SOMAIYA VIDYAVIHAR UNIVERSITY

K J Somaiya College of Engineering

Detailed Curriculum
With
Credit and Examination Scheme

F. Y. B. Tech.
Semester I and II
(Common to All Branches)

From
Academic Year 2020 – 21
(Revision 1)
(Approved by FoET 11 Jan 2020 and AC 02 May 2020)

K J Somaiya College of Engineering, Mumbai-77

(A Constituent College of Somaiya Vidyavihar University)

Salient features and changes w.r.t. KJSCE 2018 scheme:

- Promotion to Project based learning
- Electives offered from First Year level itself
- New courses introduced:
  - Python Programing in Semester II (while retaining Programing in C in Semester I)
  - Biology for Engineers (as one of the electives)
  - Engineering Explorations (as one of the electives)
- Wide choice of Exposure Courses for pursuing hobbies – music, sports, yoga, literature etc.
- More stress is given on continuous assessment
- One ISE during semester and ESE for selected courses
- Internal assessment component increased to 20% (10% in KJSCE-2018)

Dates of Approval/Amendments:

- Presented and approved in the 1st FoET meeting of SVU held on 11th Jan 2020
- Presented in the 1st AC meeting held on 16 Jan 2020
- Presented by incorporating suggested modifications and approved in the 2nd AC meeting held on 02 May 2020
- In effect from Academic Year 2020-21

Program Outcomes (PO) – Common to all disciplines

PO1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, cultural, environmental, health, safety and legal issues relevant to the professional engineering practice; understanding the need of sustainable development

PO7. **Multidisciplinary Competence:** Recognize/study/analyze/provide solutions to real-life problems of multidisciplinary nature from diverse fields

PO8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.

PO9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **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.

PO11. **Project management and finance:** Demonstrate knowledge and understanding of the 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.

PO12. **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.

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, Social Sciences and 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	**ISE**	In- Semester Examination
AOAC	Add on Audit Course	**CO**	Course Outcome
AVAC	Add on Value Audit Course	**PO**	Program Outcome
EX	Exposure Course	**PSO**	Program specific Outcome
I	Interdisciplinary courses		
MNCC	Mandatory Non Credit Course		

Acronyms used for type of Course

Acronym	Definition
C	Core Course
E	Elective Course
O	Open Elective Technical
H	Open Elective Humanities/Management/SWAYAM-NPTEL
P	Project
L	Laboratory Course
T	Tutorial
X	Exposure course
A	Audit course

Acronyms used in Eight Digit Course code e.g. 116U06C101

Acronym Serially as per code	Definition
1	SVU-2020 First Revision
16	College code
U	Alphabet code for type of program
06	Program/Department code
C	Type of course
1	Semester I – semester number
01	First course of semester – course serial number

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

Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total Hrs.	Credits Assigned TH – P – TUT	Total Credits	Course Category
116U06C101	Applied Mathematics I	3 – 0 – 1	04	3 – 0 – 1	04	BS
116U06C103	Engineering Chemistry	3 – 0 – 0	03	3 – 0 – 0	03	BS
116U06C105	Engineering Drawing	2 – 0 – 1	03	2 – 0 – 1	03	ES
116U06C107	Elements of Electrical and Electronics Engineering	3 – 0 – 0	03	3 – 0 – 0	03	ES
116U06L101	Programming in C	0 – 2 – 2	04	0 – 1 – 2	03	ES
116U06L103	Engineering Chemistry Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
116U06L105	Engineering Drawing Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
116U06L107	Elements of Electrical and Electronics Engineering Laboratory	0 – 2 – 0	02	0 – 1– 0	01	ES
116U06W101	Workshop I	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total			**25**		**21**	
116U06X1xx	Exposure Course	02		--		EX

Examination Scheme

Course Code	Course Name	Examination Scheme & Marks						
		CA		ESE	TW	O*	P&O	Total
		ISE	IA					
116U06C101	Applied Mathematics I	30	20	50	25			125
116U06C103	Engineering Chemistry	30	20	50				100
116U06C105	Engineering Drawing	30	20	50				100
116U06C107	Elements of Electrical and Electronics Engineering	30	20	50				100
116U06L101	Programming in C				75@			75
116U06L103	Engineering Chemistry Laboratory				50*			50
116U06L105	Engineering Drawing Laboratory				50			50
116U06L107	Elements of Electrical and Electronics Engineering Laboratory				50*			50
116U06W101	Workshop I				50			50
116U06X1xx	Exposure Course							-
Total								**700**

***Includes continuous assessment of Term-work of 25 marks and Oral of 25 marks based on Laboratory work**
@Includes continuous assessment of Term-work of 25 marks and practical and Oral of 50 marks based on Laboratory work

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

Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total Hrs.	Credits Assigned TH – P – TUT	Total Credits	Course Category
116U06C101	Applied Mathematics I	3 – 0 – 1	04	3 – 0 – 1	04	BS
116U06C102	Engineering Physics	3 – 0 – 0	03	3 – 0 – 0	03	BS
116U06C104	Engineering Mechanics	3 – 0 – 0	03	3 – 0 – 0	03	ES
116U06L101	Programming in C	0 – 2 – 2	04	0 – 1 – 2	03	ES
116U06L102	Engineering Physics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
116U06L104	Engineering Mechanics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
116U06L106	Environment and Technology OR Engineering Exploration OR #Biology for Engineers	1 – 2 – 0	03	0 – 2 – 0	02	HS
116U06T101	Communication Skills	0 – 0 – 2	02	0 – 0 – 2	02	HS
116U06W101	Workshop I	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total			**25**		**21**	
116U06X1xx	Exposure Course	02		--		EX

 # (Biology for Engineers with teaching scheme 2 – 0 – 0)

Examination Scheme

Course Code	Course Name	Examination Scheme & Marks						
		CA		ESE	TW	O*	P&O	Total
		ISE	IA					
116U06C101	Applied Mathematics I	30	20	50	25			125
116U06C102	Engineering Physics	30	20	50	--			100
116U06C104	Engineering Mechanics	30	20	50	--			100
116U06L101	Programming in C				75@			75
116U06L102	Engineering Physics Laboratory				50*			50
116U06L104	Engineering Mechanics Laboratory				50*			50
116U06L106	Environment and Technology OR Engineering Exploration OR Biology for Engineers				50			50
116U06T101	Communication Skills				50			50
116U06W101	Workshop I				50			50
116U06X1xx	Exposure Course							
Total								**650**

***Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**
@Includes continuous assessment of Term work of 25 marks and practical and oral of 50 marks based on Laboratory work

Semester II
Group C
COMP (Division A, B & C) and IT (Division G & H)

Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total Credits	Course Category
116U06C108	Applied Mathematics II	3 – 0 – 1	04	3 – 0 – 1	04	BS
116U06C102	Engineering Physics	3 – 0 – 0	03	3 – 0 – 0	03	BS
116U06C104	Engineering Mechanics	3 – 0 – 0	03	3 – 0 – 0	03	ES
116U06L102	Engineering Physics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
116U06L104	Engineering Mechanics Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
116U06L106	Environment and Technology OR Engineering Exploration OR #Biology for Engineers	1 – 2 – 0	03	0 – 2 – 0	02	HS
116U06L108	Python programming	1 – 2 – 0	03	0 – 2 – 0	02	ES
116U06T101	Communication Skills	0 – 0 – 2	02	0 – 0 – 2	02	HS
116U06W102	Workshop II	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total			**24**		**20**	
116U06X1xx	Exposure Course	02		--		EX

