K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Proposed Curriculum Structure and Evaluation Scheme
To be implemented from **2018-19**

***Rev: SH** Course Structure/RIT/01/2018-19*

Department: Sciences and Humanities
Class: F. Y. B. Tech **Semester:** I
Group A: Mechanical, Civil and Automobile Engineering

Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Credits	Scheme	Theory Marks Max.	Theory Marks Min. for Passing	Practical Marks Max.	Practical Marks Min. for Passing
SH 131	Engineering Physics	3	-	-	3	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1053	Engineering Mathematics I	3	1	-	4	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1132	Engineering Graphics	1	-	-	1	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
	Open Elective - I	2	-	-	2	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 187	Engineering Physics Lab	-	-	2	1	ISE	---	---	100	50
SH 1552	Engineering Graphics Lab	-	-	4	2	ISE	---	---	100	50
	Open Elective - I Lab	-	-	2	1	ISE	---	---	100	50
SH 1831/ SH 1582/ SH 1601	English Proficiency Lab I/ Japanese Language Lab Level I /German Language Lab Level I	-	-	4	2	ISE	---	---	60	50
						ESE	---	---	40	
SH 185	Engineering Practice Lab I			2	1	ISE	---	---	100	50
SH 189	Engineering Exploration and Design Project	-	-	4	2	ISE	---	---	80	50
						ESE	---	---	20	
Total:		**9**	**1**	**18**	**19**					
Total Contact Hours:		**28**								

Total Contact Hours/week : 28
Total Credits : 19
ISE = In Semester Exam, MSE (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II
ESE = End Semester Exam

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Proposed Curriculum Structure and Evaluation Scheme
To be implemented from **2018-19**

***Rev: SH** Course Structure/RIT/01/2018-19*

Department: Sciences and Humanities
Class: F. Y. B. Tech **Semester:** II
Group A: Mechanical, Civil and Automobile Engineering

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory Marks		Practical Marks	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
SH 1033	Engineering Chemistry	3	-	-	3	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1023	Engineering Mathematics II	3	1	-	4	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1291	Electrical Engineering	3	-	-	3	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 133	Programming for Problem Solving	2	-	-	2	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1532	Engineering Chemistry Lab	-	-	2	1	ISE	---	---	100	50
SH 1791	Electrical Engineering Lab	-	-	2	1	ISE	---	---	100	50
SH 191	Programming for Problem Solving Lab	-	-	4	2	ISE	---	---	100	50
SH 162/ SH 1661 /SH168	English Proficiency Lab. II/ Japanese Language Lab Level II/ German Language Lab Level II	-	-	4	2	ISE	---	---	60	50
						ESE	---	---	40	
SH 164	Engineering Practice Lab II	-	-	2	1	ISE	---	---	100	50
Total:		**11**	**1**	**14**						
Total Contact Hours:		**26**			**19**					

Total Contact Hours/week : 26
Total Credits : 19
ISE = In Semester Exam, MSE (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Proposed Curriculum Structure and Evaluation Scheme
To be implemented from **2018-19**

***Rev: SH** Course Structure/RIT/01/2018-19*

Department: Sciences and Humanities
Class: F. Y. B. Tech **Semester:** I
Group B: Electronics & Telecommunication, Electrical, Computer Engineering & Information Technology

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory Marks		Practical Marks	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
SH 1033	Engineering Chemistry	3	-	-	3	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	20	---	---
SH 1053	Engineering Mathematics I	3	1	-	4	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	20	---	---
SH 1291	Electrical Engineering	3	-	-	3	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	20	---	---
SH 133	Programming for Problem Solving	2	-	-	2	ISE	20	20	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	20	---	---
SH 1532	Engineering Chemistry Lab	-	-	2	1	ISE	---	---	100	50
SH 1791	Electrical Engineering Lab	-	-	2	1	ISE	---	---	100	50
SH 191	Programming for Problem Solving Lab	-	-	4	2	ISE	---	---	100	50
SH 1831/ SH 1582/ SH 1601	English Proficiency Lab I/ Japanese Language Lab Level I/ German Language Lab Level I	-	-	4	2	ISE	---	---	60	50
						ESE	---	---	40	
SH 185	Engineering Practice Lab I	-	-	2	1	ISE	---	---	100	50
Total:		**11**	**1**	**14**	**19**					
Total Contact Hours:		**26**								

