and working of Microprocessor.

Course Objectives: The course aims to:

1. Understand Numbering system in digital electronics and interpret logic expression.
2. Understand principles, characteristics and operations of combinational & sequential logic circuits.
3. Design, implement and analyze combinational circuits.
4. Understand operation of various memory devices.
5. Understand architecture of 8085 and 8086 Microprocessors.

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		level	**Descriptor**
CO-1	Understand Number System.	II	Understand
CO-2	Interpret Boolean Logic Expressions.	II	Interpret
CO-3	Design Combination Logic Circuits.	VI	Design
CO-4	Understand Sequential logic circuits and Memory devices.	II	Understand
CO-5	Understand architecture of Microprocessors.	II	Understand

CO-PO Mapping:

CO's/PO's	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO-1	2	2	3							2	1	1
CO-2	2	2	3	3	1					2	1	1
CO-3	2	2	3	3	1					2	1	1
CO-4	2	2	3							2	1	1
CO-5	2	2	3	3	1					2	1	1

Assessments :

Teacher Assessment:

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

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

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

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

ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Unit 1:-Number Systems &Logic Gates. Analog Vs Digital signal, Number Systems introduction, Number Representation in Decimal, Binary, Octal and Hexadecimal, Number System Conversion, Binary numbers: Addition and Subtraction, 2's Complement arithmetic, Introduction, Positive and Negative Logic, Truth Table, Logic gates, Universal Logic Gates -NAND & NOR.	**6 Hrs.**
Unit 2:- Boolean Algebra Boolean Algebra, Karnaugh Maps (up to 3 variables) and their use for Simplification of Boolean Expressions, Implicants and its use in K-map. Implementation of logic gates using universal gates.	**6 Hrs.**
Unit 3:- Combinational Logic. Introduction, Arithmetic Circuits: Half & Full Adder, Subtractor. ALU, Multiplexers, Demultiplexer, Encoders, Decoders.	**7 Hrs.**
Unit 4:-Sequential Logic and Memory Devices. Introduction, Triggering concept, Flip Flops and its operation (SR, D, T, JK Flip Flop), Flip Flop Timing Parameters, Digital Counters, Registers. Classification of Memories, Memory Structure: Address and Size, Random Access Memory (RAM),Read Only Memory (ROM),Secondary Memory, Cache Memory, Difference between RAM and ROM.	**7 Hrs.**
Unit 5:- Introduction to 8085 Microprocessors. General definitions of mini computers, microprocessors, micro controllers and digital Signal processors, Overview of 8085 microprocessor: Architecture, Pin Diagram, Functional block diagram.	**6 Hrs.**
Unit 6:- : **Introduction to 8086 Microprocessors.** Overview of 8086 microprocessor: Architecture, Pin Diagram, Functional block diagram. Assembly language of 8086:Description of Instructions,Assembly directives,Algorithms with assembly software programs.	**7 Hrs.**

Textbooks:

1. Anand Kumar 'Fundamentals of Digital Circuits'--. PHI
2. Digital Design by M. Moris Mano and Michael D Ciletti, 5th edition, Pearson Education.
3. Advanced Microprocessors and Peripherals - A.K. Ray and K.M. Bhurchandi, TMH, 3rd Edition.
4. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall.
5. Microprocessor and Interfacing- Douglas V Hall, SSSP Rao, 3rd edition TMH, 2012.

References:

1] Willim I. Fletcher.'An Engineering Approach to Digital Design'—PHI/ Pearson
2] Norman Balabanian Bradle Carlson. 'Digital Logic Design Principals,.' Wiley Publication.

Unit wise Measurable students Learning Outcomes:

Upon successful completion of this course students will be able to:

1. Explain Number Systems & Boolean Algebra.
2. Explain working of logic gates.
3. Design Combination Logic Circuits.
4. Explain working of Sequential logic circuits and Memory devices.
5. Explain Architecture and working of 8085 microprocessor.
6. Explain Architecture and working of 8086 microprocessor.

Title of the Course: Programming in "C" Language **Course Code: UHSES0105**	**L**	**T**	**P**	**Credit**
	2	**-**	**-**	**2**

Course Pre-Requisite:

Basic Knowledge of Computers

Course Description: This Course will introduce C

Course Objectives:

1. Introduce "C" Programming Language
2. Learn structure of "C" Program
3. Understand Features of "C"
4. Learn to write programs in "C" Language

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Explain features of "C" programming language
CO2	Select "C" programming constructs for program writing
CO3	Develop programming solution for given problem

CO-PO Mapping:

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

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 C – Evolution of "C", Feature of "C", Structure of C Program, Compilation and Execution, Data Types – user defined , pre-defined, Variables, Constants, reading and printing variable values, Preprocessor Directive	4
2	Operators in C – Arithmetic Operators, Relational Operators, Logical Operators, Unary Operators, Bitwise Operators, Ternary Operator, sizeof operator,	4
3	Control Flow – Statements & Blocks, Decision Controls, If-else statements, Switch Case, Loops – for loop, while loop, do – while loop, Loop interruption – break, continue, exit functions	4
4	Functions – Fundamentals of function – function declaration and prototype, function definition, function call, return type and return statement, Function arguments, Scope of Variables in function, variable storage classes, storage classes – Automatic, Static, Register, External,	4
5	Arrays – Single Dimensional Array, Multi-Dimensional Array, Character Array, Strings, Built in String functions -strcat, strcmp, strcpy, strlen	3
6	Pointers – Address & Dereferencing, Pointer Type Declaration, Pointer Initialization, Pointer Assignment, Pointer Arithmetic, Pointer Comparison, Pointer & Functions – Passing Pointer to function, pass by value, pass by reference, Pointer to array, Pointer to functions, Array of Pointers, Malloc and Calloc memory allocation	5