 # (Biology for Engineers with teaching scheme 2 – 0 – 0)

Examination Scheme

Course Code	Course Name	Examination Scheme & Marks						
		CA		ESE	TW	O*	P&O	Total
		ISE	IA					
116U06C108	Applied Mathematics II	30	20	50	25			125
116U06C102	Engineering Physics	30	20	50				100
116U06C104	Engineering Mechanics	30	20	50				100
116U06L102	Engineering Physics Laboratory				50*			50
116U06L104	Engineering Mechanics Laboratory				50*			50
116U06L106	Environment and Technology OR Engineering Exploration OR Biology for Engineers				50			50
116U06L108	Python programming				75@			75
116U06T101	Communication Skills				50			50
116U06W102	Workshop II				50			50
116U06X1xx	Exposure Course							
Total								**650**

***Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**
@Includes continuous assessment of Term work of 25 marks and Practical and Oral of 50 marks based on Laboratory work

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

Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.) TH – P – TUT	Total (Hrs.)	Credits Assigned TH – P – TUT	Total credits	Course Category
116U06C108	Applied Mathematics II	3 – 0 – 1	04	3 – 0 – 1	04	BS
116U06C103	Engineering Chemistry	3 – 0 – 0	03	3 – 0 – 0	03	BS
116U06C105	Engineering Drawing	2 – 0 – 1	03	2 – 0 – 1	03	ES
116U06C107	Elements of Electrical and Electronics Engineering	3 – 0 – 0	03	3 – 0 – 0	03	ES
116U06L103	Engineering Chemistry Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	BS
116U06L105	Engineering Drawing Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
116U06L107	Elements of Electrical and Electronics Engineering Laboratory	0 – 2 – 0	02	0 – 1 – 0	01	ES
116U06L108	Python programming	1 – 2 – 0	03	0 – 2 – 0	02	ES
116U06W102	Workshop II	0 – 2 – 0	02	0 – 2 – 0	02	ES
Total			**24**		**20**	
116U06X1xx	Exposure Course	02		--		EX

Examination Scheme

Course Code	Course Name	Examination Scheme & Marks						
		CA		ESE	TW	O*	P&O	Total
		ISE	IA					
116U06C108	Applied Mathematics II	30	20	50	25			125
116U06C103	Engineering Chemistry	30	20	50				100
116U06C105	Engineering Drawing	30	20	50				100
116U06C107	Elements of Electrical and Electronics Engineering	30	20	50				100
116U06L103	Engineering Chemistry Laboratory				50*			50
116U06L105	Engineering Drawing Laboratory				50			50
116U06L107	Elements of Electrical and Electronics Engineering Laboratory				50*			50
116U06L108	Python programming				75@			75
116U06W102	Workshop II				50			50
116U06X1xx	Exposure Course							
Total								**700**

***Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**
@Includes continuous assessment of Term work of 25 marks and practical and oral of 50 marks based on Laboratory work

Course-wise Detailed Syllabus

Course Code	Course Title							
116U06C101	Applied Mathematics - I							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	03			--		01*		04
Credits Assigned	03			--		01		04
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	30	20	50	25	--	--	--	125

* Batch wise Tutorial

Course prerequisites

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

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)
CO5. Apply Euler's theorem to prove results related to Homogeneous functions.

Module No.	Unit No.	Details	Hrs.	CO
1	**Complex Numbers, Hyperbolic Functions and Logarithm of Complex Number**		12	CO1
	1.1	Statement of De Moivre's theorem and related examples		
	1.2	Powers and roots of complex numbers		
	1.3	Circular functions of complex number and hyperbolic functions		
	1.4	Inverse circular and inverse hyperbolic functions		
	1.5	Logarithmic functions		
	1.6	Separation of real and imaginary parts		
		#Self-learning topics: Expansion of $\sin^n\theta$, $\cos^n\theta$ in terms of sine and cosine of multiples of angle θ and expansion of $\sin n\theta, \cos n\theta$ in powers of $\sin\theta, \cos\theta$		
2	**Matrix Theory: Rank of Matrix**		8	CO 2
	2.1	Types of matrices: Hermitian, Skew-Hermitian, Unitary and Orthogonal matrix		
	2.2	Rank of a matrix using row echelon forms, reduction to normal form, and PAQ form		
	2.3	System of homogeneous and non-homogeneous equations, their consistency and solutions		
	2.4	Linearly dependent and independent vectors		
	2.5	Solution of system of linear algebraic equations by **(a)** Gauss Seidal method **(b)** Jacobi iteration method		
		#Self-learning topics: Symmetric, Skew-symmetric matrices and properties, Properties of adjoint and inverse of a matrix		
3	**Matrix Theory: Eigen values & Eigen vectors**		12	CO 3
	3.1	Characteristic equation, Eigen values and Eigen vectors, Properties of eigen values and eigen vectors		
	3.2	Statement of Cayley-Hamilton theorem, Examples based on verification and application of Cayley-Hamilton theorem		
	3.3	Similarity of matrices, Diagonalisation of a matrix		
	3.4	Functions of square matrix, Derogatory and non-derogatory matrices, Minimal polynomial		
4	**Partial Differentiation and Application**		9	CO4
	4.1	Functions of several variables, Partial derivatives of first and higher order (definition using limits and simple problems)		
	4.2	Differentiation of composite functions and Total differentials		
	4.3	Maxima and minima of a function of two independent variables		
	4.4	Introduction of Jacobian of two and three independent variables (simple problems)		

5	**Homogeneous Functions**		**4**	**CO5**
	5.1	Euler's theorem on homogeneous functions with two and three independent variables (statement only) and problems		
	5.2	Deductions(Corollaries) from Euler's theorem (statements only) and problems		
		Total	**45**	

Text 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.	Shanti Narayan	A text book of Matrices	S. Chand, India	10th Edition 2004
3.	P. N. Wartikar and J. N. Wartikar	A text book of Applied Mathematics Vol I & II	Pune VidyarthiGruha, India	6th Edition 2012

Reference Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Eastern Limited, India	10th Edition 2015
2.	Dennis G. Zill and Michael R. Cullen	Advanced Engineering Mathematics	Narosa Publication India	3rd Edition 2010
3.	Glyn James	Advanced Modern Engineering Mathematic	Pearson Publication India	4th Edition 2010
4.	Ramana B.V.	Higher Engineering Mathematics	Tata Mcgraw Hill New Delhi, India	34th Edition (reprint) 2019

 # 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 Tutorials.

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							
116U06C102	Engineering Physics							
	TH			P		TUT		Total
Teaching Scheme (Hrs.)	03			--		--		03
Credits Assigned	03			--		--		03
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	30	20	50	--	--	--	--	100

Course prerequisites

- Basics of units and conversions Basics of optics, mechanics, electricity and magnetism, thermal properties of conductors and semiconductors, particle properties of radiation
- Basics of differentiation and integration methods, vectors algebra, trigonometry, complex numbers, probability

Course Objectives

This course delivers the fundamental physical concepts and mathematical foundations of a variety of real-life phenomena in the field of optics, photonics, electromagnetism and technologically useful materials such as semiconductors, dielectrics, optical fibres and liquid crystals. The course covers working principles of different types of sensors and it intends to convey the importance of quantum mechanics to advanced engineering and computing applications.