Total Contact Hours/week : 26
Total Credits : 19
ISE = In Semester Exam, MSE (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Proposed Curriculum Structure and Evaluation Scheme
To be implemented from **2018-19**

***Rev: SH** Course Structure/RIT/01/2018-19*

Department: Sciences and Humanities
Class: F. Y. B. Tech **Semester:** II
Group B: Electronics & Telecommunication, Electrical, Computer Engineering & Information Technology

Course Code	Course	Teaching Scheme				Evaluation Scheme					
							Theory Marks			Practical Marks	
		L	T	P	Credits	Scheme	Max.	Min. for Passing		Max.	Min. for Passing
SH 106	Engineering Physics	3	-	-	3	ISE	20	20	40	---	---
						UT1	15			---	---
						UT2	15				
						ESE	50	20		---	---
SH 1023	Engineering Mathematics II	3	1	-	4	ISE	20	20	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50	20		---	---
SH 1132	Engineering Graphics	1	-	-	1	ISE	20	20	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50	20		---	---
	Open Elective- I	2	-	-	2	ISE	20	20	40	---	---
						UT1	15			---	---
						UT2	15			---	---
						ESE	50	20		--	--
SH 1512	Engineering Physics Lab	-	-	2	1	ISE	---	---		100	50
SH 1552	Engineering Graphics Lab	-	-	4	2	ISE	---	---		100	50
	Open Elective- I Lab	-	-	2	1	ISE	---	---		100	50
SH 162/ SH 1661 /SH168	English Proficiency Lab. II/ Japanese Language Lab Level II /German Language Lab Level II	-	-	4	2	ISE	---	---		60	50
						ESE	---	---		40	
SH 164	Engineering Practice Lab II	-	-	2	1	ISE	---	---		100	50
SH 189	Engineering Exploration and Design Project	-	-	4	2	ISE	---	---		80	50
						ESE	---	---		20	
Total:		**9**	**1**	**18**	**19**						
Total Contact Hours:		**28**									

Total Contact Hours/week : 28 Total Credits: 19

ISE = In Semester Exam, MSE (UT1+UT2) UT-I = Unit Test-I, UT-II = Unit Test-II ESE = End Semester Exam

Open Elective- I

Sr. No.	Course Code	Department	Course
1.	SE1011	Electronics and telecommunications Engineering	Basics of Electronics Engineering
2.	SE1511		Basics of Electronics Engineering Lab
3.	SE1051	Civil Engineering	Basics of Civil Engineering
4.	SE1551		Basics of Civil Engineering Lab
5.	SE1071	Mechanical Engineering	Thermodynamics
6.	SE1571		Thermodynamics Lab
7.	SE1091		Engineering Materials
8.	SE1591		Engineering Materials Lab
9.	SE1131	Civil Engineering	Green Technology
10.	SE1631		Green Technology Lab
11.	SE143	Automobile & Mechanical Engineering	Basics of Mechanical Engineering
12.	SE165		Basics of Mechanical Engineering Lab
13.	SE145	Mechanical Engineering	Creativity, Design Thinking and Entrepreneurial Mindset
14.	SE167		Creativity, Design Thinking and Entrepreneurial Mindset Lab

Humanities & Social Science: Choice Based Languages

Sr. No.	Course Code	Department	Course
1.	SH1831	Sciences and Humanities Department	English proficiency Lab I
2.	SH162		English proficiency Lab II
3.	SH1582		Japanese Language Lab Level I
4.	SH1661		Japanese Language Lab Level II
5.	SH1601		German Language Lab Level I
6.	SH168		German Language Lab Level II

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester-**I**
Course Code : **SH131**	Course Name : **Engineering Physics (Auto, Civil and Mech)**

L	T	P	Credits
3	--	--	3

Course Description:

There is symbiotic relation between Physics & Engineering. Broadly speaking Engineering is mainly Applied Physics. The present day technological developments have been the result of joint effort of physicists & engineers. A proper study of Physics is therefore indispensable for Engineering students to excel in his field. The physicist discovers scientific principles and invents devices to describe & explain them. The technician applies and magnifies these devices for human convenience and comfort.

