University of Mumbai

Syllabus

FY B.Tech
(First Year Semester I and II)

From
Academic Year 2018-19
(KJSCE 2018 CBGS Pattern)

Approved by Academic Board 07/ 04 /2018

FY B.Tech /All Branches / Revision 2.1

K. J. Somaiya College of Engineering, Vidyavihar, Mumbai -77
(Autonomous College Affiliated to University of Mumbai)

Preamble

At the outset, I would like to congratulate you on your decision of becoming a part our journey of academic excellence. Academic Autonomy conferred by the University of Mumbai from the Academic Year 2014-15, gave us the freedom to develop and implement our own curriculum KJSCE2014 with features such as inclusion of choice based Interdisciplinary Course (IDC), Audit Courses, Add on Credit Courses, Exposure Courses, etc. Distinct assessment and evaluation methods were also designed based on focus of individual course. And the outcome of this entire exercises; either by way of student placements or the feedback received from all stakeholders is quite encouraging.

At present, Industry is moving towards Industrial revolution 4.0. Knowing very well that every country's education system forms the basis of its progress and the groundwork for its future, we need to be making engineering graduates equipped to take industrial challenges. A common feature in successful education systems is the balance between tradition and the capacity to be flexible and able to adapt to current social trends. To achieve this, AICTE has taken necessary initiative in January 2018 by introducing model syllabus for undergraduate courses having a focus on the changing industrial scenario.

Our new revision in syllabus *KJSCE2018,* to be introduced from the academic year 2018-19, has been designed based on the revised AICTE guidelines as well as various accrediting bodies.

The said syllabus is a result of expert advice from members of Board of studies and Academic Council; both having due representation from academia as well as appropriate industries. Subsequently faculty members of the college have put in efforts to document it in the form which has been presented here.

Some of the highlights of the *KJSCE2018* syllabus are: Introduction of wide choice for branch specific electives, more number of open or interdisciplinary electives, opportunity for internships, etc. Course like Environmental studies is taught in a project based learning approach; which would sensitize students about environmental concerns. A new course "Industrial applications" has been introduced at semester II which gives an overview of evolution in related areas, current trends, research and career opportunities, etc. Course on programming or Engineering Drawing pays more attention to hands-on learning.

Focus of academic processes in KJSCE is such that, by the time student completes the requirements of the degree, he/ she will be able to acquire attributes required for profession as an engineer. Outcomes are defined to acquire these attributes which lead to development of curriculum, pedagogy and assessment tools. These tools need to be updated based on experiences of teacher and learner. Hence teaching -learning -evaluation paradigm is going to be a mix of traditional as well as use of ICT tools. Role of the faculty member changes from tutor to trainer / instructor/ facilitator / mentor based on the outcomes targeted.

For measuring learning outcomes of students , traditional methods like tests, laboratory work and End Semester Examinations(ESE) are implemented. Continuous Assessment(CA) is carried out through two tests and internal assessment (IA) like quizzes, case studies , mini projects etc. These IA tools not only contribute to marks but also enables the student to learn through solutions discussed , improvisations suggested, feedbacks given by faculty members. Through these assessment methods students get opportunity for reading research papers, presenting ideas and working in a team.

Since the assessments are distributed throughout the term the learning process is continuously monitored and graded.
College promotes co-curricular, extra-curricular activities as well as sports; making life outside classroom exciting and rewarding. What makes these activities very effective is the fact that these do not focus only on winning trophies but try to nurture generic skills such as leadership, effective communication, teamwork etc. which are essential skills for a bright professional career.
Along with my colleagues, I welcome you to Somaiya Vidyavihar and KJSCE and look forward to lead you towards professional career. Together, let us build a great future for ourselves and our country!

20/06/2018

Dr.Shubha Pandit
Principal

Acronym for category of courses		Acronyms used in syllabus document	
Acronym	**Definition**	**Acronym**	**Definition**
BS	Basic Science Courses	**CA**	Continuous Assessment
ES	Engineering Science	**ESE**	End Semester Exam
HS	Humanities and Social Sciences including Management Courses	**IA**	Internal Assessment
PC	Professional Core Courses	**O**	Oral
PE	Professional Elective courses	**P**	Practical
OE	Open Elective Courses	**P&O**	Practical and Oral
LC	Laboratory Courses	**TH**	Theory
PR	Project	**TUT**	Tutorial
AC	Audit Course	**TW**	Term work
AOCC	Add on Credit Course	**T – 1**	Test – 1
AOAC	Add on Audit Course	**T – 2**	Test – 2
AVAC	Add on Value Audit Course	**CO**	Course Outcome
EX	Exposure Course	**PO**	Program Outcome
I	Interdisciplinary courses	**PSO**	Program specific Outcome

Acronyms used in Course code e.g. 2UHC101

Acronym Serially as per code	Definition
2	Second revision after autonomy –"KJSCE 2018" (First revision KJSCE 2014)
U	Undergraduate
T	Department of Science and Humanities
C	Core Course
L	Laboratory Course
W	Workshop
T	Tutorial
X	Exposure Course
A	Audit Course
1	FYBTech
01	Course No.

Group C

Computer Engineering (Division A & B)
Information Technology (Division G & H)
Mechanical Engineering (Division I)

Syllabus of Semester I and II

Semester I
Group C
COMP (Division A & B), IT (Division G & H) and MECH (Division I)
Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total Credits	Course Category
2UHC101	Applied Mathematics I	4 – 0 – 1	05	4 – 0 – 1	05	BS
2UHC103	Engineering Chemistry	4 – 0 – 0	04	4 – 0 – 0	04	BS
2UHC105	Engineering Drawing	1 – 0 – 2	03	1 – 0 – 2	03	ES
2UHC107	Elements of Electrical and Electronics Engineering	3 – 0 – 0	03	3 – 0 – 0	03	ES
2UHC109	Communication Skills	0 – 0 – 2	02	0 – 0 – 2	02	HS
2UHL103	Engineering Chemistry Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
2UHL105	Engineering Drawing Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHL107	Elements of Electrical and Electronics Engineering Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHW110	Workshop I	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total		**12 – 08 - 05**	**25**	**12 - 05 - 05**	**22**	
2UHX1XX	Exposure Course	02		--		EX

Examination Scheme

Course Code	Course Name	Examination Scheme								
		Marks								
		CA			ESE	TW	O*	P	P&O	Total
		T-1	T-2	IA						
2UHC101	Applied Mathematics I	20	20	10	50	25	--	--	--	125
2UHC103	Engineering Chemistry	20	20	10	50	--	--	--	--	100
2UHC105	Engineering Drawing	20	20	10	50	--	--	--	--	100
2UHC107	Elements of Electrical and Electronics Engineering	20	20	10	50	--	--	--	--	100
2UHC109	Communication Skills	25	25	--	--	50	--	--	--	100
2UHL103	Engineering Chemistry Laboratory	--	--	--	--	25	25	--	--	50
2UHL105	Engineering Drawing Laboratory	--	--	--	--	50	--	--	--	50
2UHL107	Elements of Electrical & Electronics Engineering Laboratory	--	--	--	--	25	25	--	--	50
2UHW110	Workshop I	--	--	--	--	50	--	--	--	50
2UHX1XX	Exposure course	--	--	--	--	--	--	--	--	-
Total		**105**	**105**	**40**	**200**	**225**	**50**			**725**

*** Oral based on Laboratory work**

Semester II

Group C
COMP (Division A & B), IT (Division G & H) and MECH (Division I)
Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total Credits	Course Category
2UHC111	Applied Mathematics II	4 – 0 – 1	05	4 – 0 – 1	05	BS
2UHC102	Engineering Physics	4 – 0 – 0	04	4 – 0 – 0	04	BS
2UHC104	Engineering Mechanics	3 – 0 – 0	03	3 – 0 – 0	03	ES
2UHC106	Programming in C	1 – 0 – 2	03	1 – 0 – 2	03	ES
2UHC108	Environmental Studies	0 – 0 – 2	02	0 – 0 – 2	02	HS
2UHC112	Industrial Applications#	0 – 0 – 2$	02	0 – 0 – 2	02	ES
2UHL102	Engineering Physics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
2UHL104	Engineering Mechanics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHL106	Programming in C Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHW113	Workshop II	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total		**12 – 08 - 07**	**27**	**12 - 05 - 07**	**24**	
2UHX1XX	Exposure Course	02		--		EX