Course Outcomes

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

CO1. Explain a variety of optical phenomena using concepts wave optics and photonics
CO2. Analyze basic physical properties of technologically important materials
CO3. Identify the scope of quantum mechanics in engineering and computing applications
CO4. Solve engineering problems using mathematical foundations of electromagnetism
CO5. Relate working of different types of sensors with the physics of materials

Module No.	Unit No.	Details	Hrs.	CO
1	**Optics and Photonics**		08	CO 1
	1.1	Thin film interference: Role of film thickness, factors affecting path difference, thin film of uniform thickness - maxima/minima conditions, formation of colours, combination of media, antireflecting films		
	1.2	Polarization: Production and detection of polarized light, Brewster's law, Malus' law, birefringence, superposition of two polarized waves, conditions for plane, elliptical and circularly polarized light		
	1.3	Principles of lasers: Interaction of radiation with matter, population, pumping, active medium, optical resonator, Einstein's coefficients, population inversion, threshold condition, laser beam parameters		
2	**Engineering Materials**		09	CO 2
	2.1	Semiconductors: Doping, concepts of hole, effective mass and mobility, carrier concentration, conductivity and their temperature dependence, drift and diffusion currents, Fermi-Dirac statistics, Fermi level, temperature dependence of Fermi level and Fermi-Dirac function		
	2.2	Dielectrics: Dielectric parameters, types of polarizations, derivation for electronic polarizability, Clausius-Mossotti equation, frequency dependence, dielectric strength, ferroelectricity		
	2.3	Optical fibres: Total internal reflection, acceptance angle, numerical aperture (with derivation), types of fibres, modes of propagation, V-number, attenuation, dispersion, bit rate		
	2.4	Liquid crystals: Classification, phases, properties, applications		
3	**Quantum Mechanics**		10	CO 3
	3.1	Dual nature of matter: Limitations of classical physics, scope of quantum mechanics, de'Broglie hypothesis, Davison-Germer experiment		
	3.2	Uncertainty principle: Wave and group velocity, matter waves, wave function, probability amplitude, normalization, uncertainty principle		
	3.3	Schrodinger equation: Time dependent Schrodinger equation, reduction to time independent form, particle in a box problem (1-dimensional infinite potential well) - full solution, boundary conditions, energy and momentum quantization, extension to 3-dimensions, degeneracy		

	3.4	Basics of quantum computing: Physics of information, qubit, quantum algorithms, quantum hardware		
4	**Electromagnetism**		**08**	**CO 4**
	4.1	Vector operators: Gradient, divergence, curl and their physical interpretation, fundamental theorems of vector calculus		
	4.2	Electrostatics and electromagnetic induction: Electric charge density, electric field, electric potential and their interrelations, Coulomb's and Gauss' law, Gauss' and Faraday's laws in integral and differential forms		
	4.3	Magnetostatics: Biot-savart's and Ampere's law, absence of magnetic monopoles, Ampere's law in integral and differential form		
	4.4	Electromagnetic wave propagation: Continuity equation, Maxwell's correction to Ampere's law, Maxwell's equations, electromagnetic waves in vacuum, speed of light, energy density of electromagnetic waves		
5	**Sensors Technology**		**10**	**CO 5**
	5.1	Ultrasonic sensors: Piezoelectric and magnetostriction effects, detection of ultrasonic waves, quartz crystal		
	5.2	Thermoelectric sensors: Seabeck and Peltier effect, laws of thermoelectricity, thermoelectric materials and series		
	5.3	Magnetic sensors: Fluxgate magnetometer, Hall probe, magnetoresistance		
	5.4	Radiation sensors: Types of radiation, G.M. counter, scintillation counter, PMT, solid state detectors - photoconductors, photodiodes and charged-coupled devices, pyranometer		
	5.5	Environmental and biomedical sensors: Sensing by plants (tropisms) and animals, MEMS, NEMS and NDT based sensors for biomedical applications		
		Total	**45**	

Textbooks:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	M N Avadhanulu, P G Kshirsagar, TVS Arun Murthy	A Textbook of Engineering Physics	S Chand	11th Edition, 2018
2.	Gaur, Gupta	Engineering Physics	Dhanpat Rai, India	8/e, 2018

Reference Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Ajoy Ghatak	Optics	McGraw Hill India	6th Edition, 2017
2.	Arthur Beiser	Concepts of Modern Physics	McGraw Hill India	7th Edition, 2017
3.	David Griffiths	Introduction to Electrodynamics	PHI	5th Edition, 2015
4.	Introduction to Solid State Physics	Charls Kittle	Wiley India	Special Indian Edition, 2019
5.	Michael Shur	Physics of Semiconductor Devices	Pearson	Special Indian Edition, 2019

Course Code	Course Title							
116U06C103	Engineering Chemistry							
	TH			P		TUT		Total
Teaching Scheme (Hrs.)	03			--		--		03
Credits Assigned	03			--		--		03
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	30	20	50	--	--	--	--	100

Course prerequisites

- Higher secondary level Chemistry

Course Objectives

The objective of course is to appreciate the basic concepts of chemistry behind the development of futuristic materials and their applications in engineering and technology. The course objective is to understand chemical processes involved in development of sustainable energy sources. To analyze the knowledge of analytical techniques involved in the analysis and characterization of chemical compounds, nanomaterial.

Course Outcomes

After successful completion of the course, the student will able to-

CO1. Understand the importance of water in industry and methods to produce soft water and wastewater treatment.
CO2. Demonstrate and analyze the knowledge of polymeric for futuristic engineering applications.
CO3. Identify and compare the material best suited for the energy production in sustainable and efficient manner.
CO4. Apply the knowledge of green chemistry and nanotechnology for solving the problems of society in sustainable and greener way.
CO5. Understand and apply basic concepts of spectroscopy and electro-analytical technique in characterizing chemical compounds.

Module No.	Unit No.	Details	Hrs.	CO
1	**Water**		10	CO1
	1.1	Introduction, Types of Hardness, Disadvantages of hardness Equivalence of $CaCO_3$, Experimental determination of hardness.		
	1.2	Softening of Hard water: Lime soda method Zeolite method, Ion Exchange process, Desalination of brackish water using Electro dialysis, Reverse osmosis		
	1.3	Methods to determine extent of water pollution, BOD, COD, Treatment of industrial wastewater.		
2	**Polymer Chemistry**		9	CO2
	2.1	Introduction, Classifications, Characteristic properties, Concept of molecular mass, determination of molecular mass, Glass transition temperature Tg		
	2.2	Methods of polymerization, Compounding and fabrication of plastics, Structure and property relationship of polymer		
	2.3	Synthesis, properties and Application of few commercially important polymers, Conducting polymer, Liquid crystal Polymer		
3	**Energy**		10	CO2
	3.1	Introduction, Classification, Renewable energy, production of electricity using solar energy, Photo voltaic cells, Fuel cell		
	3.2	Fuel: 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)		
	3.3	Waste to energy conversion: Solid waste and its classification, need of energy production from waste, method of conversion of energy from solid waste		
4	**Green Chemistry and Nanotechnology**		7	CO4
	4.1	Green Chemistry: Introduction, Goals, 12 principles of green chemistry, Significance of 12 principles with industrial examples, Green synthesis of few important materials		
	4.2	Nanomaterial and Nanotechnology: Introduction, properties and synthesis of nanomaterial, Properties and applications of special nanomaterial structure carbon Clusters		
5	**Spectroscopy and Instrumental methods of Analysis**		9	CO5
	5.1	UV spectroscopy, Principle, Instrumentation and applications		
	5.2	IR spectroscopy, Basic Principle, Instrumentation and applications		
	5.3	1H NMR Spectroscopy: Principle, Instrumentation, Chemical Shift, Factors affecting chemical shift, Applications.		
	5.4	Electroanalytical techniques, pH metry, Conductometry, Potentiometry		