Engineering, being the science of measurement, has been the off-spring of Physics which plays the primary role in the professional courses of all branches of Engineering and is generally taught during the first year of these courses. Engineering Physics is undergraduate course for F. Y. B. Tech in semester I. This course is specially designed for Auto, CIVIL and Mechanical branches. In this course student will learn physical concepts in optics, acoustics, ultrasonics, mechanics and semiconductors. Student will use this knowledge of physical concepts in different engineering applications.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Use the principles of interference, diffraction and polarization in thin reflecting films, diffraction gratings and polarimeter.
2. Apply the knowledge of architectural acoustics for acoustically good halls and principle of magnetostriction and piezoelectric methods for production of ultrasound.
3. Apply the Newton's laws of motion to calculate forces acting on objects.
4. Describe the behavior of a damped and driven harmonic oscillator.
5. Use the knowledge of semiconducting materials in semiconductor devices.
6. Explain the basics of LASER production and its applications.

Prerequisite:

Fundamentals in optics, sound, laws of motion and semiconductors.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Interference, Diffraction & Polarization** **Interference**: Interference at parallel thin film, interference at wedge shaped film, Newton's rings. **Diffraction**: Types, difference, theory of plane diffraction grating, numerical **Polarization**: Double refraction, Huygens' theory of double refraction, Laurent's half shade polarimeter	**06**
2.	**Acoustics & Ultrasonics** **Acoustics:** Introduction, Basic requirements for acoustically good hall, reverberation, time of reverberation, Sabine's formula (No derivation), absorption coefficient, factors affecting architectural acoustics and their remedies, numerical. **Ultrasonic:** Introduction, production of ultrasonic waves by Piezoelectric and Magnetostriction method (Using transistor circuit only), application of ultrasonic waves.	**06**
3.	**Mechanics** Newtonian Mechanics and Modern Physics, Newton's First Law and Inertial Systems, Newton's Second Law, Mass, Force, Newton's Third Law, Fictitious Forces, Applying Newton's Laws.	**06**
4.	**Oscillation** Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance	**06**
5.	**Semiconductors** Intrinsic and extrinsic semiconductors, Fermi energy and its location in intrinsic and extrinsic semiconductor, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect.	**06**
6.	**LASER** Einstein's theory, absorption, spontaneous emission, stimulated emission, population inversion, properties of LASER, Types of LASER (He-Ne laser, CO_2 laser), and Applications of LASER.	**06**

References -

Text Books:

1. Engineering Physics by H. K. Malik and A. K. Singh, 2nd edition, Tata McGraw Hill, 2012.
2. A textbook of Engineering Physics by Avadhanulu & Kshirsagar S. Chand Publications, Revised Edition, 2013.
3. Engineering Mechanics by M. K. Harbola, Cengage learning, 2nded. 2012.

Reference Books:

1. Principles of Physics by Halliday and Resnick, Physics, Wiley India edition, 9th edition, 2012.
2. Engineering Physics by Pandey & Chaturvedi, Cengage learning Publications, 2012.

Class:- **First Year B. Tech**	Semester-**I**
Course Code : **SH1053**	Course Name : **Engineering Mathematics-I**

L	T	P	Credits
3	1	--	4

Course Description:

Engineering Mathematics – I is offered at the first semester of first year of four year engineering degree course. This course intends to build the competency in the students to apply the concepts learnt in respective modules to various engineering Problems. It contains six units which accomplish the fundamentals of mathematics required for Engineers. The units involved in the Course are: Curve Tracing and Rectification, Partial Differentiation and Applications, Special Functions, Multiple Integrals, Applications of Multiple Integrals.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Sketch the curve with full justification.
2. Apply the properties of special functions to evaluate integral.
3. Evaluate double integral and change the order of the integration.
4. Evaluate area bounded between two curves, mass of Lamina, moment of inertia.
5. Prove the results of partial differentiation.
6. Apply partial differentiation for evaluating and proving the results based on Errors and approximations, maxima and minima.