$ **Class-wise tutorials** # **Branch wise Course**

Examination Scheme

Course Code	Course Name	Examination Scheme								
		Marks								
		CA			ESE	TW	O*	P	P&O	Total
		T-1	T-2	IA						
2UHC111	Applied Mathematics II	20	20	10	50	25	--	--	--	125
2UHC102	Engineering Physics	20	20	10	50	--	--	--	--	100
2UHC104	Engineering Mechanics	20	20	10	50	--	--	--	--	100
2UHC106	Programming in C	20	20	10	50	--	--	--	--	100
2UHC108	Environmental Studies	25	25	--	--	50	--	--	--	100
2UHC112	Industrial Applications	--	--	--	--	50	--	--	--	50
2UHL102	Engineering Physics Laboratory	--	--	--	--	25	25	--	--	50
2UHL104	Engineering Mechanics Laboratory	--	--	--	--	25	25	--	--	50
2UHL106	Programming in C Laboratory	--	--	--	--	50	--	--	--	50
2UHW113	Workshop II	--	--	--	--	50	--	--	--	50
2UHX1XX	Exposure Course	--	--	--	--	--	--	--	--	-
Total		**105**	**105**	**40**	**200**	**275**	**50**			**775**

Group P

Electronics Engineering (Division C & D)
Electronics and Telecommunication Engineering (Division E & F)
Mechanical Engineering (Division J)

Syllabus of semester I and II

Semester I
Group P
ETRX (Division C & D), EXTC (Division E & F) and MECH (Division J)

Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total Credits	Course Category
2UHC101	Applied Mathematics I	4 – 0 – 1	05	4 – 0 – 1	05	BS
2UHC102	Engineering Physics	4 – 0 – 0	04	4 – 0 – 0	04	BS
2UHC104	Engineering Mechanics	3 – 0 – 0	03	3 – 0 – 0	03	ES
2UHC106	Programming in C	1 – 0 – 2	03	1 – 0 – 2	03	ES
2UHC108	Environmental Studies	0 – 0 – 2	02	0 – 0 – 2	02	HS
2UHL102	Engineering Physics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
2UHL104	Engineering Mechanics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHL106	Programming in C Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHW110	Workshop I	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total		**12 – 08 - 05**	**25**	**12 - 05 - 05**	**22**	
2UHX1XX	Exposure Course	02		--		EX

Examination Scheme

Course Code	Course Name	Examination Scheme								
		Marks								
		CA			ESE	TW	O*	P	P&O	Total
		T-1	T-2	IA						
2UHC101	Applied Mathematics I	20	20	10	50	25	--	--	--	125
2UHC102	Engineering Physics	20	20	10	50	--	--	--	--	100
2UHC104	Engineering Mechanics	20	20	10	50	--	--	--	--	100
1UHC106	Programming in C	20	20	10	50	--	--	--	--	100
2UHC108	Environmental Studies	25	25	--	--	50	--	--	--	100
2UHL102	Engineering Physics Laboratory	--	--	--	--	25	25	--	--	50
2UHL104	Engineering Mechanics Laboratory	--	--	--	--	25	25	--	--	50
2UHL106	Programming in C Laboratory	--	--	--	--	50	--	--	--	50
2UHW110	Workshop II	--	--	--	--	50	--	--	--	50
2UHX1XX	Exposure course	--	--	--	--	--	--	--	--	-
Total		**105**	**105**	**40**	**200**	**225**	**50**			**725**

Semester II
Group P
ETRX (Division C & D), EXTC (Division E & F) and MECH (Division J)
Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total credits	Course Category
2UHC111	Applied Mathematics II	4 – 0 – 1	05	4 – 0 – 1	05	BS
2UHC103	Engineering Chemistry	4 – 0 – 0	04	4 – 0 – 0	04	BS
2UHC105	Engineering Drawing	1 – 0 – 2	03	1 – 0 – 2	03	ES
2UHC107	Elements of Electrical and Electronics Engineering	3 – 0 – 0	03	3 – 0 – 0	03	ES
2UHC109	Communication Skills	0 – 0 – 2	02	0 – 0 – 2	02	HS
2UHC112	Industrial Applications[#]	0 – 0 – 2[$]	02	0 – 0 – 2	02	ES
2UHL103	Engineering Chemistry Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
2UHL105	Engineering Drawing Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHL107	Elements of Electrical and Electronics Engineering Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
2UHW113	Workshop II	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total		**12 – 08 - 07**	**27**	**12 - 05 - 07**	**24**	
2UHX1XX	Exposure Course	02		--		EX

[$] **Class-wise tutorials** [#] **Branch wise Course**

Examination Scheme

Course Code	Course Name	Examination Scheme								
		Marks								
		CA			ESE	TW	O*	P	P&O	Total
		T-1	T-2	IA						
2UHC111	Applied Mathematics II	20	20	10	50	25	--	--	--	125
2UHC103	Engineering Chemistry	20	20	10	50	--	--	--	--	100
2UHC105	Engineering Drawing	20	20	10	50	--	--	--	--	100
2UHC107	Elements of Electrical and Electronics Engineering	20	20	10	50	--	--	--	--	100
2UHC109	Communication Skills	25	25	--	--	50	--	--	--	100
2UHC112	Industrial Applications	--	--	--	--	50	--	--	--	50
2UHL103	Engineering Chemistry Laboratory	--	--	--	--	25	25	--	--	50
2UHL105	Engineering Drawing Laboratory	--	--	--	--	50	--	--	--	50
2UHL107	Elements of Electrical & Electronics Engineering Laboratory	--	--	--	--	25	25	--	--	50
2UHW110	Workshop I	--	--	--	--	50	--	--	--	50
2UHX1XX	Exposure course	--	--	--	--	--	--	--	--	
Total		**105**	**105**	**40**	**200**	**275**	**50**			**775**

*** Oral based on Laboratory work**

Course Code	Course Title							
2UHC101	Applied Mathematics - I							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	04			--		01*		05
Credits Assigned	04			--		01		05
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50	25	--	--	--	125

* Batch wise Tutorial

Course prerequisites

- Differentiation Methods
- Basics of Complex numbers
- Basics of Matrices, Inverse and Adjoint

Course Objectives

The objective of the course is to impart knowledge of De- Moivre's theorem, hyperbolic functions and logarithm of complex numbers. The course clarifies the concept of partial differentiation and its applications. The concept of rank of matrix, solving system of linear equations, Eigen values and Eigen vectors is also conveyed.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Solve problems involving different forms and properties of complex numbers, hyperbolic functions and logarithm of complex numbers.

CO2. Apply the concept of rank of a matrix and numerical methods to solve system of linear equations.

CO3. Find Eigen values, Eigen vectors of a matrix, apply Cayley Hamilton theorem, diagonalise a matrix and find functions of square matrices.

CO4. Find partial derivatives of multivariable functions, apply the concept of partial differentiation to find maxima and minima of multivariable functions (2-3 variables) apply Euler's theorem to prove results about Homogeneous functions.

Module No.	Unit No.	Details	Hrs.	CO
1	**Complex Numbers**		7	CO 1
	1.1	Statement of De Moivre's theorem and related examples		
	1.2	Expansion of $sin^n\theta$, $cos^n\theta$ in terms of sine and cosine of multiples of angle θ and expansion of $sinn\theta, cosn\theta$ in powers of $sin\theta, cos\theta$		
	1.3	Powers and roots of complex numbers		
2	**Hyperbolic Functions and Logarithm of Complex Number**		6	CO 1
	2.1	Circular functions of complex number and hyperbolic functions		
	2.2	Inverse circular and inverse hyperbolic functions		
	2.3	Logarithmic functions		
	2.4	Separation of real and imaginary parts		
3	**Matrix Theory: Rank of Matrix**		12	CO 2
	3.1	Types and properties of matrices: Symmetric, Skew-symmetric, Hermitian, Skew hermitian, Unitary and Orthogonal matrix		
	3.2	Rank of a matrix using row echelon forms, reduction to normal form, and PAQ form		
	3.3	System of homogeneous and non-homogeneous equations, their consistency and solutions		
	3.4	Linearly dependent and independent vectors		
	3.5	Solution of system of linear algebraic equations by **(a)** Crout's method (LU) **(b)** Gauss Seidal method **(c)** Jacobi iteration method		
		#**Self learning topic:** Properties of adjoint and inverse of a matrix		
4	**Matrix Theory: Eigen values & Eigen vectors**		12	CO 3
	4.1	Characteristic equation, Eigen values and Eigen vectors, Properties of eigen values and eigen vectors		
	4.2	Statement of Cayley-Hamilton theorem, Examples based on verification and application of Cayley-Hamilton theorem		
	4.3	Similarity of matrices, Diagonalisation of a matrix		
	4.4	Functions of square matrix, Derogatory and non-derogatory matrices, Minimal polynomial		
5	**Partial Differentiation and Application**		10	CO4
	5.1	Functions of several variables, Partial derivatives of first and higher order (definition using limits and simple problems)		
	5.2	Differentiation of composite and implicit functions, Total differentials		
	5.3	Maxima and minima of a function of two independent variables		
	5.4	Lagrange's method of undetermined multipliers with one constraint		