Text Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Dr. S.S.Dara, Dr. S.S. Umare	A textbook of Engineering Chemistry	S. Chand, India	Revised edition, 2015
2.	Shashi Chawla	A textbook of Engineering Chemistry	Dhanpat Rai & Co.	3rd edition, 2017
3.	R Gopalan, D Venkappayya, Sulochana Nagarjan	Engineering Chemistry	Vikas Publishing House, India	4th edition, 2018

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	K. SESHA Maheswaramma, Mridula Chugh	Engineering Chemistry	Pearson, India	Revised edition, 2016
2.	O G Palanna	Engineering Chemistry	Mc Graw Hill, India	2nd edition, 2017

Course Code	Course Title						
116U06C104	Engineering Mechanics						
	TH			P		TUT	Total
Teaching Scheme(Hrs.)	03			--		--	03
Credits Assigned	03			--		--	03
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	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. Evaluate resultant and moment of a force system
CO2. Analyze the concept of kinematics of particle and rigid body.
CO3. Determine center of gravity of wires (rods), lamina and solids
CO4. Analyze applications of equilibrium using free body diagram
CO5. Analyze the dynamic system using D'Alembert, work energy and impulse momentum principle.

Module No.	Unit No.	Details	Hrs.	CO
1	**System of forces**		7	CO 1
	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		
	1.2	Resultant of forces in space		
2	**Kinematics of Particles and Rigid Bodies**		11	CO 2
	2.1	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.		
	2.2	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)		
3	**Centroid of Wires, Laminas and Solids**		5	CO 3
	3.1	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		
4	**Equilibrium of Force System and Friction**		13	CO 4
	4.1	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.		
	4.2	Types of support, loads, beams, determination of reactions at supports for various types of loads on beams (excluding internal hinge problems)		
	4.3	Laws of friction, cone of friction, angle of repose, equilibrium of bodies on inclined plane, application to problems involving wedges and ladders		
5	**Kinetics of particle**		9	CO5
	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	45	

Text Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Tayal, A.K.	Engineering Mechanics, Statics and Dynamics	Universal Publication, India	14th Edition 2011
2.	Bhavikatti S. S.	Engineering Mechanics	New Age international, India	Revised Edition 2019

Reference books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Hibbeler, H. C. and Gupta	Engineering Mechanics, Statics and Dynamics	Prentice Hall Private limited, India	Revised Edition 2017
2.	Bhattacharyya B.	Engineering Mechanics	Oxford University Press, India	2nd Edition 2014
3.	Ram H.D. and Chauhan A.K.	Foundations and Applications of Engineering Mechanics	Cambridge University Press, UK	1st Edition 2015

Course Code	Course Title						
116U06C105	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&O	Total
	ISE	IA					
	30	20	50	--	--	--	100

* Batch wise Tutorial

Course prerequisites

- Knowledge of various geometric constructions.
- Basics of trigonometry

Course Objectives

The students will be able to

1. Familiarize with the conventions and standards along with the principles of projections applied to lines and points.
2. Apply the principles of orthographic projections to draw elevation, plan, End view, Isometric views etc.
3. Apply the principles of orthographic projections to draw various views of regular solid objects.
4. Apply the fundamentals of solid geometry and develop lateral surfaces of solids

Course Outcomes

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

CO1. Projection of lines and planes
CO2. Orthographic and sectional views of any 3D object.
CO3. Isometric drawing.
CO4. Projection of regular solids
CO5. Section and lateral development of regular solids

Module No.	Unit No.	Details	Hrs.	CO
1	**Projection of Points and Lines**		04	**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	**Orthographic Projection**		03	**CO 2**
	2.1	Orthographic projections of simple machine parts by first angle method as recommended by Indian standards, Sectional views of simple machine parts (full section).		
3	**Isometric View**		02	**CO 3**
	3.1	Introduction to Isometric drawing and construction of isometric drawing of machine parts		
Self-Learning: Students have to prepare a Simple 3D model with at least five components using SolidWorks software				
4	**Projection of Solids**		03	**CO 4**
	4.1	Introduction to Projection of Solids, Classification of Solids and Projection of right regular solids (prism, pyramid, cylinder, and cone) inclined to both reference planes (excluding spheres, hollow and composite solids)		
5	**Section and Development of Solids**		03	**CO5**
	5.1	Projection of sectional views for solids (prism, pyramid, cylinder, and cone) cut by plane perpendicular to one and inclined to other reference planes (excluding curved cutting planes).		
	5.2	Lateral surface development of prism, pyramid, cylinder, cone with section plane inclined to one reference plane only. (excluding reverse development)		
		Total	**15**	

Text Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	N.D. Bhatt V.M. Panchal	Machine Drawing	Charotar Publishing House Pvt. Ltd	53rd edition, India,2014
2.	P.J. Shah	Engineering Graphics	S. Chand Publications	Revised Edition, India, 2014
3.	Dhananjay Jolhe	Engineering Drawing	Tata McGraw Hill	Revised Edition, India, 2017

Reference Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1	N.D. Bhatt	Engineering Drawing	Charotar Publishing House Pvt. Ltd	53rd Revised 2014
2	P. S. Gill	Engineering Graphics and Drafting	S.K. Kataria & Sons	Revised Edition, India,2014

Course Code	Course Title							
116U06C107	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
	ISE	IA						
	30	20	50	--	--	--	--	100

Course prerequisites

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

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 fundamental knowledge to understand the design of electrical and electronics systems.

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. Explain rectifier-filter circuits using PN junction diode and working of Bi-polar junction and field effect transistor.
CO3. Demonstrate and analyze steady state response of single phase and three phase circuits.
CO4. Understand principles and working of AC and DC machines with their applications.
CO5. Understand operational amplifier and its applications

Module No.	Unit No.	Details	Hrs.	CO
1	**DC circuits**		**10**	**CO 1**
	1.1	Concept of dependent and independent sources, ideal and practical voltage and current sources, Kirchhoff's Laws, source transformation and network terminology.		
	1.2	Resistive network simplification, Series, parallel connection and Star-Delta transformations		
	1.3	Mesh and nodal analysis, concept of super mesh and super node (Analysis only with independent sources)		
	1.4	Superposition theorem, Thevenin's theorem, Norton"s theorem, Maximum power transfer theorem (Analysis only with independent sources)		
2	**Basic Electronic devices and their applications**		**08**	**CO2**
	2.1	**P-N Junction diode:** Construction and working of PN junction diode, current voltage characteristics. **Zener Diode:** Construction and working, current voltage characteristics. Zener diode as voltage regulator. **Rectifiers:** 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. Filter circuits		
	2.2	**Bipolar Junction Transistor:** BJT operation, CE, CB and CC configuration of BJT, BJT as a switch, BJT as a current amplifier and voltage amplifier. (No derivations and Numerical)		
	2.3	**Field effect transistor:** FET operation, Configuration of FET, Output and transfer characteristics, Common source FET amplifier, Comparison between BJT and FET (No derivations and Numerical)		
	#Self-study topics **Components of LT Switchgear**: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. Lamps- fluorescent, CFL, LED. Electrical measuring instruments principle and applications- energy meter, megger, tong tester.			
3	**AC circuits**		**12**	**CO 3**
	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, and C, concept of inductive and capacitive reactance, phasor diagram of impedance, phase relationship in voltage and current.		