Prerequisite: Higher Secondary Mathematics.

Course Content		
Unit No.	**Description**	**Hrs.**
1.	**Curve Tracing &Rectification:** Basic notions, Tracing of standard rectangular curves, Tracing of standard polar form curves, Rectification of plane curves (Rectangular & polar form).	**06**
2.	**Special Functions:** Beta and Gamma Functions, Properties of Beta and Gamma Functions, Differentiation under the Integral Sign (Single variable).	**06**
3.	**Multiple Integrals:** Introduction to double integrals, Evaluation of double integrals (Cartesian and polar forms), Evaluation of double integrals over the given region (Cartesian and polar forms), Change of order of integration, Evaluation of double integrals by Change of order of integration, Triple integration (for given constant limits).	**06**
4.	**Applications of Multiple Integrals:** Area under the curves using double integrals, mass of lamina, moment of inertia of a plane lamina, volumes of solids (Volumes as double integral, triple integral).	**06**
5.	**Partial Differentiation:** Functions of two and three variables, Partial derivatives of first order and higher order. Partial derivatives of composite functions and Implicit functions. Euler's theorem on homogeneous function.	**06**
6.	**Application of Partial Differentiation:** Jacobian, Jacobian of composite functions (chain rule), Jacobian of Implicit functions, Errors and Approximation, Maxima and Minima of functions of two variables.	**06**

Tutorials:

1. Curve Tracing
2. Rectification
3. Special Functions (Beta functions)
4. Special Functions (Gamma functions)
5. Multiple Integrals (Evaluation of double integrations)
6. Multiple Integrals (Evaluation of Triple integrations)
7. Applications of Multiple Integrals
8. Partial Differentiation
9. Application of Partial Differentiation (Jacobians)
10. Application of Partial Differentiation (Maxima and Minima)

References-

Textbook:

B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference Books:

1. Erwin Kreyszig, Advanced engineering mathematics, 9th edition, Wiley, 2011.
2. Raman B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
3. N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi, 6th edition, 2004
4. S. S. Sastry, Introductory Methods of Numerical Analysis.
5. Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing house, 4th edition, 2002.
6. P. N. Wartikar and J. N. Wartikar, A Text book of Applied Mathematics, Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune. 9th Revised edition, October 1984, Reprints: September 2005.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1132**	Course Name : **Engineering Graphics**

L	T	P	Credits
1	--	--	1

Course Description:
A picture speaks thousands of words. A message conveyed by a picture or a sign is much effective than a message conveyed by words. The human beings used the language of drawing to convey their ideas since before the start of civilization. With progress of science and technology, human felt the need for a 'standardized' drawing that it could be understood globally. This standardized graphical language was then termed as *Engineering Drawing.*

The languages of Engineering Drawing can be effectively used if its 'grammar' is mastered along with use of AutoCAD drawing software. This grammar refers to the use of standard conventions, notations and the methods used in technical drawing. This course aims to make students conversant with the grammar rules and methods in Engineering Drawing. This course also aims the students to learn the AutoCAD so that they can draw and make best use of it in drawing of Engineering Graphics.

Prerequisite: The knowledge of simple geometrical theorems and constructional procedure.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Determine the location of the location and orientation of point, line, and plane with respect to reference planes to draw their projection.
2. Develop the projection of various types of solids in various conditions.
3. Develop section views and true shape section of various types of solids
4. Identify the need of development of lateral surfaces and apply the same in engineering drawing.
5. Develop orthographic views of an object to convert pictorial view into two-dimension (2D) view.
6. Develop isometric view to convert two-dimension (2D) view to pictorial view.