	5.5	Introduction of Jacobian of two and three independent variables (simple problems)		
6	**Homogeneous Functions**		**5**	**CO4**
	6.1	Euler's theorem on homogeneous functions with two and three independent variables (with proof) and problems		
	6.2	Deductions(Corollaries) from Euler's theorem (with proof) and problems		
		Total	**52**	

Recommended Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	B. S. Grewal	*Higher Engineering Mathematics*	Khanna Publications, India	43rd Edition 2014
2.	Erwin Kreyszig	*Advanced Engineering Mathematics*	Wiley Eastern Limited, India	10th Edition 2015
3.	Shanti Narayan	*A text book of Matrices*	S. Chand , India	10th Edition 2004
4.	P. N. Wartikar and J. N. Wartikar	*A text book of Applied Mathematics Vol I & II*	Pune Vidyarthi Gruha, India	6th Edition 2012

 # Students should prepare all self-learning topics on their own. Self-learning topics will enable students to gain extended knowledge of the topic. Assessment of these topics may be included in IA.

Term-Work will consist of Tutorials covering entire syllabus. Students will be graded based on continuous assessment of their term work

Course Code	Course Title							
2UHC102	Engineering Physics							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	04			--		--		04
Credits Assigned	04			--		--		04
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50	--	--	--	--	100

Course Prerequisites

The Following topics of higher Secondary Level Physics are required as Prerequisites of this course

- Semiconductors
- Optics
- Electrodynamics

Course Objectives:

The objective of this course is to impart fundamental concepts, their application and processes. This course enhances creative thinking of the students which leads them to explore engineering applications for technological development.

Course Outcomes:

At the end of successful completion of the course the student will be able to

CO1. Apply the knowledge of Solid State Physics to different crystal structures and semiconductor materials.

CO2. Distinguish engineering materials on the basis of their behavior such as Dielectric, Magnetic and Superconducting properties.

CO3. Apply knowledge of quantum opto-electronics and sensors in futuristic development of science and technology.

CO4. Demonstrate the concepts of interference, diffraction and polarization using real life applications.

CO5. Discuss the behavior of electromagnetic waves using fundamentals of Electrodynamics.

Module No.	Unit No.	Details	Hrs.	CO
1	**Solid State Physics**		11	CO1
	1.1	**Crystallography:** Diamond cubic and Hexagonal Closed Packed (HCP) structures, Planes and directions, Miller indices.		
	1.2	X-Ray diffraction, Crystal structure determination by rotating crystal method and Powder crystal method.		
	1.3	**Liquid Crystals:** Types, phases, properties and applications.		
	1.4	**Semiconductors:** Fermi Dirac distribution function, Fermi energy in conductors and its temperature dependence, Fermi level in semiconductors, Effect of concentration and temperature dependence on the Fermi level of extrinsic semiconductors.		
	1.5	Concepts of effective mass and hole, Density of states, Drift, Diffusion and Continuity equation, p-n junction at equilibrium, Derivation of barrier potential, Hall effect.		
2	**Dielectrics, Magnetic and Superconducting Properties of Materials**		9	CO2
	2.1	**Dielectrics:** Relation between basic dielectric parameters (E, D, P, ε_r, χ and allied terms), Types of polarization, derivations of various polarizabilities, Frequency dependence of polarizability, Ferro-electricity and pyro-electricity.		
	2.2	**Magnetic Properties:** Diamagnetism, Paramagnetism and ferromagnetism, Hysteresis effect, Soft and hard magnetic materials, Ferrites and its applications.		
	2.3	**Superconductivity:** Superconducting materials and its properties and basic parameters, Temperature dependence of critical magnetic field, Meissner effect.		
	2.4	Type I and II superconductors, Their application in superconducting magnets and Maglev.		
3	**Quantum and Opto-electronics**		9	CO3
	3.1	**Quantum mechanics**: De-Broglie's hypothesis, Matter waves, Wave packet, Phase velocity, Group velocity and their relation, Uncertainty principle and its applications.		
	3.2	Wave function, Time dependent and time independent Schrodinger's equation, Free particle, Particle in box, 3-Dimensional potential well, Tunneling effect.		
	3.3	**LASERs:** Population, Absorption, Spontaneous and Stimulated emission, Pumping, Metastable state, Optical resonator, Einstein's coefficient, He-Ne and Nd:YAG Laser, Applications of Lasers, Holography.		
	3.4	**Optical Fibres:** Total internal reflection, Classification of fibres, Numerical aperture, Modes of propagation, V-number, Block diagram of basic optical fibre communication system, Attenuation, Dispersion,		

		Optical windows, Bit-rate, Commercially used fibres.		
4	**Sensors and Transducers**		**6**	**CO3**
	4.1	**Sensors and Transducers:** Effects used in sensors technology: Piezoelectric, Magnetostriction effect, Magnetoresistance effect, Seebeck effect, Peltier effect (Qualitative and Quantitative discussions).		
	4.2	**Biological Sensors:** Environmental sensing by plants, Different types of Tropism, Environmental sensing by animals eg. Shark *etc*. MEMS, NEMS: Principle, Types of designing tools.		
	4.3	IR/UV Sensors, Gas sensors.		
5		**Optics**	**11**	**CO4**
	5.1	**Interference:** Interference by division of amplitude, Interference in thin films of uniform thickness, Non-uniform thin film: Wedge shaped film and Newton's rings, Antireflection films, Anti-transmitting films, Testing of optical flatness.		
	5.2	**Diffraction:** Fraunhoffer's diffraction, Resultant amplitude due to large number of waves, Diffraction due to single slit, double slits, Absent spectra.		
	5.3	Diffraction due to multiple slits: diffraction grating, grating equation, Rayleigh's criterion and resolving power of grating.		
	5.4	**Polarization:** Production of plane polarized light, Birefringence, Nicol's prism, Polarizer-analyzer, Malus's law, Elliptically and circularly polarized light, Application in photoelasticity.		
6	**Electrodynamics**		**6**	**CO5**
	6.1	**Vector Calculus**: Scalar fields & vector fields, Gradients, Divergence, Curl and their physical significance, Fundamental laws of gradient, Divergence and curl. Electric field due to continuous charge distribution, Electric potential.		
	6.2	Magnetostatics: Source and properties of magnetic field, Laws of magnetostatics, Faraday's law of electromagnetic induction.		
	6.3	Maxwell's equation, Electromagnetic wave equation.		
		Total	**52**	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with Country	Edition with Year of Publication
1.	Kittle Charles	*Introduction to Solid State Physics*	Wiley, India	8th Edition, 2012
2.	Murthy D.V.S.	*Transducers and Instrumentation*	PHI, India	2nd Edition, 2013
3.	Bransden B. H. and Joachain C. J.	*Quantum Mechanics*	Pearson, UK	2nd Edition, 2011
4.	Kshirsagar M. N. and Avadhanulu P. G.	*A Textbook of Engineering Physics*	S. Chand, India	10nd Edition, 2014
5.	Ghatak Ajoy and Thyagarajan K	*Fibre Optics and Lasers*	McMillan, India	1st Edition, 2016

Course Code	Course Title							
2UHC103	Engineering Chemistry							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	04			--		--		04
Credits Assigned	04			--		--		04
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50	--	--	--	--	100

Course prerequisites

The following topics of higher secondary level Chemistry are required as prerequisites of this course

- Stoichiometry
- Organic Chemistry
- Inorganic Chemistry

Course Objective:

The objective of this course is to appreciate the basic concepts of Chemistry towards the development of futuristic materials and their applications in engineering. The course helps to understand chemical processes involved in development of sustainable energy sources and development of Nanomaterial and Nanotechnology in engineering. The course also inculcates the knowledge about water technology and green chemistry in day to day life.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Understand the methods to produce soft and portable water and use of green chemistry principles in real life applications.