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1.	The Complete Reference	4th Edition	Herbert Schildt	McGraw-Hill Education	2017

Reference Books:

SN	Title	Edition	Author/s	Publisher	Year
1.	"C" Programming Language	Second Edition	Brian Kernighan, Dennis Ritchie	PHI Learning	2011
2.	Practical "C" Programming	Third Edition	Steve Oualline	Oreilly	2013
3.	Programming in ANSI C	Eight Edition	E. Balagurusamy	McGraw Hill Education	2019

Title of the Course: Modern Chemistry	L	T	P	Credit
Course Code: UHSBS0106 / UHSBS0206	3	-	-	3

Course Pre-Requisite:

Students should have knowledge about basic chemistry related to periodic table, properties of elements, electrochemistry, properties of electromagnetic radiations, energy storage and energy conversion devices, physical and chemical properties of nano materials and advanced materials, etc.

Course Description:

This course intends to impart fundamentals knowledge of advanced materials (conducting polymers, nano materials, sensors), and applied knowledge of instrumental methods, energy conversion and storage devices, prevention techniques of corrosion.Students will be expected to communicate knowledge to society and industry.

Course Objectives:

1. To provide and demonstrate chemistry concepts relevant to technological field.
2. To understand basic principles of electrochemistry and use of different electrodes in analysis.
3. To train students to effectively use knowledge of instrumental techniques, advanced materials and nanomaterials.
4. To introduce electrochemical phenomenon involved in corrosion and corrosion control methods.
5. To understand the chemistry of different energy conversion devices such as batteries, fuel cells.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	**State** concepts and principles used in various modern chemical technologies.
CO2	**Understand** working of different techniques such as pH meter, spectrophotometer, sensors used for analysis of chemical samples.
CO3	**Illustrate** construction and applications of energy conversion devices, electron microscopes for engineering materials.
CO4	**Analyze** problems related to engineering materials, chemical fuels and design practical solution.
CO5	**Evaluate** the efficiency of fuel and quality parameters of advanced materials from given data.

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		2							1		
CO3	3	2	1									1		
CO4	3	2										1		
CO5	3	2					1					1		

Assessment Scheme:

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

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

ISE 1 and **ISE 2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.
MSE is based on 50% of course content (first 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	**Electrochemistry and Instrumental techniques** An introduction to various analytical techniques as qualitative and quantitative analysis, advantages and disadvantages of instrumental methods, cell potentials, Nernst equation, reference electrodes, electrolyte concentration cells, ion selective electrodes, glass electrode:pH measurement using glass electrode, applications of pH-metry. Ultraviolet-Visible Spectroscopy:Lamberts and Beer-Lambert's law, Single beam spectrophotometer: instrumentation and working, numericals.	07
2	**Conducting polymers and sensors** **A) Conducting polymers:** Introduction, Intrinsically conducting polymers: conjugated π-electron conducting polymers and doped conducting polymers, extrinsically conducting polymers, factors responsible for conduction, advantages and applications. **B) Sensors:** Introduction, Electrochemical sensors-working principle, advantages and applications of glucose sensor and gas sensor. Optical sensors-working principle and applications.	07
3	**Corrosion and Its Prevention** Introduction, dry corrosion (corrosion due to oxygen and other gases), wet corrosion: electrochemical theory of corrosion (hydrogen evolution and oxygen absorption), differential metal corrosion, differential aeration corrosion: pitting corrosion and water line corrosion, stress corrosion, factors affecting rate of corrosion; Corrosion control: cathodic protection-Sacrificial anode and Impressed current method, Anodic protection- electroplating.	07
4	**Chemical Fuel** Introduction, classification, characteristics of good fuel, calorific value-definition, units, gross calorific value, net calorific value, Calculation of calorific value by Dulong's formula, Bomb calorimeter and Boy's calorimeter-basic instrumentation, working, Numericals. Petroleum-Introduction, refining, important petroleum products, Non-petroleum fuels.	07
5	**Fuel cell and Battery Technology** **A) Fuel Cells:** Principle, components, classification of fuel cell, H_2-O_2 Fuel Cell (AFC), Phosphoric Acid Fuel Cell (PAFC), Polymer Electrolyte Membrane Fuel Cell (PEMFC), Molten Carbonate fuel cell (MCFC), solid oxide fuel cell (SOFC). **B) Battery technology:** Introduction, components of battery, Battery characteristics, Li-Ion battery: Principle, working and applications.	07
6	**Nanomaterials and Characterization Techniques** Introduction to Nanomaterials, Synthesis of Nanomaterials (Bottom up-self assembly and Top down approaches using methods like Ball milling, Sol-gel Process, Chemical Vapour deposition (CVD), Classification of nanomaterials, Characterization of Nanomaterials using Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Graphene, Carbon Nanotubes, Applications of nanomaterial in engineering fields.	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	Engineering Chemistry	3	Godbole, Pendse, Joshi	Nirali publication, Pune	2009
4	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	Industrial Electrochemistry	2	D. Pletcher, F.C. Walsh	S K Kataria and Sons, New Delhi	2010
3	Engineering Chemistry	2	O. G. Palanna	Blackie Academic and Professional	2009
4	Fundamentals of Analytical Chemistry	9	D. A. Skoog, D. M. West	Cengage Learning	2013
5	Nanotechnology-Importance and Applications	1	M. H. Fulekar	Wiley	2019
6	Biosensors	3	J. M. Copper	Oxford Publication	2004