Course Content		
Unit No	**Description**	**Hrs**
1.	**Projection of Point, Lines and Planes** Projection of oblique line by rotation or auxiliary plane method True shape and angle between planes.	**02**
2.	**Projection of Solids** Projection of prism, pyramid, cone, cylinder and cylinder by rotation method.	**02**
3.	**Section of solids** Projections of regular solids cut by section plane and True shape of section.	**02**
4.	**Development of Surfaces** Development of lateral surfaces of various types of solids (Prism, pyramid, Cone Cylinder) for simple positions only.	**02**
5.	**Orthographic Projection** Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method. Missing views, procedure for preparing scaled drawing, sectional views and hatching of sections.	**02**
6.	**Isometric Projection** Isometric axes, line and planes, isometric projection and isometric view. Drawing isometric view of objects.	**02**

***Note:** Drawings of Theory paper of UT1, UT2 and ESE exam will be completed by using AutoCAD software.

References -

Text Books:

1. Dhanjay A Jolhe. Engineering Drawing, Tata-McGraw hill (2008).
2. N. D. Bhatt. Elementary Engineering Drawing, Charotar Publishing House, Anand (India)
3. K. L. Narayana & P. Kannaiah. Text Book on Engineering Drawing, Scitech Publications (India) Pvt. Ltd., Chennai.

Reference Books:

1. Warren Luzzader. Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.
2. P. S. Gill. Engineering Graphics, S. K. Kataria and sons New Delhi (2009).
3. D.M. Kulkarni, A. P. Rastogi, & A. K. Sarkar. Engineering Graphics with AutoCAD, PHI Publication (2010).

Class:- **First Year B. Tech**	Semester-**I**
Course Code : **SH187**	Course Name : **Engineering Physics Lab (Auto, Mech. &Civil)**

L	T	P	Credits
--	--	2	1

Course Description:
Engineering Physics Lab is the undergraduate course designed for F. Y. B. Tech in semester I. This course includes different experiments based on optics, mechanics, magnetic materials and semiconductors. The main objective of this course is student will be able to verify the theoretical concepts studied into practicals.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Apply the theory of semiconductors to calculate band gap energy and carrier concentration
2. Apply theory of interference and grating to calculate radius of curvature of plano convex lens and wavelength of light.
3. Compare B-H curve for different ferromagnetic materials and measure hysteresis loss in it.
4. Use ultrasonic interferometer to calculate velocity of ultrasound in given liquid.
5. Use Laurent's half shade polarimeter to calculate specific rotation of optically active solution.
6. Verify Newton's laws of motion and phenomena of resonance in forced oscillations.

Prerequisite:
Basics of semiconductor, laws of motion, wave theory of light, measurement skills, graph plotting and slope calculation.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	To determine band gap energy of semiconductor using Four Probe Setup	**02**
2.	To determine wavelength of laser using diffraction grating	**02**
3.	To determine wavelength of yellow, green, & violet colours using plane diffraction grating	**02**
4.	To find type and carrier concentration of a given semiconductor using Hall effect.	**02**
5.	To determine velocity of ultrasonic waves in given liquid	**02**
6.	To compare the hysteresis curve of different ferromagnetic material and calculate loss in it.	**02**
7.	To find radius of curvature of given lens using Newton's rings	**02**
8.	To determine specific rotation of optically active solution using Laurent's half shade polarimeter.	**02**
9.	To verify the Newton's laws of motion.	**02**
10.	To investigate phenomena of resonance in forced oscillations.	**02**

References –

Reference Books:

1. Principles of Physics by Halliday and Resnick, Physics, Wiley India edition, 9th edition, 2012.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1552**	Course Name : **Engineering Graphics Lab**

L	T	P	Credits
--	--	4	2

Course Description:

A picture speaks thousands of words. A message conveyed by a picture or a sign is much effective than a message conveyed by words. The human beings used the language of drawing to convey their ideas since before the start of civilization. With progress of science and technology, human felt the need for a 'standardized' drawing that it could be understood globally. This standardized graphical language was then termed as *Engineering Drawing.*

The languages of Engineering Drawing can be effectively used if its 'grammar' is mastered along with use of AutoCAD drawing software. This grammar refers to the use of standard conventions, notations and the methods used in technical drawing. This course aims to make students conversant with the grammar rules and methods in Engineering Drawing. This course also aims the students to learn the AutoCAD so that they can draw and make best use of it in drawing of Engg. Graphics.