CO2. Distinguish between the various types of fuels and materials for construction of batteries in sustainable energy production.

CO3. Discuss the use of polymeric and nanomaterial for futuristic engineering applications.

CO4. Apply basic concepts of Spectroscopy and Electro-analytical technique in characterizing chemical compounds.

CO5. Explain synthetic organic chemistry for justifying mechanism of chemical reactions and the role of inorganic elements in living organisms.

Module No.	Unit No.	Details	Hrs.	CO
1	**Water and Green Chemistry**		**11**	**CO1**
	1.1	Introduction, Types of hardness, Equivalence of $CaCO_3$, Experimental determination of hardness		
	1.2	Softening of hard water, Lime soda method with reaction, Zeolite or Permutit process, problems on Zeolite, Ion-exchange method		
	1.3	Methods to determine extent of water pollution, BOD, COD. Desalination of water using Electro dialysis, Reverse osmosis		
	1.4	Green chemistry: Introduction, Goals, 12 principles of green chemistry, Significance of 12 principles with industrial examples		
2	**Energy**		**10**	**CO2**
	2.1	Renewable source of energy - Introduction, Classification, Solar energy, Production of electricity using solar energy, Photo voltaic cells		
	2.2	Non-renewable source of energy - Fuels, Definition, characteristic of good fuel, Calorific value of fuel, Solid fuel, Analysis of coal and its significance, Liquid fuel, Refining of petroleum, Cracking, Characteristic of fuel for internal combustion engine, Knocking, Anti-knocking agents, Octane number, Cetane number, Unleaded petrol		
	2.3	Battery technology- Basic concepts, Battery characteristics, Classification, Classical batteries and Modern batteries		
3	**Polymer Chemistry**		**9**	**CO3**
	3.1	Introduction, Classifications, Characteristic properties, Concept of molecular mass, Determination of molecular mass		
	3.2	Methods of polymerization, Compounding and fabrication of plastics		
	3.3	Synthesis, Properties and Application of polyvinyl acetate (PVA), Polyvinyl alcohol, Polymethyl methacrylate (PMMA), Poly acrylamide, Polycarbonate, Conducting polymer, Liquid crystal polymer		
4	**Nano science and Nanotechnology**		**4**	**CO3**
	4.1	Introduction, Properties, Synthesis and applications of Nanomaterials		
	4.2	Carbon Clusters- Graphene, Fullerene, Carbon nanotubes , Structure, Quantum dots, Properties and applications of CNTs		

5	**Spectroscopy and Instrumental Methods of Analysis**		**10**	**CO4**
	5.1	UV spectroscopy, Principle, Instrumentation and applications		
	5.2	IR spectroscopy - Basic Principle, Instrumentation and applications		
	5.3	^{1}H NMR spectroscopy: Principle, Instrumentation, Chemical shift, Factors affecting chemical shift, Applications		
	5.4	Electroanalytical techniques, pH metry, Conductometry		
6	**Synthetic Organic Reactions and Bio-inorganic Chemistry**		**8**	**CO5**
	6.1	Name reactions: 1) Aldol condensation, 2) Baeyer –Villiger oxidation, 3) Dakin Reaction, 4) Haloform reaction, 5) Sharpless epoxidation, 6) Wurtz synthesis, 7) Benzilic acid rearrangement, 8) Benzoin condensation, 9) Birch reduction, 10) Fries rearrangement		
	6.2	Bio-inorganic Chemistry Inorganic elements and their biological functions, Enzymes: Carboxy peptidase, Carboxy anhydrase, Liver alcohol Dehydrogenase (LADH), Rubredoxin Proteins: Ferredoxins, Hemoglobin and Myoglobin, Hemerythrin, Hemocyanin		
		Total	**52**	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition with Year of Publication
1.	Sesha Maheswaramma K. and Chugh Mridula	*Engineering Chemistry*	Pearson, India	1st Edition, 2017
2.	Dara S.S. and Umare S.S.	*A textbook of Engineering Chemistry*	S. Chand, India	12th Edition, 2014
3.	Ahluwalia V.K. and Parashar R. K.	*Organic reactions Mechanisms*	Narosa, India	5th Edition, 2010
4.	Bertini I., Gray H. B., Lippard S. J. and Valentine J. S.	*Bioinorganic Chemistry*	University Science Books, USA	1st Edition, 1995

Course Code	Course Title							
2UHC104	Engineering Mechanics							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	03			--		--		03
Credits Assigned	03			--		--		03
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50	--	--	--	--	100

Course prerequisites:

- Basics of units and conversions
- Basics of Trigonometry
- Newton's Laws of Motion

Course Objectives:

Engineering mechanics is the application of physics to solve problems involving common engineering elements. This course introduces system of forces and its effect on stationary and moving objects. The goal of this course is to expose students to problems in real-world scenarios and respond accordingly.

Course Outcomes:

At the end of successful completion of the course the student will be able to

CO1. Identify the effect of forces and moment in a given engineering system
CO2. Determine center of gravity of wires (rods), lamina and solids
CO3. Analyze applications of equilibrium using free body diagram
CO4. Apply the concept of kinematics to rectilinear and curvilinear motion of particle.
CO5. Analyze general plane motion of rigid body using instantaneous center.
CO6. Analyze the dynamic system using D'Alembert, work energy and impulse momentum principle.

Module No.	Unit No.	Details	Hrs.	CO
1	**System of Forces**		04	CO1
	1.1	System of coplanar forces: Resultant of concurrent forces, parallel forces, non-concurrent non parallel system of forces, moment of force about a point, couples, Varignon's theorem, Principle of transmissibility of forces		
2	**Centroid of Wires, Laminas and Solids**		04	CO2
	2.1	Centroid of wires/rods Centroid of plane laminas: Plane lamina consisting of primitive geometrical shapes Center of gravity of solids: Solids consisting of primitive solids		
3	**Equilibrium of Force System, Plane Truss and Friction**		13	CO3
	3.1	Equilibrium of system of coplanar forces: Condition of equilibrium for concurrent forces, parallel forces and non-concurrent, non-parallel force system (general force system), Free body diagram.		
	3.2	Types of support, loads, beams, determination of reactions at supports for various types of loads on beams (excluding internal hinge problems)		
	3.3	Plane truss: Analysis of plane truss by using method of joints and method of sections.(excluding frames)		
	3.4	Laws of friction, cone of friction, angle of repose, equilibrium of bodies on inclined plane, application to problems involving wedges and ladders		
4	**Kinematics of Particles and Rigid Bodies**		10	CO4, CO5
	4.1	Variable motion, motion curves (a-t, v-t, s-t) (acceleration curves restricted to linear acceleration only), motion along plane curved path, velocity & acceleration in terms of rectangular components, tangential & normal component of acceleration, relative velocities.		
	4.2	Introduction to general plane motion, problems based on ICR method for general plane motion of bodies (up to 2 linkage mechanism and no relative velocity method)		
5	**Kinetics of Particle**		08	CO6
	5.1	Force and acceleration: Introduction to basic concepts, equations of dynamic equilibrium, Newton's second law of motion (only rectilinear motion)		
	5.2	Work energy principle		
	5.3	Impulse and Momentum: Principle of linear impulse and momentum, law of conservation of momentum, impact and collision, direct central and oblique central impact.		
		Total	39	

Recommended Books:

Sr. No.	Name/s of Author/s	Title	Name of Publisher with Country	Edition with Year of Publication
1	Tayal, A.K.	*Engineering Mechanics, Statics and Dynamics*	Universal Publication, India	14th Edition 2011
2	Hibbeler, H. C. and Gupta	*Engineering Mechanics, Statics and Dynamics*	Prentice Hall Private limited, India	11th Edition 2012
3	Bhattacharyya B.	*Engineering Mechanics*	Oxford University Press, India	2nd Edition 2014
4	Ram H.D. and Chauhan A.K.	*Foundations and Applications of Engineering Mechanics*	Cambridge University Press, UK	1st Edition 2015
5	Bhavikatti S. S.	*Engineering Mechanics*	New Age international, India	6th Edition 2017

Course Code	Course Title							
2UHC105	Engineering Drawing							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	01			--		02		03
Credits Assigned	01			--		02		03
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20*	20*	10	50*	--	--	--	--	100

*** On Screen Examination**

Course prerequisites:

- Knowledge of various geometric constructions.
- Basics of trigonometry.