Unit wise Measurable students Learning Outcomes:

1. To demonstrate the working of different instrumental methods of chemical analysis.
2. To describe different types of conducting polymers, sensors and their applications in engineering fields.
3. To analyze the degree of corrosion and study of its preventative techniques.
4. To illustrate the characteristics properties of an ideal fuel and fuel cells.
5. To calculate the heating value of chemical fuels.
6. To demonstrate the mechanism and applications of energy conversion devices with respect to fuel cells and batteries.
7. To illustrate techniques of synthesis and characterization of nanomaterials

Title of the Course: Basic Electrical Engineering	L	T	P	Credit
Course Code: UHSES0107 / UHSES0207	3	-	-	3

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

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

Course Objectives:

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

Course Outcomes:

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

CO-POMapping:

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

AssessmentComponent	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

ISE1 and **ISE2** 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	Hour
1	**DC Electric Circuit & Magnetism:** **DC Electric Circuit:** Kirchhoff's laws, Concept of constant voltage source, Analysis of series andparallel DC circuit with resistances, Voltage rating, Power rating of resistive devices, DC circuit with R-C & R-L (Charging and discharging of capacitor, Time constant for RC & R-L circuit.) **Magnetism:** Concept of Magneto Motive Force (Mmf), Reluctance(S), Flux density (B), Series and parallel Magnetic circuits with dc excitation, BH curve, Hysteresis ,Eddy current loss ,Magnetic leakage & fringing, Numerical treatment on DC electric circuit & Magnetism.	**08**
2	**Single Phase AC Fundamentals:** Generation of Sinusoidal Voltage, Representation of Sinusoidal Waveforms, RMS value, Averagevalue, Form factor, Peak factor, Phasor representation, Impedance of AC circuit,Powers- Active, Reactive & Apparent, Power Factor and its Significance, Power Factor Improvement by Capacitive bank, R-L, R-C, R-L-C series circuits, Numerical treatment on Single Phase AC Fundamentals.	**08**
3	**DC Motor:** Basic principle of any electric motor, Construction and Working of DC motor, Types of DC motors and their Speed Torque characteristics with Applications, Speed Control methods of DC Motor (armature voltage control & flux control), Starter of DC motor (Soft starter, 3 point & 4 Point, starter)	**06**
4	**Single Phase Transformer:** Principle, Construction, Classifications, EMF equation, voltage ratio, current ratio, working at No Load & with Load, Losses in Transformer, Efficiency and Voltage Regulation, Applications, Numerical treatment on Voltage Regulation & Efficiency.	**06**
5	**Diode &Transistors:** **Diode**: Review of PN junction diode, Review of Zener Diodes, Light-Emitting Diodes, Load-Line Analysis of diode, Types of Rectifiers (Half Wave & Full Wave), Clippers, Clampers. **Transistors**: Types of Transistor (NPN & PNP), Transistor Configuration, Characteristics of Transistors, Transistor operation and amplifying action, DC Load Line analysis.	**08**
6	**Transducers** Introduction, Need of transducers, Classification of Transducers, Selection Factors and General Applications of Transducers like: LVDT, RTD, Strain Gauge (Load Cell), Capacitive Proximity Sensor, Vacuum Phototube, Photo Diode, Photo voltaic, Peizo Electric devices.	**06**

Textbooks:

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

ReferenceBooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Basic Electrical Engineering	3rd	D.P.Kothari, I.J.Nagrath	Tata Mc Graw Hill.	
2	Electronics Devices & Circuits		Allen Mottershead	PHI	
3	Electronic Instrumentation	3rd	H.S.Kalsi	MGH	
4	Electrical Engineering concepts and Applications		P.V.Prasad and S.Shivan Raju	Cengage learning	

Unit wise Measurable students Learning Outcomes:

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

Title of the Course: Optics and Modern Physics Laboratory Course Code: UHSBS0121 / UHSBS0221	L	T	P	Credit
	-	-	2	1

Course Pre-Requisite:

1.To calculate least count of measuring instrument

2. Requisite theory concepts related to that experiment.

Course Description: This course includes experiments designed to verify the laws studied in 'Optics and Modern Physics' Theory course.

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 demonstrate electrical properties of semiconducting sample.
7. To study I – V characteristics of semiconducting devices.