Prerequisite : Knowledge of simple geometrical theorems and constructional procedure

Course Outcomes:

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

1. Determine the location of the location and orientation of point, line, and plane with respect to reference planes to draw their projection.
2. Develop the projection of various types of solids in various conditions.
3. Develop section views and true shape section of various types of solids
4. Identify the need of development of lateral surfaces and apply the same in engineering drawing.
5. Develop orthographic views of an object to convert pictorial view into two-dimension (2D) view.
6. Develop isometric view to convert two-dimension (2D) view to pictorial view.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Orientation of AutoCAD software with basic draw and modify commands and simple practice sketches	**04**
2.	Advanced AutoCAD commands, dimensioning, text, line type properties etc. and practice sketches	**04**
3.	Projection of lines (Minimum four problems)	**04**
4.	Projection of Planes (Minimum two problems)	**04**
5.	Projection of Solids (Minimum two problems)	**06**
6.	Section of Solids (Minimum two problems)	**06**
7.	Development of Surfaces (Minimum two problems)	**04**
8.	Problems on simple object with sectional views (Minimum two problems each with all three views)	**04**
9.	Orthographic projection with sectional view (Minimum two problems each with all three views)	**08**
10.	Isometric projection and Missing Views (Minimum two problems)	**04**

References -

Text Book:

1. Engineering Drawing by Dhanjay A Jolhe, Tata-Mcgarw hill (2008).
2. Elementary Engineering Drawing by N. D. Bhatt, Charotar Publishing House, Anand (India)
3. Text Book on Engineering Drawing by K. L. Narayana & P. Kannaiah , Scitech Publications (India) Pvt. Ltd., Chennai.

Reference Book:

1. Fundamentals of Engineering Drawing by Warren Luzzader, Prentice Hall of India, New Delhi.
2. Engineering Graphics by P. S. Gill, S. K. Kataria and sons New Delhi (2009).
3. Engineering Graphics with AutoCAD by D.M. Kulkarni, A. P. Rastogi, A. K. Sarkar, PHI Publication (2010).

Class:- **First Year B. Tech**	Semester- **I**
Course Code : **SH1831**	Course Name : **English Proficiency Lab I**

L	T	P	Credits
--	--	4	2

Course Description:

The objective of the course is to train students to acquire language and applied grammar skills practically. Practical course in English Proficiency Lab I addresses students' listening, speaking, reading, writing and soft (fundamental) skills. The course helps students to acquire language and applied grammar skills practically. We provide personal attention to individual student's performances.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Demonstrate reception skills of language
2. Communicate using oral and written modes.
3. Make use of English language with grammatical accuracy.
4. Articulate correctly the frequently used words using phonemic transcriptions

Prerequisite:
A Student, who is going to enroll himself for this course, should have following English language abilities:

1. A student should have knowledge of basic grammar of English language.
2. A student should have an intermediate level vocabulary of English language.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Nature and Process of Communication	**04**
2.	Vocabulary Building (For general purpose and competitive exams)	**04**
3.	Listening Skills – I (Listen and reproduce [oral])	**04**
4.	Listening Skills – II (Listen and summarize [written])	**04**
5.	Listening Skills – III (Listen and answer the questions)	**04**
6.	Speaking Skills – I (Phonetics)	**04**
7.	Speaking Skills – II (Organising Thoughts and Extempore; Telephone Conversations and etiquettes)	**04**
8.	Speaking Skills – III (Conversational English)	**04**
9.	Reading Skills – I (Read and reproduce [oral])	**04**
10.	Reading Skills – II (Read and summarize [written])	**04**
11.	Reading Skills – III (Read and answer the questions)	**04**
12.	Writing Skills – Essay writing	**04**

References –

Reference Books:

1. D. Sudha Rani, Business Communication and Soft Skills Laboratory Manual, Pearson Education, Mumbai (2012)
2. Krishna Mohan and Meera Banerji, Developing Communication Skills, 2nd Edition, Macmillan India Ltd., New Delhi (2012)
3. Hewings Martin, Advanced English Grammar – A Self Study Reference Book, Prentice – Hall of India Pvt. Ltd., New Delhi (2010)
4. Robert J. Dixson, Everyday Dialogues in English, Prentice Hall India Pvt Ltd.
5. Norman Lewis. Word Power Made Easy. Goyal Publications.