Course Objectives:

Engineering drawing is the language of Engineers. This course aims at building visualization skills required for every engineer. These skills are developed through projections of various solid objects by creating their multi-views. Learner acquires sketching and drafting abilities through manual drawing as well as computer aided tools

Course Outcomes:

At the end of successful completion of the course the student will be able to visualize and draw

CO1. Projections of lines and planes
CO2. Orthographic multi-views of any object along with isometric views
CO3. Various views of regular solid geometrical objects
CO4. Sections and development of solid geometrical objects

Module No.	Unit No.	Details	Hrs.	CO
1	**Projection of points and lines**		**9**	**CO 1**
	1.1	Standard sizes of drawing sheets, Types of lines, Dimensioning, Scales, Drawing pencils etc.		
	1.2	Projection of points, Projection of lines inclined to both the reference planes.		
	1.3	Projection of planes: Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to one reference plane and perpendicular to other.		
2	**Visualization of multi-views of object**		**14**	**CO 2**
	2.1	Multi-view orthographic projections of simple machine parts by first angle method as recommended by Indian Standards, Sectional views of simple machine parts (full section).		
	2.2	Introduction to Isometric drawing and Isometric projection, Construction of isometric drawing of machine parts		
3	**Projection of solids**		**06**	**CO 3**
	3.1	Introduction to projection of solids, Classification of solids and projection of right regular solids (Cube, Prism, Pyramid, Tetrahedron, Cylinder and Cone) inclined to both reference planes (excluding spheres, hollow and composite solids)		
4	**Section and development of solids**		**10**	**CO 4**
	4.1	Projection of sectional views for solids (Cube, Prism, Pyramid, Tetrahedron, Cylinder and Cone) cut by plane perpendicular to one and inclined to other reference planes (excluding curved cutting planes)		
	4.2	Development of surfaces: Lateral surface development of Prism, Pyramid, Cylinder and Cone with section plane inclined to one reference plane only (excluding reverse development)		
		TOTAL	**39**	

Recommended Books:

Sr. No.	Name/s of Author/s	Title	Name of Publisher with Country	Edition with Year of Publication
1.	Bhatt N.D.	*Engineering Drawing (Plane and solid geometry)*	Charotar Publishing House Pvt. Ltd India	53rd Edition; 2017 Reprint
2.	Bhatt N.D. and Panchal V.M.	*Machine Drawing*	Charotar Publishing House Pvt. Ltd, India	20th Edition 2014
3.	Gill P. S.	*Engineering Graphics and Drafting*	S.K. Kataria & Sons, India	11th Edition; 2013
4.	Shah P.J.	*Engineering Graphics*	S. Chand Publications, India	Revised Edition; 2008
5.	Parkinson A. C. (Albert Charles)	*General Engineering Drawing*	Pitman, UK	6th Edition Pitman, 1968

Course Code	Course Title							
2UHC106	Programming in C							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	01			--		02		03
Credits Assigned	01			--		02		03
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50*	--	--	--	--	100

*** Conducted in laboratory as practical and oral examination**

Course prerequisites: Basic knowledge of computer peripheral devices and software concepts

Course Objectives

The course aims at a systematic approach to build logic for problem solving using tools like algorithm and flowchart. Software development process is introduced through mini-projects. The concepts of Structured Programming Approach are introduced with C as Programming language. This first course in programming enables students to develop domain specific software based solutions.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Formulate a problem statement and develop the logic (algorithm/flowchart) for its solution.
CO2. Apply basic concepts of C programming for problem solving.
CO3. Illustrate the use of derived and structured data types such as arrays, strings, structures and unions.
CO4. Demonstrate the concepts of modular programming through functions and dynamic memory allocation through use of pointers.

Module No.	Unit No.	Details	Hrs.	CO
1	**Introduction to C**			
	1.1	**Problem solving skill development:** Problem definition, fundamentals of algorithms and flowcharts, Algorithms and flowchart development	02	CO1
	1.2	**Structure of C program and its Elements:** Character Set, C Tokens, Keywords and Identifiers, Literals , Variables, Data Types and its qualifiers, Declaration and Initialization of Variables, Local and Global Variables, Declaring Constants, Formatted Input/output functions and unformatted input/output functions	03	CO2
	1.3	**Introduction to pointers:** Pointer declaration and initialization	01	CO4
2	**Operators and Expressions**			
	2.1	**Types of Operators:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators and Bitwise Operators	02	CO2
	2.2	**Pointer Arithmetic:** Pointer addition and subtraction and Evaluating pointer expressions	01	CO4
	2.3	**Type Conversions:** Implicit and Explicit, Special Operators- Comma Operator, size of Operator, dereferencing operator and Expressions and Evaluation of Expressions and Operator Precedence and Associativity	03	CO2
3	**Control Structures**			
	3.1	**Decision Making and Branching Control Structures:** if Statement, Multiple, Statements within if, if – else Statement, Nested if – else, else if Ladder and Decision making using Switch-Case	02	CO2
	3.2	**Looping Control Structures:** While Loop, For Loop, Do While Loop and Algorithm and Flowchart for all the loops	05	CO2
	3.3	**Jump Statements:** Break and Continue, goto Statement	01	CO2
	3.4	**Algorithm and Flowchart:** Algorithm and Flowchart for if, if-else, else if ladder, switch case, for loop, while loop and do-while loop	01	CO1
4	**Arrays, Structures And Unions**			
	4.1	**Arrays:** Introduction to Arrays, One Dimensional Arrays, Multidimensional Arrays, Declaration and Initialization of Arrays, Reading and Displaying arrays	03	CO3
	4.2	**Character Arrays and Strings:** Introduction, Declaring and Initializing String Variables, Reading Character and Writing Character, Reading and Writing Strings and String Handling Functions	03	CO3
	4.3	**Structures and Unions:** Introduction, Declaring and defining Structure, Structure Initialization, Accessing	02	CO3

		and Displaying Structure Members, Array of Structures, Introduction to Unions and Structure Vs Unions		
	4.4	**Dynamic Memory Allocation using Pointers:** Dynamic memory allocation using malloc(), calloc() and realloc() and deallocation of memory using free()	**02**	**CO4**
5	**User Defined Functions**			
	5.1	**User Defined Functions:** Need, Function Declaration and Definition, Return Values, Function Calls, Passing Arguments to a Function by Value, Recursive functions and Storage classes of Variables	**05**	**CO4**
	5.2	**Pointers and Functions:** Pass by Reference and Returning pointers from functions	**01**	**CO4**
	5.3	**Command Line Arguments:** Using main() function arguments argc, argv	**02**	**CO2**
		Total	**39**	

Recommended Books:

Sr. No.	Name/s of Author/s	Title	Name of Publisher	Edition and Year of Publication
1.	E. Balagurusamy	*Programming in ANSI C*	McGraw-Hill Education, India	7th Edition, 2016
2.	Dey P. and Ghosh M.	*Structured Programming Approach*	Oxford University Press, India	1st Edition, 2016
3.	Kanetkar Y.	*Let Us C*	BPB Publications, India	15th Edition, 2016

Course Code	Course Title							
2UHC107	Elements of Electrical and Electronics Engineering							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	03			--		--		03
Credits Assigned	03			--		--		03
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50	--	--	--	--	100

Course Prerequisites

Knowledge of Basic Electrical parameters: Resistance, Inductance, Capacitance, Frequency, Voltage, Current and Power and Energy

Course Objectives:

It is difficult to imagine life without electricity and electronics. Electricity plays a major role in the working of all minor and major devices used in our day to day life. In this course students acquire skills that build the domain knowledge right from the fundamentals till the actual design of electrical and electronics appliances. The course also prepares students for follow up courses in circuit and electronics area.

Course Outcomes:

At the end of successful completion of the course the student will be able to

CO1. Analyze resistive networks excited by DC sources using various network theorems
CO2. Demonstrate and analyze response of series - parallel combinations of R-L-C circuits excited by single phase AC source.
CO3. Analyze three phase AC star and delta connections for resistive, inductive and capacitive loads.
CO4. Understand principles and working of AC machines and DC machines with their applications.
CO5. Explain rectifier-filter circuits using PN junction diode and working of Bi-polar junction transistor.