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	**Demonstrate** working of optical fibre and **determine** its acceptance angle.
CO3	**Analyze** crystal structure and electrical properties semiconducting material and semiconducting devic
CO4	**Design, develop and 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												
CO4	3	2			2			2	3	3		1		

Assessment Scheme:

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

Course Contents		
Practical No.	**Practical/Experiment Title and Contents**	**Hours**
1	**Title of the practical/Experiment 1:** Photocell **Aim and Objectives:** To study photoresponse of photocell.	**2**
2	**Title of the practical/Experiment 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 study phenomenon of diffraction and determine thickness of given obstacle.	**2**
4	**Title of the practical/Experiment 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 5:** Resolving power of plane transmission grating. **Aim and Objectives:** To determineResolving power of plane transmission grating.	**2**
6	**Title of the practical/Experiment 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 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 8:** Hall effect **Aim and Objectives:** To determine Hall coefficient of semiconducting sample and its charge density.	**2**
9	**Title of the practical/Experiment 9:** Numerical aperture of optical fibre **Aim and Objectives:** To calculate Numerical Aperture of optical fibre and its acceptance angle.	**2**
10	**Title of the practical/Experiment 10:** Four point probe method **Aim and Objectives:** To study electrical properties of given semiconducting sample using four point probe method.	**2**
11	**Title of the practical/Experiment 11:** Polarimeter **Aim and Objectives:** To calculate specific rotation of sugar solution.	**2**
12	**Title of the practical/Experiment 12:** Characteristics of p-n junction Diode **Aim and Objectives:** To study forward bias and reverse bias I – V Characteristics of	**2**

	p-n junction diode and find junction potential.	
13	**Title of the practical/Experiment 13:** Characteristics of transistor in Common Emitter configuration **Aim and Objectives:** To study input, output Characteristics of transistor in Common Emitter configuration and find current gain.	**2**
14	**Title of the practical/Experiment 14:** Characteristics of transistor in Common Base configuration **Aim and Objectives:** To study input, output Characteristics of transistor in Common Base configuration and find current gain.	**2**
15	**Title of the practical/Experiment 14:** Franck – Hertz Experiment **Aim and Objectives:** To determine the first excitation potential of gas.	**2**

Any 9 practical/experiments to be completed

Textbooks:

SN	Title	Edition	Author/s	Publisher	Ye
1.	An Advanced Course In Practical Physics	8	D. Chattopadhay, P.C. Rakshit	New Central Book Agency(P) Ltd	20

Reference Books:

SN	Title	Edition	Author/s	Publisher	Ye
1	Experiments in Engineering Physics		M.N.Avadhanulu, A.A. Dani, P.M. Pokley.	S. Chand & Company Ltd., Delhi	

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 to 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 determine Hall coefficient and calculate carrier concentration of semiconductor.
9. To calculate numerical aperture and acceptance angle of optical fibre.
10. To measure resistivity and calculate energy band gap of semiconductor and to demonstrate advantages of four point probe method over two probe method.
11. To explain phenomenon of optical activity and determine specific rotation of sugar solution.
12. To explain working and characteristics of LED.
13. To discuss working of transistor in common emitter configuration and its application in amplifier.
14. To discuss working of transistor in common base configuration and its application in amplifier.
15. To verify the energy transferred from electrons to the atoms always had discrete value.

Title of the Course: Communication Skills Laboratory	L	T	P	Credit
Course Code: UHSAE0122/ UHSAE0222	-	-	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/Story telling/Assignments/Demonstration, etc. **Distribution of Marks:**	
▪ Lab Manual	10
▪ Grammar tests and exercises	10
▪ Lab Tests and Practical Performance	10
▪ Group Discussion	05
▪ Personal Interviews	05
▪ Public Speech (extempore and prepared)	05
▪ Attendance	05
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	**Verbal Aptitude 1 (Discussion on applications of grammar)** Using proper tenses, correct use of articles, conjunctions and prepositions	2
4	**Verbal Aptitude 2 (Watching videos and solving grammar exercises)** Using proper tenses, correct use of articles, conjunctions and prepositions	2
5	**Listening practice** Listening comprehension, Strategies for effective listening with audio/video samples	2
6	**Speaking practice-1** Video samples of effective and ineffective public speeches, Extempore (JAM), prepared speeches	2
7	**Speaking practice-2** Prepared speeches	2
8	**Group Discussion-1** Group discussion tips, Do's and Don'ts, video samples Mock GD-1, analysis and comments on individual performances	2
9	**Group Discussion -2** Final GD participation	2
10	**Interview 1** Discussing interview FAQs in detail, video samples	2
11	**Interview 2** Mock interviews (prepared and formal)	2
12	**Incident Narration or Story telling** Practicing narration methods and techniques for effective narration.	2

Any 10 practical/experiments will be completed.

Textbooks/Software:

Orell Talk Digital Language Lab 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 They will be able to use proper pronunciation, tone and intonation

Practical 3,4: Their verbal ability will be enhanced

Practical 5: Students will improve their listening comprehension skills

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

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

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

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

Title of the Course: Digital Electronics Lab Course **Code: UHSES0124 / UHSES0224**	L	T	P	Credit
	- -	--	2	1

Course Pre-Requisite: The knowledge of numbering system and working of basic gates will be beneficial.

Course Description: It is a core and fundamental subject. The course focuses on basic Working of logic gates, Designing of combinational and sequential logic and working of Microprocessor.

Course Objectives: This course aims to

1. Understand the basic characteristics Logic gates
2. Understand the operation of combinational and sequential circuits and its applications.
3. Demonstrate the operation of sequential circuits.
4. Design and analyze different types of combinational and sequential circuits.
5. Demonstrate the operation 8085 and 8086 Microprocessors.