Class:- **First Year B. Tech**	Semester-**I**
Course Code : **SH1582**	Course Name : **Japanese Language Lab Level I**

L	T	P	Credits
--	--	4	2

Course Description:

This course is designed to introduce students to the everyday language of Japan. Lessons will be organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Demonstrate Japanese scripts through oral and written communication.
2. Express themselves by using simple sentences and responses to questions.
3. Demonstrate effective listening.
4. Make use of Japanese etiquette

Prerequisite: Nil

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Brief history of Japan, and Japanese Language. Introduction of three scripts in Japanese, viz. Hiragana, Katakana, and Kanji	**04**
2.	Daily greetings and expressions	**04**
3.	Days of the week, Basic Numerals, and months of the year	**04**
4.	Demonstratives in Japanese, Writing simple words in Hiragana	**04**
5.	Writing all types of words, and simple sentences in Hiragana	**04**
6.	Verbs in Japanese, Introduction of Katakana	**04**
7.	Formation of simple sentences involving asking and answering questions	**04**
8.	Basic Conversational skills. Asking and answering questions based on the topics studied.	**04**
9.	Introduction of few simple Kanji, and their use in sentences based on the pattern "---ni---gaarimasu".	**04**
10.	Translations from, and into Japanese.	**04**
11.	Reading an unseen paragraph, and answering questions based thereon	**04**
12.	General revision	**04**

***Note**: Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

References –
Text Book:
Nihongo Shoho I (Japan Foundation Publ.)

Reference Book:
Minna No Nihongo I (3A Corporation, Japan)

Class:- **First Year B. Tech**	Semester-**I**
Course Code : **SH1601**	Course Name : **German Language Lab Level I**

L	T	P	Credits
--	--	4	2

Course Description:
This course provides an opportunity to enhance acquisition of the fundamental elements of the German language. Emphasis is on the progressive development of basic listening, speaking, reading, and writing skills through the use of supplementary learning media and materials.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Make use of familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type.
2. Express him /herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has.
3. Interact in a simple way provided the other person talks slowly and clearly and is prepared to help.
4. Make use of the basic grammar concepts correctly.
5. Demonstrate reading and writing skills.

Prerequisite: Nil

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Introduction of the language, Greetings, to Introduce oneself, speaking about yourself and others, numbers, E-mail address	**04**
2.	Alphabets, speaking about countries and languages	**04**
3.	Speaking about Hobbies, to have an informal appointment, learning weekdays, months and seasons	**04**
4.	Speaking about professions, work and wartimes, learning to fill up a profile in German	**04**
5.	Learning to name the famous places, buildings in a city, learning definite/ indefinite and negative articles in German, to name the modes of transportation	**04**
6.	To learn to describe the way, to understand the texts with international words.	**04**
7.	To speak about food, to plan a shopping, conversation with the shopkeeper	**04**
8.	Conversation about the food, about likes and dislikes, to understand the "w" questions.	**04**
9.	To understand the watch timings , giving information about time, speaking about the families, to plan a date	**04**
10.	Learning about punctuality in Germany and how to excuse for delay, telephonic conversation about the appointments.	**04**
11.	To plan something together, speaking about birthday, to understand invitation and to write an invitation, to order and to pay in restaurant, to speak about own experiences	**04**
12.	To understand particular information from the texts, to understand about different events and events related information in Radio	**04**

Note: *This course (after successful completion of 1st course) will prepare the students for Start Deutsch 1 exam (A1 exam by Goethe Institue, Max Mueller Bhavan). The students will find it very easy to pursue for this exam after completion of this course. They just need some exam training to get acquainted with Goethe pattern.*

Class:- **First Year B. Tech**	Semester- **I**
Course Code : **SH185**	Course Name : **Engineering practice Lab I**

L	T	P	Credits
--	--	2	1

Course Description:

Workshop practice imparts basic knowledge of various tools and their uses in different sections of manufacturing such as Fitting, Tin Smithy, House Wiring, Carpentry etc. It is true that engineers are not going to become carpenters or blacksmiths or skilled workers on the shop floor, but by exposing themselves to all working trades, they get a bird eye view of the basic practical activities associated with all sections of manufacturing. It helps them, when they occupy managerial positions, in understanding the activities and practical difficulties, so that they can take appropriate decisions.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Acquire skills in basic engineering practice.
2. Use of hand tools and power tools.
3. Develop sheet metal model for specific application.
4. Understand the various operations performed in machine shop.
5. Perform different joining operations
6. Perform pipe fittings operations.