Module No.	Unit No.	Details	Hrs.	CO
1	**DC Circuits**		11	CO1
	1.1	Concept of dependent / independent sources, ideal / practical sources, source transformation and network terminology.		
	1.2	Series, parallel connection and Star-Delta transformations for resistive network.		
	1.3	Mesh and nodal analysis, analysis using principle of superposition theorem.		
	1.4	Super mesh and super Node analysis, Thevenin's and Norton's theorems, maximum power transfer theorem (only independent sources).		
2	**Single Phase AC Circuits**		12	CO2
	2.1	Generation of alternating voltage, average value, RMS value, form factor, crest factor, phasor representation in rectangular and polar form.		
	2.2	Steady state behavior of single phase AC circuits with pure R, L, andC, , concept of inductive and capacitive reactance , phasor diagram of impedance, phase relationship in voltage and current.		
	2.3	RL, RC and RLC series/ parallel circuits, concept of impedance and admittance, power triangle, power factor, active, reactive and apparent power, concept of power factor improvement.		
	2.4	Series and parallel resonance: concept of resonance, resonant frequency, bandwidth and Q factor.		
3	**Three Phase AC Circuits**		04	CO3
	3.1	Star and Delta connected balanced circuits: Three phase voltages, current and power, delta/star equivalence and analysis for various loading conditions.		
	3.2	Measurement of power using two watt meter method.		
4	**Electrical Machines**		06	CO4
	4.1	Single phase transformer construction and principle of working, emf equation of a transformer, different types of transformer, losses in transformer, voltage regulation and efficiency of transformer (no numerical expected)		
	4.2	Construction and working principle of DC motors such as series, shunt and compound, torque-speed characteristics, selection criteria and applications (no derivations and numerical expected)		

5	**Basic Electronic Components and applications**		**06**	**CO5**
	5.1	**P-N Junction diode:** Construction and working of PN junction diode, half wave rectifiers with resistive load, full wave center tap and bridge rectifier with resistive load with their parameters such as ripple factor, rectification efficiency, transformer utilization factor. capacitor filter (no derivation and numerical expected)		
	5.2	**Bipolar Junction Transistor:** Construction of PNP and NPN transistor, input- output characteristics of CE configuration and single stage CE amplifier. (no derivation, no numerical expected)		
TOTAL			**39**	

Books Recommended:

Sr. No.	**Name/s of Author/s**	**Title**	**Name of Publisher with country**	**Edition with Year of Publication**
1.	Mittle and Mittle	*Basic Electrical Engineering*	Tata McGraw Hill, India	2nd edition (New) 2001
2.	Hughes E.	*Electrical and Electronic Technology*	Pearson Education, India	10th edition, 2008
3.	Singh Ravish R	*Basic of Electrical and Electronics Engineering*	Tata McGraw Hill, India	1St Edition, 2013
4.	Patil B R	*Basic of Electrical and Electronics Engineering*	Oxford University Press, India	3rd edition, 2016

Course Code	Course Title							
2UHC108	Environmental Studies							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			--		02		02
Credits Assigned	--			--		02		02
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	25	25	--	--	50	--	--	--	100

Course prerequisites

- Exposure to composition of atmosphere, lithosphere, hydrosphere and its interaction with biotic components.
- Awareness of natural resources.

Course Objective

The objective of this course is to sensitize the students towards environment along with emphasis on engineering applications required for sustainable development. Learner will get acquainted with various environmental assessments and monitoring tools for addressing environmental issues.
Experiential learning through projects will enable them to relate with real world problems. It will also develop an ability to analyze and think critically.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1.Understand need and concept of sustainability associated with developmental activities.

CO2. Get acquainted with various renewable energy resources and technologies to harness the same.

CO3. Enumerate various types of pollution and their abatement.

CO4. Recognize the tools and technologies required for environmental assessment and monitoring.

Module No.	Unit No.	Details	Hrs.	CO
1	**Environmental Sustainability**		2	CO1
	1.1	Strategic planning in sustainable development, Sustainable agriculture		
	1.2	Concept of green building, Green building materials		
	1.3	Climate change mitigation and adaptations – International programs, REDD+		
2	**Social and Environmental Issues**		2	CO1
	2.1	Water management practices & case study		
	2.2	Waste management practices & case study		
3	**Renewable Energy Resources**		2	CO2
	3.1	Various renewable energy resources		
	3.2	Recent advancements in renewable energy		
4	**Environmental Pollution and Technology**		4	CO3
	4.1	Environmental pollution – Sources, effects and control technologies for Air, water, land, e-waste and noise pollution		
	4.2	Tools used in sampling and monitoring (air, water, soil)		
5	**Environmental Assessment and Management**		2	CO4
	5.1	Environment Impact Assessment (EIA)		
	5.2	Environmental audit and Eco-labeling, ISO - 14001, 18001 and 31001		
6	**Environment and Technology**		2	CO4
	6.1	Disaster management plan and use of technology		
	6.2	Remote sensing and GIS – Introduction and its applications in environment sector		
7	**Mini Project -** Choice based group projects will be carried out		12	CO1, CO2 CO3, CO4
		Total	26	

Recommended Books:

Sr. No.	Name of Author	Title of book	Name of Publication and country	Edition and Year of Publication
1.	Kaushik A and Kaushik C P	*Perspectives of Environmental Studies*	New age international, India	6th edition, 2018
2.	Anjaneyulu Y. and Manickam V.	*Environmental Impact Assessment Methodologies.*	B.S. Publications, India	2nd edition, 2011
3.	Asolekar S. and Gopichandran R.	*Preventive Environmental Management: An Indian Perspective*	CEE Publication, India	Environment and Development Series, 2005
4.	Boyle G.	*Renewable Energy: Power for a Sustainable Future*	Oxford publication, UK	3rd edition, 2012
5.	Masters G M. and Ela W. P.	*Introduction to Environmental Engineering and Science*	Harlow, United Kingdom Pearson	3rd edition, 2014

Term Work:

1. **Mini Project (30 marks):** Project related activities will be conducted and final evaluation will be based on presentation and viva voce on the selected topic
2. **Tutorial (20 marks):** Various activities covering entire syllabus will be conducted during tutorial hours

Course Code	Course Title							
2UHC109	Communication Skills							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			--		02		02
Credits Assigned	--			--		02		02
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	25	25	--	--	50	--	--	--	100

Course Prerequisites:
The following topics of higher secondary level English are required as prerequisites of this course

- Grammar of English Language
- Reading and Listening Comprehension
- Letter Writing

Course Objectives:
The focus of this course is to improve linguistics and soft skills. The modules on phonology and functional grammar will enhance students' proficiency in English. Students' interpersonal skills and non-verbal communication are developed through role plays and group discussions.

Course Outcomes:
At the end of successful completion of the course the student will be able to
CO1. Use advanced vocabulary and grammar for effective communication.
CO2. Compose business letters, technical documents and e-communication messages.
CO3. Articulate sentences correctly by using stress pattern, intonation and voice modulation.
CO4. Use basic communication and behavioral skills in day to day communication.
CO5. Communicate effectively as an individual and a team-member.

Module No.	Unit No.	Details	Hrs.	CO
1	**Grammar and Vocabulary**		3	CO1
	1.1	Vocabulary building (one word substitution, synonyms and antonyms)		
	1.2	Pairs of confused words		
	1.3	Subject - predicate agreement		
	1.4	Common errors in the use of articles, modifiers and prepositions		
2	**Mechanics of Writing**		5	CO1 , CO2
	2.1	Use of proper punctuation, phrases and clauses in sentences		
	2.2	Summarizing		
	2.3	Business letter writing		
	2.4	Introduction to technical writing		
		# **Self learning topic:** ICT enabled communication: E-mail, Blog and Website		
3	**Introduction to Phonetics**		4	CO3
	3.1	Basic sounds in English (vowels and consonants)		
	3.2	Syllable, word stress and word accent		
	3.3	Weak forms and strong forms		
	3.4	Intonation		
	3.5	Phonetic transcription		
4	**Soft Skills**		6	CO4
	4.1	Non – verbal communication		
	4.2	Barriers to communication		
	4.3	Assertiveness		
	4.4	Positive thinking		
	4.5	Personality development		
5	**Basics of Workplace Communication**		8	CO5
	5.1	Listening comprehension		
	5.2	Speaking skills		
	5.3	Reading comprehension		
	5.4	Group discussion and public speaking		
		Total	26	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition with Year of Publication
1.	Raman, M. and Sharma, M.	*Communication Skills*	Oxford University Press, India	1st Edition, 2016
2.	Sharma, R. C. and Krishna Mohan	*Basic Correspondence and Report Writing: A Practical Approach to Business and Technical Communication*	Tata McGraw-Hill Publishing Company Limited, India	5th Edition, 2017
3.	Seely, J.	*The Oxford Guide to Writing and Speaking*	Oxford University Press, India	3rd Edition , 2013
4.	Lesikar, R. V. and Pettit, J. D.	*Basic Business Communication*	McGraw-Hill International Edition, Singapore	10th Edition, 2006
5.	Sethi, J. and Dhamija P.V.	*A Course in Phonetics and Spoken English*	Prentice-Hall of India	2nd Edition, 2006

 # Students should prepare all self-learning topics on their own. Self-learning topics will enable students to gain extended knowledge of the topic.