Course Learning Outcomes:

CO	**After the completion of the course the student shouldbe able to**	Bloom's Cognitive level	Descriptor
CO1	Design & Construct Combinational logiccircuits.	V I	Design
CO2	Design & Construct sequential logiccircuits.	V I	Design
CO3	Demonstrate the operation of sequential logic circuits and 8085 and 8086 Microprocessor.	II	Demonstrate

CO-PO Mapping:

CO	1	2	3	4	5	6	7	8	9	10	11	12		
CO1	3	2	3	2	1		1		1	1	1	1		
CO2	3	2	3	2	1		1		1	1	1	1		
CO3	2	2	3	2	1		1		1	1	1	1		

Assessments :

Teacher Assessment:

One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having50%, and 50% weights respectively.

Assessment	Marks
ISE	50

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

ESE: Assessment is based on oral examination

Course Contents:

Experiment 1: - Working of Basic logic gates. Truth table verification of basic Logic gates.	**2Hrs.**
Experiment 2: - Implementation of Basic logic gates by universal gates. Implementation of basic gates from universal gates	**2Hrs.**
Experiment 3 :- Combinational Logic Circuits a. Adder/ Subtractor.	**2Hrs.**
Experiment 4:- Combinational Logic Circuits **a.** Code Converters	**2Hrs.**
Experiment 5:- Combinational Logic Circuits **a.** Logic implementation of 2/3 input minterm/maxterm. MUX/ Decoders	**2Hrs.**
Experiment 6:- Sequential Logic Circuits a. Study of S-R flip-flop and D flip-flop, T-flip flop and JK flip-flop TTL ICs.	**2 Hrs.**
Experiment 7:- Sequential Logic Circuits **a.** Synchronous/ Asynchronous counters/ Shift Registers.	**2Hrs.**
Experiment 8:- Assembly language programming to evaluate a. Arithmetic operations	**2Hrs.**
Experiment 9:- Assembly language programming to evaluate **a.** Logical and shift operations	**2Hrs.**
Experiment 10:- Assembly language programming to evaluate **a.** Implementation of simple programs to demonstrate use of branch instructions	**2Hrs.**

Textbooks:

1. Anand Kumar _Fundamentals of Digital Circuits'--. PHI
2. M. Morris Mano _Digital Design'-- (Third Edition),. PHI
3. Advanced Microprocessors and Peripherals - A.K. Ray and K.M. Bhurchandi, TMH, 3rd Edition.
4. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall.
5. Microprocessor and Interfacing- Douglas V Hall, SSSP Rao, 3rd edition TMH, 2012.

References:
1] William I. Fletcher.'An Engineering Approach to Digital Design'—PHI/ Pearson
2] Norman BalabanianBradle Carlson. _Digital Logic Design Principals,.' Wiley Publication.3] Rajkamal _Digital Systems Principals and Design'—Pearson
4] A.P. Malvino, D.P. Leach _Digital Principles & Applications' -VIth Edition-Tata McGraw Hill, Publication.
5] R.P. Jain-_Modern Digital Electronics' IIIrd Edition- Tata McGraw Hill, Publication

Title of the Course: Computer "C"Language Laboratory **Course Code: UHSES0124**	**L**	**T**	**P**	**Credit**
	-	**-**	**2**	**1**

Course Pre-Requisite: Computer "C" Language

Course Description: In this course students will apply the leanings of theory Computer "C" language theory Course. Students are expected to develop programming solutions to given problems

Course Objectives:

1.To use knowledge of "C" to write programs.
2. Test understanding of students of "C" language.
3. Develop programming skills of students.

Course Outcomes:

CO	**After the completion of the course the student should be able to**
CO1	Explain 'C' Language Constructs
CO2	Select Constructs of 'C' to develop programming solution
CO3	Use Memory Management techniques for dynamic memory management
CO4	Develop "C" program to solve problem.

CO-PO Mapping:

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

Assessment Scheme:

Two components of In Semester Evaluation (ISE), End Semester Examination (ESE) in Practical Oral Examination pattern

Assessment Component	**Marks**
ISE	25
ESE (PoE)	25

ISE based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.
ESE is based on 100% course content and Practical Oral Examination in Laboratory

Course Contents		
Experiment No.	**Title**	**Hours**
1	To Study basic Linux commands and different IDEs usedfor programming. Practical/Experimentation: • Hands on Basic Linux Commands & Different IDEs • Command Line based compilation and execution of program	**2**
2	To study variables and constants in "C" Practical/Experimentation: • Declare and initialize variables and constant using assignment statement and scanf function • Use printf function to display the variables – (data type formatting)	**2**
3	To Study arithmetic operators in "C" • Develop program to use arithmetic operators	**2**
4	To Study logical operators and Conditional Execution • Develop program to test conditional execution of the code – o If else, switch, while, do-while	**2**
5	To Study functions in "C" • Develop function which accept argument, process the argument and return the result – eg. Addition function accepts two numbers, preforms addition and returns the result	**2**
6	To Study Arrays in "C" • Develop a function which accepts a integer array and print the array • Develop a function which accepts a character array, string operation on the array and print the array • Develop a function which accepts a integer array, perform arithmetic operation on array	**2**
7	To Study Multi-Dimensional Array • Implement Matrix Multiplication using 2D array.	**2**
8	To Study Pointers in "C" • Develop a function to accept array argument using pointer, modify and display contents of the array using pointer	**2**
9	To Study Pointers in "C" • Pass integer variables using – pass by value and pass by reference concept • Modify the values and test the effect on the variables by printing values in the function and main method	**2**