	2.3	RL, RC and RLC series and 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, Q-factor and bandwidth		
	2.5	Three-phase balanced circuits, voltage and current relations in star and delta connections.		
	2.6	Measurement of power in 3-phase system using two wattmeter method		
4	**Electrical Machines**		**12**	**CO4**
	4.1	Single phase transformer construction and principle of working, emf equation of a transformer, losses in transformer, equivalent circuit of Ideal and practical transformer, voltage regulation and efficiency of transformer, phasor diagram at various loading condition (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)		
	4.3	Three phase induction motor: Construction, working principle, Generation of rotating magnetic field, applications. (no derivations and numerical expected)		
	4.4	Single phase induction motor: Construction, working principle, double field revolving theory, split phase, capacitor start and shaded pole motor. applications (no derivations and numerical expected)		
5	**Operational Amplifier**		**03**	**CO5**
	5.1	Operational amplifier, block diagram, characteristics of IDEAL opamp, open loop configuration, opamp as comparator		
	5.2	Closed loop configuration applications: opamp as an inverting and noninverting amplifier, opamp adder and subtractor.		
		Total	**45**	

Text Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Singh Ravish R	Basic of Electrical and Electronics Engineering	Tata McGraw Hill, India	1St Edition, 2013
2.	D.P.Kothari,I.J. Nagrath	Basic Electrical and Electronics Engineering	Tata McGraw Hill(India) Pvt. Ltd.	1St Edition,
3.	P.V. Prasad , R Prasad , S. Sivanagaraju	Basic Electrical and Electronics Engineering	Cenage Learning	1St Edition,

Reference Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	B. L. Thereja	Electrical Technology Vol-1 and Vol-II	S.Chand	25th Edition 2014
2.	Mittle and Mittle	Basic Electrical Engineering	Tata McGraw Hill, India	2nd edition (New) 2001
3.	Donald Neamen	Electronic Circuit Analysis and Design	Tata McGraw Hill india	Second Edition 2001

 # 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.

Course Code	Course Title							
116U06C108	Applied Mathematics - II							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	03			--		01*		04
Credits Assigned	03			--		01		04
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	30	20	50	25	--	--	--	125

* Batch wise Tutorial

Course prerequisites

- Higher secondary level Mathematics
- Applied Mathematics- II

Course Objectives

1. Impart the knowledge of solving ordinary differential equations
2. Impart the knowledge of Multiple Integral
3. Impart the knowledge of Improper Integral
4. To expand 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.Identify and solve different types of ordinary differential equations using various methods.
CO2. 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.
CO3. Apply concept of Beta – Gamma function and DUIS to solve improper integrals
CO4. Find length of a curve using Cartesian, Polar and Parametric equations of curves
CO5. Evaluate multiple integrals and use it to find Area, Volume and Mass of Lamina.

Module No.	Unit No.	Details	Hrs.	CO
1	**Differential Equation of First Order and First Degree**		13	CO 1
	1.1	Differential Equation of first order and first degree- Exact differential equations, Equations reducible to exact equations by integrating factors.		
	1.2	Linear differential equations (Review), Equation reducible to linear form. Applications of Differential Equation of first order and first degree		
	1.3	Linear Differential Equation with constant coefficients: Complimentary function, particular integrals of differential equation of the type f(D)y=X, where X is e^{ax}, sin $(ax + b)$, cos $(ax + b)$, x^n ,$e^{ax}V$		
	1.4	Cauchy's homogeneous linear differential equation		
	1.5	Method of variation of parameters		
		# **Self-learning topic:** Bernoulli's equation. Equation reducible to Bernoulli's equation.		
2	**Successive Differentiation, Expansion Of Functions, Indeterminate Forms**		5	CO 2
	2.1	Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and problems.		
	2.2	Taylor's Theorem (only statement) and Taylor's series, Maclaurin's series(only Statement) Expansion of e^x, $sinx, cosx, tanx$		
		#Self-learning topic: Expansion of sinh(x), cosh(x), tanh(x), log(1 + x) , Indeterminate forms, L'Hospital Rule, problemsinvolving series		
3	**Integration : Review And Some New Techniques**		7	CO 3
	3.1	Beta and Gamma functions with properties		
	3.2	Differentiation under integral sign with constant limits of integration.(without proof)		
		# **Self-learning topic:** Differentiation under integral sign with variable limits of integration.		
4	**Rectification**		5	CO4
		Pre-requisite: Idea of Curve tracing in Cartesian, Parametric and polar forms. (Straight lines, Circles, Parabolas, Ellipse, Hyperbola, Catenary, Cissoid, Astroid, Cycloid, Lemniscate of Bernoulli, Cardiode).		
	4.1	Rectification of plane curves in Cartesian form		
	4.2	Problems of Rectification in parametric and polar forms		
5	**Multiple Integration: Double Integration, Triple Integration and their Applications**		14	CO5
	5.1	Double integration- Introduction, Evaluation of Double Integrals with given limits and over the given region.		
	5.2	Change of order of integration, Evaluation of double integrals by changing order of integration		
	5.3	Application of double integrals to compute Area, Mass of Lamina.		

	5.4	Triple integration- Introduction and evaluation of integral in Cartesian form		
	5.5	Problems of Triple integration using cylindrical and spherical Polar coordinates		
	5.6	Application of triple integral to compute volume.		
		Total	**45**	

Textbooks:

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.	P. N. Wartikar and J. N. Wartikar	A text book of Applied Mathematics Vol I & II	Pune VidyarthiGruha, India	6th Edition 2012

Reference Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Erwin Kreyszig	Advanced Engineering Mathematics	Wiley Eastern Limited, India	10th Edition 2015
2.	Dennis G. Zill and Michael R. Cullen	Advanced Engineering Mathematics	Narosa Publication India	3rd Edition 2010
3.	Shanti Narayan, Mittal P.K.	Integral Calculus	S. Chand , India	10th Edition 2005
4.	Ramana B.V.	Higher Engineering Mathematics	Tata Mcgraw Hill New Delhi, India	34th Edition (reprint) 2019
5	Dr.M.D.Raisinghania	Ordinary and Partial Differential Equations	S. Chand, India	18th Edition 2013

 # 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 Tutorials.

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							
116U06L101	Programming in C							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	--			02		02		04
Credits Assigned	--			01		02		03
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	-	-	-	75*	-	-	-	75

* Includes continuous assessment of Term work of 25 marks and practical and Oral of 50 marks based on Laboratory work