Term-Work will consist of Tutorials covering entire syllabus. Students will be graded based on continuous assessment of their term work

Course Code	Course Title							
2UHW110	Workshop- I							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			02		--		02
Credits Assigned	--			02		--		02
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	50	--	--	--	50

Course prerequisites:
Nil

Course Objectives:
Workshop is an important part of any engineering industry. Engineering students should be conversant with different operations performed on materials for producing desired objects, of various shapes/ sizes, made using several tools and devices. Experiential learning in this course develops skills in different trades of manufacturing.

Course Outcomes:
At the end of successful completion of the course the student will be able to
CO1. Build an object using Fitting trade as per given specifications.
CO2. Develop an object using carpentry trade as per given specifications.
CO3. Understand the use of Lathe machine for shaping objects by removal of metal.
CO4. Comprehend the process of PCB making, layout of house wiring, and electric arc welding.

Module No.	Unit No.	Details	Hrs.	CO
1	**Fitting shop**		**06**	**CO1**
	1.1	Introduction to Fitting shop, Demonstration of measuring instruments, cutting tools etc. used in Fitting shop.		
	1.2	One simple job involving filing, right angle making, and cutting to size operations.		
2	**Carpentry shop**		**04**	**CO 2**
	2.1	Introduction to carpentry shop, Demonstration of measuring instruments, cutting tools used in Carpentry shop and Planning a job using Jack plane.		
	2.2	One simple job consisting of lap joint to be performed in a group consisting of Two students.		
3	**Machine shop (Demonstration)**		**04**	**CO 3**
	3.1	Introduction of all machines available in machine shop. Demonstration of assembling and disassembling tools.		
	3.2	One demonstration job on lathe machine involving turning, facing, grooving, threading etc. operations		
4	**Welding shop**		**04**	**CO 4**
	4.1	Introduction to Welding shop. Demonstration of welding tools and equipment, arc welding practice.		
	4..2	One simple job involving Lap, Butt, Vertical joint to be performed in a group consisting of Four students.		
5	**Electrical Wiring shop**		**04**	**CO4**
	5.1	Introduction to Electrical wiring. Demonstration of Electrician tools like Tester, pliers, screw driver, multimeter, etc.		
	5.2	Hands on experience on House wiring or staircase wiring or godown wiring. Exposure to connecting solar panel with battery and tube light.		
6	**Printed Circuit Board (PCB) shop**		**4**	**CO4**
	6.1	Introduction to PCB shop. Demonstration of tools, material used for PCB making.		
	6.2	Demonstration of PCB making.		
		TOTAL	**26**	

Recommended Books

Sr. No.	Name/s of Author/s	Title	Name of Publisher With Country	Edition and Year of Publication
1.	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy	*Elements of Workshop Technology, Vol. I & II.*	Media Promoters, India	16th Edition, 2015
2.	Raghuwanshi B.S.	*A Course in Workshop Technology, Vol. I &II.*	Dhanpat Rai and Co. India	10th Edition, 2012 Reprint 2017
3.	Khurmi R.S. and Gupta J.K.	*Text book of Workshop Technology.*	S. Chand India	6th Edition, 2007 Reprint 2012

Term-Work will consist of workshop practices covering entire syllabus. Students will be graded based on continuous assessment of their term work.

Course Code	Course Title							
2UHC111	Applied Mathematics - II							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	04			--		01*		05
Credits Assigned	04			--		01		05
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	20	20	10	50	25	--	--	--	125

*Batch wise Tutorials.

Course prerequisites

- Methods of integration
- Methods of differentiation
- Basics of differential equations
- Tracing of standard curves

Course Objectives

The objective of this course is to model a real life scenario into differential equations and solve them. The course will enable students to learn different methods of solving improper and multiple integral. It will also focus on expansion of a real function as Taylor's series and finding successive derivatives of functions.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Apply concept of Beta & Gamma functions and DUIS to solve improper integrals.
CO2. Find length of a curve using cartesian, polar and parametric equations of curves.
CO3. Evaluate multiple integrals and use it to find area, volume and mass of lamina.
CO4. Identify and solve different types of ordinary differential equations using various methods.
CO5. Solve problems involving successive derivatives of real variable functions. Expand a function as an infinite series using Taylor's and Maclaurin's series and use it to solve problems involving indeterminate forms.

Module No.	Unit No.	Details	Hrs.	CO
1	**Integration : Review And Some New Techniques**		8	**CO1**
	1.1	Beta and Gamma functions with properties		
	1.2	Differentiation under integral sign with constant limits of integration (without proof)		
		#Self-learning topic: Differentiation under integral sign with variable limits of integration		
2	**Rectification**		**5**	**CO2**
	2.1	Rectification of plane curves in cartesian form		
	2.2	Problems of rectification in parametric and polar forms		
3	**Double Integration and Applications**		**9**	**CO3**
	3.1	Double integration - Introduction, Evaluation of double integrals with given limits and over the given region		
	3.2	Change of order of integration, Evaluation of double integrals by changing order of integration		
	3.3	Evaluation of double integrals by changing to polar form, Examples on change of variables by using Jacobians		
	3.4	Application of double integrals to compute area and mass of lamina		
4	**Triple Integration and Applications**		**7**	**CO3**
	4.1	Triple integration - Introduction and evaluation of integral in cartesian form		
	4.2	Problems of triple integration using cylindrical and spherical polar coordinates		
	4.3	Application of triple integral to compute volume		
5	**Differential Equation of First Order and First Degree**		**9**	**CO4**
	5.1	Differential equation of first order and first degree - Exact differential equations, Equations reducible to exact equations using integrating factor (Four rules)		
	5.2	Linear differential equations (review), Equation reducible to linear form		
	5.3	Bernoulli's equation, Equation reducible to Bernoulli's equation		
6	**Higher Order Differential Equation**		**7**	**CO4**
	6.1	Linear differential equation with constant coefficients - Complimentary function and particular integral of differential equation of the type f(D)y=X, where X is e^{ax}, sin $(ax + b)$, cos $(ax + b)$, x^n, $e^{ax}V$, xV		
	6.2	Cauchy's homogeneous linear differential equation and Legendre's differential equation		
	6.3	Method of variation of parameters		
7	**Successive Differentiation, Expansion of Functions, Indeterminate Forms**		**7**	**CO5**

	7.1	Successive differentiation - n^{th} derivative of standard functions. Leibnitz's theorem (without proof) and problems		
	7.2	Taylor's theorem (only statement), Taylor's series and Maclaurin's series (only Statement). Expansion of e^x, $sinx, cosx, tanx, sinhx,$ $coshx, tanhx, log\,(1+x)$, Binomial series, Series expansion using differentiation and integration		
		#**Self-learning topic**: Indeterminate forms, L-Hospital rule, Problems involving series		
		TOTAL	**52**	

Recommended Books

Sr. No.	**Name/s of Author/s**	**Title of Book**	**Name of Publisher with country**	**Edition and Year of Publication**
1.	Grewal B. S.	*Higher Engineering Mathematics*	Khanna Publications, India	43rd Edition, 2014
2.	Kreyszig E.	*Advanced Engineering Mathematics*	Wiley Eastern Limited, India	10th Edition, 2015
3.	Wartikar P. N. and Wartikar J. N.	*A text book of Applied Mathematics Vol. I & II*	Pune Vidyarthi Gruha, India	6th Edition, 2012
4.	Ramana B.V.	*Higher Engineering Mathematics*	Tata Megraw Hill New Delhi, India	12th Reprint, 2012

 # Students should prepare all self-learning topics on their own. Self-learning topics will enable students to gain extended knowledge of the topic. Assessment of these topics may be included in IA.