10	To Study Memory allocation in "C" • Reserve the memory using malloc or calloc function • Use the memory for storing values • Free the memory after completion of the taks/funciton	**2**

Textbooks:

SN	Title	Edition	Author/s	Publisher	Yea
1.	**The Complete Reference**	**4th Edition**	**Herbert Schildt**	**McGraw-Hill Education**	**201**

Reference Books:

SN	Title	Edition	Author/s	Publisher	Yea
1.	**"C" Programming Language**	**Second Edition**	**Brian Kernighan, Dennis Ritchie**	**PHI Learning**	**201**
2.	**Practical "C" Programming**	**Third Edition**	**Steve Oualline**	**Oreilly**	**201**
3.	**Programming in ANSI C**	**Eight Edition**	E. Balagurusamy	McGraw Hill Education	**201**

Title of the Course: Web Design Laboratory **Course Code: UHSVS0125 / UHSVS0225**	**L**	**T**	**P**	**Credit**
	-	**-**	**2**	**1**

Course Pre-Requisite:
Basic understanding of programming.

Course Description:
This Course contains various techniques and technologies used for website designing and development

Course Objectives:

- To learn basic userinterface.
- To develop static and responsive web pages using HTML andCSS
- To develop interactive websites using jQuery andJS.
- To learn how to host the website

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Apply basic knowledge of HTML and CSS to design web pages
CO2	Create attractive static web pages
CO3	Make use of bootstrap to develop responsive website
CO4	Design and host websites using javascript and jquery

CO-PO Mapping:

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

Assessment Scheme:

Assessment Component	Marks
ISE	50

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

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**HTML** Introduction to HTML5, Features of HTML5, HTML5 DocType, New Structure Tags, Header, Footer, designing a HTML Structure of Page, New Media Tags, Audio Tag, Video Tag, Canvas and Svg Tag, Introduction to HTML5 Forms, New Attributes, Placeholder Attribute, Require Attribute,	4
2	**CSS** Introduction to CSS 3, New CSS 3 Selectors, Attribute Selectors, First-of-type, Last- of-type, New CSS3 Properties, Custom Fonts, Text- Shadow Property, Text-Stroke Property, Rounded Corners, Box Shadows, Transition effect, Transform effect, Animation effects,	4
3	**BootStrap** Introduction to Responsive Design, Mobile first design concepts, Common device dimensions, View-port tag, Using css media queries, Menu conversion script, Basic Custom Layout, Introduction to Bootstrap, Installation of Bootstrap, Grid System, Forms, Buttons, Icons Integration, Using CSS3 in Practical Layout	4
4	**JavaScript** Introduction to Client Side Scripting, Introduction to Java Script, Javascript Types, Variables in JS, Operators in JS, Conditions Statements, JS Popup Boxes, JS Events, JS Arrays, JS Objects, JS Functions, Validation of Forms, Related Examples	4
5	**jQuery and jQuery UI** Introduction to jQuery, jQuery Features, Installing jQuery, jQuery Syntax, jQuery Ready Function, jQuery Selectors, jQuery Actions, jQuery plugins, jQuery Validation plugin, jQuery Slideshow, jQuery Dropdown, jQuery UI, Working with jQueryUI	4

6	**Web Hosting** Web Hosting Basics, Types of Hosting Packages, Registering domains, Defining Name Servers, Using Control Panel, Creating Emails in Cpanel, Using FTP Client, Maintaining a Website, Introduction to Joomla & Wordpress CMS	**4**

Textbooks:

SN	Title	Edition	Author/s	Publisher	Year
1	HTML & CSS: The Complete Reference	5	Thomas Powell	McGraw-Hill	2010
2.	JavaScript: The Definitive Guide	6	David Flanagan	O'Reilly Media, Inc.	2011
3	Learning jQuery	4	Jonathan Chaffer; Karl Swedberg	Packt Publishing	2013

Title of the Course: Modern Chemistry Laboratory	**L**	**T**	**P**	**Credit**
Course Code: UHSBS0126 / UHSBS0226	**-**	**-**	**2**	**1**

Course Pre-Requisite: Students should have preliminary knowledge about the handling of glass wares, apparatus and preparation of chemicals. Students should have basic knowledge about fundamental principles used in various analytical techniques.

Course Description: The course intends to train students to enhance experimental skills and apply fundamental chemical principles to solve chemistry related problems in engineering. The course providing experience to students about qualitative and quantitative analysis of different samples using instrumental and non-instrumental techniques.

Course Objectives:

1.To understand various quality parameters of water using volumetric quantitative analysis.

2. To determine the quality of polymeric materials by measuring molecular weight.

3. To analyze various analytical samples by using conductometer, potentiometer and spectrophotometer.

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

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	State the fundamental principles in problems related to chemistry in engineering.
CO2	Design experiments and organize, analyse, interpret, represent data in the form of tables and graphs.
CO3	Know the laboratory practices implemented in a research and industrial chemistry laboratory.
CO4	Illustrate the operation of different instrumental and non-instrumental techniques for the analysis of various engineering materials.