Course prerequisites
Basic knowledge of computer peripheral devices, software concepts

Course Objectives
The course aims at a systematic approach to build logic for problem solving using tools like algorithm and flowchart. 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
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 datatypes such as arrays, strings, structures and unions.
CO4. Design modular programs using functions and demonstrate the concept of pointers and file handling

Module No.	Unit No.	Details	Hrs. (Tutorial and Lab)	CO
1	**Introduction to C**			
	1.1	**Problem solving skill development:** Problem Definition, fundamentals of algorithms and flowcharts, Algorithms and flowchart development	04	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	04	CO2
2	**Operators and Expressions**			
	2.1	**Types of Operators:** Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator , Bitwise Operators	04	CO2
	2.2	**Type Conversions:** Implicit and Explicit, Special Operators- Comma Operator, sizeof Operator, dereferencing operator, Expressions and Evaluation of Expressions, Operator Precedence and Associativity	04	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, Decision making using Switch-Case	04	CO2
	3.2	**Looping Control Structures:** While Loop, For Loop, Do While Loop, Algorithm and Flowchart for all the loops	06	CO2
	3.3	**Jump Statements:** Break and Continue, goto Statement	02	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	02	CO1
4	**Arrays, Structures And Unions**			
	4.1	**Arrays:** Introduction to One Dimensional Arrays, Multidimensional Arrays, Declaration and Initialization of Arrays, Reading and Displaying arrays	04	CO3
	4.2	**Character Arrays and Strings:** Introduction, Declaring and Initializing String Variables, Reading Character and Writing Character, Reading and Writing Strings, String Handling Functions	04	CO3
	4.3	**Structures and Unions:** Introduction, Declaring and defining Structure, Structure Initialization, Accessing and Displaying Structure Members, Array of Structures, Introduction to Unions, Structure Vs Unions	04	CO3
5	**User Defined Functions, Pointers and File Handling Operations**			
	5.1	**User Defined Functions:** Need, Function Declaration and Definition, Return Values, Function Calls, Passing Arguments to a Function by Value, Recursive functions, Storage classes of Variables, Command Line Arguments	06	CO4

	5.2	**Introduction to pointers:** Pointer declaration and initialization, Pointer addition and subtraction, Evaluating pointer expressions **Pointers and Functions:** Pass by Reference, Returning pointers from functions **Dynamic Memory Allocation using Pointers:** Dynamic memory allocation using malloc(), calloc() and realloc() and deallocation of memory using free()	**08**	**CO4**
	5.3	**File Handling Operations:** Defining and Opening a file, closing files, file modes, input/output operations on files	**04**	**CO4**
		Total	**60**	

Text 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	8th Edition, 2019
2.	Yashwant Kanetkar	Let Us C	BPB Publications, India	16th Edition, 2017

Reference Books

Sr. No.	Name/s of Author/s	Title	Name of Publisher	Edition and Year of Publication
1.	Brian W. Kernighan and Dennis Ritchie	The C programming Language	Prentice Hall	2nd Edition, 2015
2.	Pradeep Dey and Manas Ghosh	Structured Programming Approach	Oxford University Press, India	1st Edition, 2016

Course Code	Course Title							
116U06L102	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
	ISE	IA						
	--	--	--	50*	--	--	--	50

*** Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**

Term work will consist of different types of experiments such as hands-on, experiential learning, virtual laboratory etc. The experiments will be based partly on the Engineering Physics syllabus and partly covering the fundamentals of Physics and Measurements. Students will be graded based on continuous assessment of their practicals and written report on practicals. Oral examination will be based on all experiment and related theory.

Course Code	Course Title							
116U06L103	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
	ISE	IA						
	--	--	--	50*	--	--	--	50

*** Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**

Term-Work will consist of experiments based on Engineering Chemistry. Students will be graded based on continuous assessment of their term work. Oral examination will be based on all experiment and related theory.

Course Code	Course Title						
116U06L104	Engineering Mechanics Laboratory						
	TH			P		TUT	Total
Teaching Scheme(Hrs.)	--			02		--	02
Credits Assigned	--			01		--	01
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	--	--	--	50*	--	--	50

*** Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**

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

Course Code	Course Title						
116U06L105	Engineering Drawing Laboratory						
	TH			P		TUT	Total
Teaching Scheme(Hrs.)	--			02		--	02
Credits Assigned	--			01		--	01
Examination Scheme	Marks						
	CA		ESE	TW	O*	P&O	Total
	ISE	IA					
	--	--	--	50	--	--	50

Term work will consist of tutorials and practicals covering entire syllabus of Engineering Drawing. Students will be graded based on continuous assessment of their term work.

Course Code	Course Title						
116U06L106	Environment and Technology						
	TH			P		TUT	Total
Teaching Scheme(Hrs.)	01			02		--	03
Credits Assigned	01			01		--	02
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	--	--	--	50	--	--	50

Course prerequisites

- Basic knowledge of environmental studies up to higher secondary

Course Objective

The objective of this course is to sensitize the students towards environment along with emphasis on engineering applications required for environmental preservation. Learner will get acquainted with various environmental assessments and monitoring tools for addressing environmental concerns.

Experiential learning through projects will enable them to relate with real world problems. It will also develop an approach to analyze and think critically.

Course Outcomes

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

CO 1. Understand need and concept of sustainability associated with developmental activities

CO 2. Get familiar with various renewable energy resources and technologies to harness the same

CO 3. Get acquainted with various pollution control and energy conversion technologies

CO 4. Recognize various tools for environmental assessment and monitoring

CO 5. Realize the role of technology for the environmental conservation

Module No.	Unit No.	Details	Hrs.	CO
1	**Environmental Sustainability**		4	CO1
	1.1	Appropriate and Rural technology for Sustainable development		
	1.2	Sustainable building - Concept of Sustainable building, Sustainable building materials		
	1.3	Climate change mitigation and Adaptations – International programs		
2	**Renewable Energy Resources**		4	CO2
	2.1	Various renewable energy resources		
	2.2	Recent advancements in renewable energy		
3	**Environmental pollution and Technology**		4	CO3
	3.1	Environmental pollution control technologies		
	3.2	Waste to energy technologies		
4	**Environmental assessment and management**		6	CO4
	4.1	Introduction of Environment Impact Assessment (EIA)		
	4,2	Concept Environmental audit		
	4.3	Water and waste management practices, Zero waste		
5	**Environment and Technology**		4	CO5
	5.1	Disaster Management		
	5.2	Remote Sensing and GIS – Introduction and its applications in environment sector		
6	**Mini Project** (Choice based group projects will be carried out and assessed)		8	CO1 CO2 CO3 CO4 CO5
Total Hours			**30**	

Term Work:

1. **Mini Project (20 Marks):** Project related activities will be conducted based on the selected topic for which continuous evaluation will be done.
2. **Tutorial (30 Marks):** Various activities covering entire syllabus will be conducted and evaluated during tutorial hours.

Text 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 in Environmental Studies	New age international, India	6th edition, 2018
2.	Erach Bharucha	Textbook Of Environmental Studies For Undergraduate Courses	University press	2nd edition, 2015

Reference Books:

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

Course Code	Course Title							
116U06L106	Engineering Exploration							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	01			02		--		03
Credits Assigned	--			02		--		02
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	--	25	--	25	--	--	--	50

Course prerequisites
None

Course Objectives
The objective of the course is to introduce activity based learning to solve real world problems with engineering solution.