Term-Work will consist of Tutorials covering entire syllabus. Students will be graded based on continuous assessment of their term work.

Course Code	Course Title							
2UHC112	Industrial Applications							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			--		02		02
Credits Assigned	--			--		02		02
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	50	--	--	--	50

Course prerequisites:
Nil

Course Objectives:
The course introduces a new entrant to evolution, breadth of applications of chosen branch as well as job and research opportunities. Interaction with experts from Industry and Academia through series of lectures and industrial visits helps to create interest in specific domain. This will enable the learner to understand the reach of technology to real-world scenarios.

Course Outcomes
At the end of successful completion of the course the student will be able to
CO1. Recognize different program specific thrust areas and industrial applications
CO2. Understand evolution and developments in the related areas

Module No.	Details	Hrs.	CO
1	Industrial Experts Lectures	10	CO1 & CO2
2	Internal Faculty / Academician-(Thrust Area)	4	
3	Industrial Visit	4	
4	Video Lecture	2	
5	Students Presentation	6	
	TOTAL	26	

Term Work-

1. **Presentation (Evaluation along with Communication Skills Faculty)**
2. **Quiz**
3. **Report Writing**
4. **Attendance**

.

Course Code	Course Title							
2UHW113	Workshop - II							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			02		--		02
Credits Assigned	--			02		--		02
Examination Scheme	Marks							
	CA			ESE	TW	O	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	50	--	--	--	50

Course prerequisites:
Nil

Course Objectives:
Workshop is an important part of any engineering industry. Engineering students should be conversant with different operations performed on materials for producing desired objects, of various shapes/ sizes, made using several tools and devices. Experiential learning in this course develops skills in different trades of manufacturing.

Course Outcomes:
At the end of successful completion of the course the student will be able to
CO1. Build an object/product using Fitting trade as per given specifications.
CO2. Develop an object/product using carpentry trade as per given specifications.
CO3. Create an object/product using Welding trade as per given specifications.
CO4. Prepare an object/product using PCB trade as per given specifications.

Based on the skills acquired by students in semester I, they will choose any **Two** trades from Fitting, Carpentry, welding and PCB. With the help of these skills they will make product or job in respective trade. Following is the list of some sample products which can be selected but not limited. Apart from products listed below students can choose any product.
A team of students consisting of 4 to 5 members from same batch will have to select two trades from Fitting, carpentry, welding and PCB,. Each team will get 12 hours to complete one trade. Assessment will be

1. Continuous assessment
2. Quality of finished product

Module No.	Unit No.	Details	Hrs.	CO
1	**Fitting shop**		**12**	**CO 1**
	1.1	**Proposed products for Fitting shop:** 1. Machine clamp assembly 2. C shape clamp 3. Fitting shop jobs involving various shapes and operations 4. Any other product involving fitting operations		
2	**Carpentry shop**		**12**	**CO 2**
	2.1	**Proposed products for carpentry shop:** 1. Office Tray 2. Switch board 3. Wooden stool 4. Mail box 5. Chalk box and duster 6. Picture frame 7. Chair cum ladder 8. Any other product involving carpentry operations		
3	**Welding shop**		**14**	**CO 3**
	3.1	**Proposed products for Welding shop:** 1. Magazine rack 2. Metal stool 3. Welding table 4. Cloth dryer stand 5. Ladder 6. Shoe rack 7. Flower pot stand 8. Any other product involving Welding operations		
4	**Printed Circuit Board (PCB)**		**12**	**CO 4**
	4.1	**Proposed products for PCB shop:** 1. Digital Clock 2. Electric Lamp. 3. 3Digit thermometer 4. 12V Power Supply 5. Portable Speaker. 6. Transistor Polarity Tester 7. Automatic Street Light. 8. LED Headlights		
		TOTAL	**26**	

In this project, work expected from student is

1. Prepare product drawing
2. Calculate material required
3. Calculate selling price of product considering raw material cost, labour cost, profit etc.
4. Process plan with manpower and approximate time required.
5. Complete the product in given time period

Term work assessment is based on the overall performance of the student with every Job/product graded from time to time.

Recommended Books

Sr. No.	Name/s of Author/s	Title	Name of Publisher With Country	Edition and Year of Publication
1.	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy	*Elements of Workshop Technology, Vol. I & II.*	Media Promoters, India	16th Edition, 2015
2.	Raghuwanshi B.S.	*A Course in Workshop Technology, Vol. I &II.*	Dhanpat Rai and Co. India	10th Edition, 2012 Reprint 2017
3.	Khurmi R.S. and Gupta J.K.	*Text book of Workshop Technology.*	S. Chand India	6th Edition, 2007 Reprint 2012

Course Code	Course Title								
2UHL102	Engineering Physics Laboratory								
	TH			P		TUT		Total	
Teaching Scheme(Hrs.)	--			02		--		02	
Credits Assigned	--			01		--		01	
Examination Scheme	Marks								
	CA			ESE	TW	O*	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	25	25	--	--	50

*** Oral based on Laboratory Experiments**

Term-Work will consist of experiments covering entire syllabus of Engineering Physics (2UHC102).
Students will be graded based on continuous assessment of their term work.

Course Code	Course Title								
2UHL103	Engineering Chemistry Laboratory								
	TH			P		TUT		Total	
Teaching Scheme(Hrs.)	--			02		--		02	
Credits Assigned	--			01		--		01	
Examination Scheme	Marks								
	CA			ESE	TW	O*	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	25	25	--	--	50

*** Oral based on Laboratory Experiments**

Term-Work will consist of experiments covering entire syllabus of Engineering Chemistry(2UHC103).
Students will be graded based on continuous assessment of their term work.

Course Code	Course Title							
2UHL104	Engineering Mechanics Laboratory							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			02		--		02
Credits Assigned	--			01		--		01
Examination Scheme	Marks							
	CA			ESE	TW	O*	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	25	25	--	--	50

*** Oral based on Laboratory Experiments**

Term-Work will consist of experiments covering entire syllabus of Engineering Mechanics (2UHC104).
Students will be graded based on continuous assessment of their term work.

Course Code	Course Title							
2UHL105	Engineering Drawing Laboratory							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			02		--		02
Credits Assigned	--			01		--		01
Examination Scheme	Marks							
	CA			ESE	TW	O*	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	50@	--	--	--	50

@ 25 marks each for Practical and Tutorial

Term-Work will consist of tutorials and practicals covering entire syllabus of Engineering Drawing (2UHC105).
Students will be graded based on continuous assessment of their term work.

Course Code	Course Title								
2UHL106	Programming in C Laboratory								
	TH			P		TUT		Total	
Teaching Scheme(Hrs.)	--			02		--		02	
Credits Assigned	--			01		--		01	
Examination Scheme	Marks								
	CA			ESE	TW	O*	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	50	--	--	--	50

Term work will consist of tutorials and practicals covering entire syllabus of Programming in C(2UHC107).
Students will be graded based on continuous assessment of their term work.

Course Code	Course Title								
2UHL107	Elements of Electrical & Electronics Engineering Laboratory								
	TH			P		TUT		Total	
Teaching Scheme(Hrs.)	--			02		--		02	
Credits Assigned	--			01		--		01	
Examination Scheme	Marks								
	CA			ESE	TW	O*	P	P&O	Total
	T-1	T-2	IA						
	--	--	--	--	25	25	--	--	50

*** Oral based on Laboratory experiments /activities**

Term-Work will consist of experiments / activities based on syllabus of Elements of Electrical & Electronics Engineering (2UHC107).
Students will be graded based on continuous assessment of their term work.

Graduate Attributes of an Engineering Graduates:
(Defined by National Board of Accreditation)

1. **Engineering Knowledge**: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
4. **Conduct** investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5. **Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long Learning**: Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

Note: It is notified to all concerned that Revision 1.0 of FYBTech – KJSCE 2018 syllabus is further amended to Revision 2.1 with the due permissions from academic board. The course codes prefix modified to 2 from 1 in earlier version of 1.0 and no change in the contents of any course.

13th November 2018 Principal