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			2			1	1			1		
CO3	3	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: a) Practical attendance and performance b) Journal Submission	15 15
Component 2: Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral	20
Total	50

Course Contents

Experiment No.	Experiment Title and Contents	Hours
1	**Determination of pH of industrial waste water using pH meter.**	2
2	**Determination of Acid dissociation constant (pKa) of acetic acid by pH metric titration with NaOH solution.**	2
3	**Estimation of strong acid and weak acid from given mixture by conductometric titration.**	2
4	**Estimation of ferrous ammonium sulfate (FAS) form given solution by potentiometric titration.**	2
5	**Estimation of copper from given solution using spectrophotometer.**	2
6	**Identification of basic radicals from given binary mixture of inorganic salts by paper chromatography.**	2
7	**Determination of rate of corrosion of Aluminium metal.**	2
8	**Determination of hardness of given water sample by EDTA method.**	2
9	**Determination of chemical oxygen demand (COD) from waste water.**	2
10	**Determination of percentage of copper in brass alloy using standard sodium thiosulfate solution.**	2
11	**Determination of molecular weight of polymer by viscosity measurements.**	2
12	**Drawing chemical structures using ChemDraw/ChemSketch software.**	2

Any 08 practical/experiments will be completed.

Textbooks:

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

Reference Books:

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

Practical wise Measurable students Learning Outcomes:

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

Title of the Course: Basic Electrical Engineering Laboratory Course Code: UHSES0127 / UHSES0227	L	T	P	Credit
	-	-	2	1

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

Course Description:

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

Course Objectives:

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

Course Outcomes:

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

CO-PO Mapping:

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

AssessmentScheme:

AssessmentComponent	Marks
ISE (Journal Writing, Practical Performance, Oral)	
Journal Writing (20), Practical Performance (20), Oral (10)	**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	Verification of Kirchhoff's Laws for DC Circuit by using MATLAB	2
2	Power Factor improvement by using Capacitor bank	2
3	Load test on single phase transformer for finding Efficiency & Voltage Regulation	2

4	LoadtestonDCmotor.	**2**
5	Demonstration of use of fuse, MCB, starter, energy meter etc. in electrical installation.	**2**
6	Residential& Commercial ElectricityEnergybillverification	**2**
7	Study of Half wave rectifier (HWR) with & without filter	**2**
8	Study of Full wave rectifier (FWR) with & without filter	**2**
9	Study of Zener Diode as Voltage regulator	**2**
10	Study of output characteristics of Transistors.	**2**
11	Study of Strain Gauge (Load Cell).	**2**
12	Study of speed measurement using proximity switch & photoelectric pickup	**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	

ReferenceBooks:

SN	Title	Edition	Author/s	Publisher	Year
1	Laboratory courses in Electrical Engineering	--	SG Tarnekarand P.KKharbanda	SChand	
2	Basic Electrical Engineering	3rd	D.P.Kothari, I.J.Nagrath	TMH Publishing Co.Ltd.,New Delhi	

Practical wise Measurable students Learning Outcomes:

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

Class: First. Year B. Tech. (Common to all disciplines)	L	T	P	Credit
Title of the Course: Ecology, Energy and Environment	2	-	-	2
Course Code: UHSIK0136/UHSIK0236				

Course Pre-Requisite:

Students shall have the knowledge of:

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

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

Course Learning Objectives:

At the end of the course, students will

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

Course Outcomes:

COs	After the completion of the course, the students will be able to	Bloom's Cognitive Descriptor
CO.1	Explain the importance of Ecology, Environment and role of humans.	Cognitive Understanding (L2)
CO.2	Discuss how agriculture originated during Neolithic times and discover the diffusion of agriculture today.	Cognitive Understanding (L2)
CO.3	Identify the measures for Environmental resources management.	Cognitive Applying (L3)
CO.4	List the Energy conservation measures to achieve Sustainability in energy use.	Cognitive Analysing (L4)

CO-PO Mapping:

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

Assessments:

Assessment	Weightage (Marks)
ISE	100

- **ISE:**Based on practical performed/ Quiz/ Mini-Project assigned/ Presentation/ Group Discussion/ Internal oral etc.
-

Course Contents:

Unit 1: Studying Ecology & Environment Defining Nature, Social, Cultural and Religious Structure and values of Environment, Ecological consciousness, developed and developing nation's views, philosophy of environment, Environmental governance, Integrating ethical values and knowledge, **Nature-human interface**: Introduction, Defining Nature, Social Animal, Nature-Human Interface: Changing Concerns.	**07 Hrs.**
Unit 2: Environment, Early Societies and Agricultural Societies **Origins of Agriculture**: Neolithic Revolution, Early Agriculture and Environment, Early Agriculture: Regional Dispersal, Baluchistan, Indus System, Northern Valleys, East Peninsular India. Nomadic Pastoralism, Hunting-Gathering, Resource Use and Human Societies, Agricultural Diffusion and Regional Specificities, River Valley Civilization. **Importance of water**: Water uses and dependency, water scarcity, consumption in industries, water conservation practices from ancient times, Indian water policy, Sustainability in water conservation.	**07 Hrs.**
Unit 3: Colonialism, Environment and Modern Concerns History of Colonialism andIndustrialism in India, Traditional Wisdom, Indigenous/traditional Communities and Livelihood Security, Industrial Society, Modernization and Adaptations to Natural and Anthropogenic variations **Resource Management**: Water and Forests, Environmental Agenda, Understanding of Environment, Alternatives, Environmental Resources, Biodiversity, Development and Environmental Concerns, Urban Planning.	**07 Hrs.**
Unit 4: Energy and its conservation Importance of energy and its related issues. Quantifying energy, types of energy sources and end uses. Conventional energy sources. Non-conventional energy sources, Energy Consumption: Historical Patterns, energy conservation practices, non-conventional energy generation potential of India, Earth's global energy balance, energy budget - past and present, energy conservation, energy efficiency and sustainable energy systems.	**07 Hrs.**