Course Outcomes
At the end of successful completion of the course the student will be able to
CO1. Analyse a real world situation to convert it into engineering design statement
CO2. Adopt multidisciplinary approach for designing solution to the problem.
CO3. Use the engineering design process to build a product using simple mechanisms, controllers and software development approach.
CO4. Execute the project ethically in the project management paradigm.

Course Project:
A multidisciplinary team will develop a product from the given need statement during the semester. Prototype building using 3D modelling and printing can be learnt. This project will be reviewed at various stages.

Module No.	Unit No.	Details	Hrs.	CO
1	**Introduction to Engineering and Engineering Study**		1+2	CO 1
	1.1	Introduction to Engineering and Engineering Study: Difference between science and engineering. Expectation for latest engineering trend and Industry 4.0 standard.		
	1.2	**Activities :** for problem solving with variety of solutions in a team of 2 students		
2	**Engineering Design**		2+4	CO 1 CO 2
	2.1	Engineering Design Process, **Activity for understanding design process.**		
	2.2	Need statement Finalization		
	2.3	Problem statement formulation, Pairwise comparison chart Activity: Role play, surveys in a project team		
Review 1 for Project				
3	**Project Management and Engineering Ethics**		2+4	CO 4
	3.1	Significance of teamwork, communication and documentation in engineering projects, , group discussion for ethical dilemma		
	3.2	**Activities :** 2 - game for teamwork , Gantt chart etc.		
	3.3	Significance of Professional Ethics, Identifying Ethical Dilemmas in different tasks of engineering Activity: Group discussions for ethical dilemmas		
4	**Introduction to Mechanisms**		4+8	CO 3
	4.1	Basic Components of a Mechanism, Introduction to mechatronics system, Degrees of Freedom or Mobility of a Mechanism		
	4.2	4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism. Simple Robotic Arm building.		
	4.3	**Activities:** 4 /5 , Power transmission devices, Mechanisms and Mechanical Links, Software Simulation for mechanisms, in a team		
Review II of Project:				
5	**Platform based development and Sensors**		4+8	CO 3
	5.1	Introduction to various platform based development (Arduino) programming and its essentials,		
	5.2	Types of Data, introduction to signal handling Introduction to sensors, transducers and actuators		
	5.3	Interfacing of Arduino with various sensors like temperature , humidity, IR sensor, Motors, communication		
	5.4	Batteries and Battery sizing		
	5.5	**Activities: 4 /5,** hands on using Arduino, sensors and motors. Implementing Arduino based system using different Design environments in a team		

6	**Project work**		**2+4**	**CO4**
	6.1	Prototype or Application Development		
	6.2	Report writing		
Project Demonstration				
		Total	**15+30**	

Recommended Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Clive L. Dym, Patrick Little, and Elizabeth J. Orwin	Engineering Design: A Project-Based Introduction	John Wiley & Sons, Inc	4th Edition 2014
2.	Seyyed Khandani, John Clarkson and Mari Huhtala	Engineering Design: Theory and Practice	Engineering Design Centre, University of Cambridge, UK	March 2005
3.	Karl T Ulrich and Steven D Eppinger	Product Design and Development	McGraw Hill Irwin	5th Edition 2012

Course Code	Course Title						
116U06L106	Biology for Engineers						
	TH			P		TUT	Total
Teaching Scheme(Hrs.)	02			--		--	02
Credits Assigned	02			--		--	02
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	--	25	--	25	--	--	50

Course prerequisites

- Basics of biological systems
- Basics of Engineering mechanics

Course Outcomes:

Biology for Engineers is an interdisciplinary course designed for the students of various engineering streams to appreciate the link between biological Science and engineering.

At the end of the course a student will be able to

CO1: Understand cell structure and its function at the molecular level.
CO2: Understand the computational biology and human genome data
CO3: Apply the knowledge of biomechanics to determine the forces in the muscles, prediction of blood flows, etc.
CO4: Select the appropriate material for medical device or implants by considering its biocompability

Module No.	Unit No.	Details	Hrs.	CO
1	**Basic Cell Biology**		04	CO1
	1.1	Introduction, Origin of life, Evolution		
	1.2	Basic definition of a cell, prokaryotic cell ,eukaryotic cell, cell cycle and cell division, m-phase, meiosis, cell differentiation		
2	**Biomolecules and Enzymes**		06	CO1
	2.1	Lipids, carbohydrates, amino acids and proteins, nucleic acids		
	2.2	Enzymes and Industrial applications: Enzymes, endo-enzymes and exo-enzymes, enzyme action, Types of enzymes, Cofactors , Enzyme Kinetics		
3	**Genetics**		08	CO2
	3.1	Central dogma of molecular biology		
	3.2	Nucleotides, DNA, RNA, tRNA, mRNA, Amino acids,		
	3.3	DNA replication, transcription, translation		
	3.4	Introduction to bioinformatics, applications of bioinformatics		
4	**Biomechanics**		06	CO3
	4.1	Introduction of biomechanics, history, perspectives in biomechanics, rigid body biomechanics; anatomical concepts in biomechanics.		
	4.2	Musculoskeletal biomechanics: musculoskeletal geometry, muscle structure and force generation, motion tracking techniques		
	4.3	Cardiovascular mechanics: cardiovascular physiology, Blood Flow Models		
	4.4	Case studies on applications of biomechanics on bones, joints, muscles, tissues etc.		
5	**Biocompatible materials**		06	CO4
	5.1	Physico-chemical properties of biomaterials: mechanical (elasticity, yield stress, ductility, toughness, strength, fatigue, hardness, wear resistance), tribological (friction, wear, lubricity), morphology and texture, physical (electrical, optical, magnetic, thermal), chemical and biological properties.		
	5.2	Technologies of biomaterials processing, as implants and medical devices; improvement of materials biocompatibility by plasma processing.		
	5.3	Introduction to bioelectronics, applications of bioelectronics		
		Total	30	

IA and Term work Assessment scheme:

The student will be evaluated based on three tasks which will be graded. If any of the tasks given is not completed / submitted / shown, then the corresponding lower grade will be given.

1. Presentations on case study
2. Multiple choice Quiz
3. Assignment

Recommended Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	G.K.Suraishkumar	Biology for Engineers	Oxford University Press	Edition 2019
2.	Wiley Editorial	Biology for Engineers	`Wiley	Edition 2018
3.	Campbell, N. A.	Biology: A global approach	Pearson Education Ltd	Eleventh Edition
4.	Jin Xiong	Essential Bioinformatics	Cambridge University Press	Edition 2007
5.	S. Ignacimuthu,	Basic Bioinformatics	Narosa Publishing House	Second Edition (2013)
6.	Cees Oomens ,Marcel Brekelmans , Frank Baaijens	Biomechanics: concepts and computation	Cambridge texts in Biomedical Engineering	Second Edition

Course Code	Course Title					
116U06L107	Elements of Electrical and Electronics Engineering Laboratory					
	TH		P	TUT		Total
Teaching Scheme(Hrs.)	--		02	--		02
Credits Assigned	--		01	--		01
Examination Scheme	Marks					
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	--	--	--	50*			50

*** Includes continuous assessment of Term work of 25 marks and Oral of 25 marks based on Laboratory work**

Term work will consist of experiments covering entire syllabus of Elements of Electrical and Electronics Engineering Laboratory. Students will be graded based on continuous assessment of their term work. Oral examination will be based on laboratory experiment and related theory.