Reference Books:

1. Coping with Water Scarcity: Addressing the Challenges by Iacovos Iacovides, Ian Cordery, and Luis Santos Pereira (2009)
2. Water Security in India: Hope, Despair, and the Challenges of Human Development by Ashok Chandra Shukla and Vandana Asthana (2014)
3. Energy Management and Conservation by K. V. Sharma and P. Venkataseshaiah (2011)
4. Energy Engineering and Management (Second Edition) by Amlan Chakrabarti (2011).
5. 2021-22 Syllabus of IIT Delhi for subjects "ESL727 Energy and Environment", "ESL740 Non-conventional Sources of Energy" and "HSL703 Perspectives on climate change: Implications"
6. World Commission non-Environment and Development. 1987.*Our Common Future*. Oxford University Press.
7. Khanduri, I., Pandey, M., Maikhuri, R. 2006. *Environment and Ecology*, Trans media Publication Srinagar Garhwal
8. P.D. Sharma, 2012 Ecology and Environment. Rastogi Publication

9. Singh, J. S., Singh, S. P. and Gupta, S. R.2014. *Ecology, Environmental Science and recourse Conservation*. Anamaya Publishers.
10. Robert A. Ristinen, Jack J, Kraushaar, Jeffery Brack, Energy and the Environment, Wiley Publication

Title of the Course: COMPUTER AIDED ENGINEERING GRAPHICS **Course Code: UHSVS0137 / UHSVS0237**	**L**	**T**	**P**	**Credit**
	1	**-**	**2**	**2**

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

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

Course Objectives:

5. To learn Manual as well as computer based Engineering Drawing.
6. To project line, plane and solids by using 1st angle method of projections.
7. To understand and project orthographic and isometric Projections

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	Understand basic commands of CAD for practicing lines, lettering and dimensioning in Engineering Drawing.
CO3	Visualize and project Orthographic and Isometric drawings of simple machine components

CO-PO Mapping:

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

Assessment Scheme:

SN	**Assessment**	**Marks**	**Remark**
1	ISE1	25	Assignment, Quiz, Practice Sheets,
2	ISE2	25	Assignment, Quiz, Practice Sheets,

ISE is based on Assignment/Declared test/Quiz/Oral etc.
40 % Weightage to Manual Drawing & 60 % Weightage to Computer Drawing

Course Contents

Unit No.	**Unit Title and Contents**	**Hours**
Unit 1	**Projections of Planes & Solids** Introduction to CAEG, Methods of projection- Projection concept, Orthographic Projection, first angle Vs third angle method of projection. Projections of line inclined to one Plane, Projections of Planes (Only Square and Pentagonal Plane). Projections of Solid resting on & inclined to HP. (limited to 2 Stage.)	**6Hrs.**

Unit 2	**Orthographic Projections** Conversion of pictorial view of a three dimensional object into orthographic views.	**4 Hrs.**
Unit 3	**Isometric Projections** Concept of isometric projection, Isometric scale and isometric drawing. Conversion of orthographic views of simple 3D objects into single isometric drawing.	**4 Hrs.**
Lab Contents:		
Practical1	**Sheets on Geometrical Constructions & Projections of Planes & Solids** Introduction of Auto CADGUI & Basic Commands: at least 4 Figures are to be drawn in sketchbook and redraw using AutoCAD and Line, plane & Solid Problems for submission sheets	**10Hrs.**
Practical2	**Orthographic Projections** Sheets on orthographic projections. (Manual & AutoCAD Drawing)	**6Hrs.**
Practical3	**Isometric Projections** Conversion of orthographic views of simple 3D objects containing (Slopes, Slots, Curves & Holes) into single isometric drawing. (Manual & AutoCAD Drawing)	**6Hrs.**
Practical4	**Practice & Internal Oral**	**4Hrs.**

Textbooks:

1. Engineering Graphics with AutoCAD-D.M. Kulkarni, A.P. Rastogi, A.K.Sarkar, (PHI)Publisher2010.
2. N.D.Bhatt,"EngineeringDrawing",Charotar Publisher, 41th Edition,2016
3. Luzzerder, "Graphics for Engineering", Prentice Hall International, 1st Edition,1964
4. Computer Aided Engineering Drawing- S. Trymbaka Murthy,-I.K. International Publishing House Pvt. Ltd., New Delhi.

Reference Books:

1. Cencil Jensen, Jay D.Helsel , Dennis R. Short, "Engineering Drawing & Design", TATAMcGRAWHILL,7th Edition, 2012.
2. Basant Agrawal and C M Agrawal, "Engineering Graphics", Tata Mc Graw Hill Education Pvt. Ltd.,New Delhi, 7th Edition, 2012
3. Computer Aided Engineering Drawing, Prof. M. H. Annaiah, New Age International Publisher, New Delhi, 2009