Course Code	Course Title							
116U06L108	Python Programming							
	TH			P		TUT		Total
Teaching Scheme(Hrs.)	01			02		--		03
Credits Assigned	01			01		--		02
Examination Scheme	Marks							
	CA		ESE	TW	O	P	P&O	Total
	ISE	IA						
	-	-	-	75@	-	-	-	75

@Includes continuous assessment of Term work of 25 marks and practical and oral of 50 marks based on Laboratory work

Course prerequisites

- Knowledge of programming languages.

Course Objectives

The objective of the course is to impart knowledge of python programming. The course mainly introduces basic in python programming language concepts like data structures, Decision Making statements and Functions. Further the course also covers Object Oriented Programming concepts and Files Handling in Python.

Course Outcomes

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

CO1: Use basic data structures in Python

CO2: Use different Decision Making statements and Functions in Python.

CO3: Apply Object oriented programming concepts in Python

CO4: Implement different File handling operations

Module No.	Unit No.	Details	Hrs.	Lab Hrs.	CO
1	**Introduction to Python 3.x**		01	01	CO 1
	1.1	Features and Applications of Python, Installation of IDE for python		01	
	1.2	Spyder and Jupyter Notebook			
2	**Programming with python: Basic Concepts**		03	08	CO1
	2.1	Data Types in Python, Strings , format(), print(),Code Block Indentation, Comments, Variables and assignment, Operators in Python, Basic built-in Math functions, Copying Data: Shallow Copy and Deep Copy		02	
	2.2	**Data Structures:** Tuples, List, Dictionaries, Set, Arrays, Conversion of data structures		06	
3	**Programming with python: Decision Making and Functions**		03	06	CO2
	3.1	If statement: if, if-else, elif, Repetition using While loop, for loop, break statement		02	
	3.2	What is Regular Expression, Special Symbols and Characters for Regular Expressions**,** RE Module and functions		02	
	3.3	**Functions**- Defining a Function, Checking & Setting Parameters, Nested Functions, Lambda and Filter, Map & range functions.		02	
4	**Object Oriented Programming using Python programming**		05	12	CO3
	4.1	Class, Object, Self-Variables, Constructors, Types of Methods, Access Modifiers		02	
	4.2	Inheritance and types, constructor inheritance, The super() Method, Method Resolution order(MRO)		04	
	4.3	Polymorphism: Using Function as a Common Interface, Operator Overloading, Abstract Class: abstract method		04	
	4.4	Exceptions Handling: Errors in python program, Exceptions, Exception Handling, Types of Exceptions, The Except Block, The assert statement		02	
5	**Files Handling**		03	03	CO4
	5.1	Types of Files in Python, Opening a File: File opening modes, Closing a File, Writing Text Files, Appending in Text Files		02	
	5.2	Working with Binary Files, File Exceptions, The with Statement, Pickle module in Python		01	
		Total	15	30	

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

Practical and Oral examination based on laboratory experiments and entire syllabus.

Text Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Reema Thareja	Python Programming: Using Problem Solving Approach	Oxford University Press	First Edition 2017, India
2.	Dr. R. Nageswara Rao	Core Python Programming	Wiley Publication.	Second Edition 2018,India
3.	Sheetal Taneja and Naveen Kumar	Python Programing: A Modular Approach	Pearson India	Second Edition 2018, India

Reference Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Swarroop C.H	Byte of python	e-book	Kindle edition
2.	Martin C Brown	The Complete Reference Python	Brandon A Nordin	First Edition 2001

Course Code	Course Title							
116U06T101	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
	ISE	IA						
	--	--	--	50	--	--	--	50

* Batch wise Tutorial

Course prerequisites

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 oral activities such as role-plays public speeches, impromptu presentations 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
Syllabus of Term Work (TW)				
1	**Grammar and Vocabulary**		**6**	**CO 1**
	1.1	Vocabulary building (one word substitution, synonyms and antonyms)		
	1.2	Common errors in use of articles, modifiers, prepositions and pairs of confused words etc.		
	1.3	Subject - predicate agreement		
2	**Mechanics of Writing**		**6**	**CO 1, CO 2**
	2.1	Use of punctuation		
	2.2	Summarizing		
	2.3	Business letter writing		
		# Self learning topics: ICT enabled communication: E-mail, Blog and Website		
3	**Introduction to Phonetics**		**6**	**CO 3**
	3.1	Basic sounds in English (vowels and consonants)		
	3.2	Syllable, word stress, word accent & Intonation		
	3.4	Phonetic transcription of words		
4	**Soft Skills**		**6**	**CO 4**
	4.1	Non – verbal communication		
	4.2	Barriers to communication		
	4.3	Assertiveness		
5	**Basics of Workplace Communication**		**6**	**CO5**
	5.1	Listening comprehension		
	5.2	Public speaking skills & impromptu presentations		
	5.3	Reading comprehension		
	5.4	Group discussion		
		Total	**30**	

 # 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 TW.

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

Text Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and 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

Reference Books

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Sullivan, Jay	Simply Said: Communicating Better at Work and Beyond	Wiley publication	1st Edition , 2018(reprint)
2.	Lesikar, R. V. and Pettit, J. D.	Basic Business Communication	McGraw-Hill International Edition, Singapore	10th Edition, 2006
3.	Koneru A.	English Language Skills	Mc Graw Hill Education	1st Edition, Fourth Reprint 2018

Course Code	Course Title							
116U06W101	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
	ISE	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. 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**		04	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

Course Code	Course Title							
116U06W102	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
	ISE	IA						
	-	-	-	50	-	-	-	50

Course prerequisites: **Workshop-I**

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 if some sample products which can be selected but not limited. Apart from products listed below they 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 15 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**		**15**	**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**		**15**	**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**		**15**	**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)**		**15**	**CO 4**
	4.1	**Proposed products for PCB shop:** 1. Digital Clock 2. Electric Lamp. 3. 3Digital thermometer 4. 12V Power Supply 5. Portable Speaker. 6. Transistor Polarity Tester 7. Automatic Street Light. 8. LED Headlights (Egal 7.6 software will be used)		
		Total	**30**	

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

Recommended Books

Sr. No.	Name/s of Author/s	Title	Name of Publisher With Country	Edition and Year of Publication
1	Deepak Dhounchak, Lalit Kumar Biban	A Textbook of Workshop Technology	White Falcon Publishing India	1st Edition 2018
2	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy	Elements of Workshop Technology, Vol. I & II.	Media Promoters, India	16th Edition, 2015
3	Raghuwanshi B.S.	A Course in Workshop Technology, Vol. I &II.	Dhanpat Rai and Co. India	10th Edition, 2012 Reprint 2017
4	Khurmi R.S. and Gupta J.K.	Text book of Workshop Technology.	S. Chand India	6th Edition, 2007 Reprint 2012

Reference Books:

Sr. No.	Name/s of Author/s	Title	Name of Publisher With Country	Edition and Year of Publication
1	W. A. J. Chapman	Workshop Technology Part-1	CBS Publisher & Distributors India	5th Edition 2001