Prerequisite: Nil

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Demonstration of different carpentry operations useful for making wooden pattern, furniture items etc. with the help of hand tools and power tools	**02**
2.	To make small jobs like dovetail joint, butt joint or T-joint using carpentry tools.	**02**
3.	Demonstration of different Sheet metal operations useful for Sheet metal objects like CPU cabinet, Enclosures of inverter, Tray etc. by performing operations like Cutting, Bending, Folding.	**02**
4.	To make small jobs like Electrical meter cover, transformer clamping.	**02**
5.	Demonstration of different machining operations useful for machining objects like crankshaft, camshaft, axis-symmetric parts etc. by performing centre drilling, facing, plain turning, knurling and chamfering.	**02**
6.	Demonstration of different joining processes for metal rods, plates and sheet metal.	**02**
7.	To make Lap joint, butt joint or T-joint using metal joining techniques.	**02**
8.	Demonstration of different piping connections, plumbing techniques in G.I, PVC, UPVC, CPVC fittings.	**02**
9.	Demonstration of Automobile routing maintenance and fault finding for moped & two wheelers.	**02**
10.	Demonstration of household wiring connections, wiring for experiments and assembly &disassembly of various Electrical appliances.	**02**
11.	Demonstration of soldering and testing of electronic components.	**02**
12.	Demonstration of use of electronic control circuits.	**02**

Class:- **First Year B. Tech.**	Semester- **I/II**
Course Code : **SH189**	Course Name : **Engineering Exploration & Design Project**

L	T	P	Credits
--	--	4	2

Course Description:

The Engineering Exploration course is an introduction to engineering concepts with a focus on critical thinking, creativity, teamwork, communication, and working across different engineering disciplines. Students will be introduced to various disciplines as well as engineering design processes through a semester-long project, providing a design-built-test experience. This course makes students familiar with Engineering Design, Project and Constraints Management, Multi-disciplinary nature of engineering, problem solving, data acquisition analysis, Team Building, Engineering Ethics & Sustainability.

Students are expected to complete the mini project by applying the engineering concepts/principles taught in the course. Students could join (maximum 4 students) together, form a small team, and execute a simple project in multi-disciplinary engineering field under the guidance of course teachers. The continuous assessment of the Project work will be carried out by evaluating project work.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the role of an Engineer as a problem solver.
2. Design engineering solutions to complex problems utilizing multi-disciplinary systems approach.
3. Examine a given problem using process of engineering problem analysis.
4. Build simple systems/prototypes using engineering design and development process.
5. Analyze engineering solutions from ethical and sustainability perspectives.
6. Apply basics of engineering project management skills in project development.

Prerequisite: Nil

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Introduction to Engineering and Engineering Study** Difference between science and engineering, Problem space of an engineer (needs), various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes.	**06**
2.	**Engineering Design** Engineering Design Process, Importance of analysis in engineering design, general analysis procedure, Multidisciplinary facet of design, Mechatronics system design,12V DC power supply design, Conversion of Electrical to Mechanical Energy	**08**
3.	**Mechanisms** Mechanisms and Machines, Different types of Mechanisms (focus on linkages), Degrees of freedom or mobility of a mechanism, 4-Bar Mechanisms: Crank Rocker Mechanism, Slider Crank Mechanism	**08**
4.	**Platform based development** Introduction to systems and Platform Based Development, Arduino as a development board, Sensors, actuators and control, Interfacing of I/O devices, Pulse Width Modulation, Analog and Digital data	**08**
5.	**Data Acquisition and Analysis** Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition(Temperature and humidity) using Sensors interfaced with Arduino, Exporting acquired data to Microsoft Excel and analysis using visual representation	**08**
6.	**Project Management, Engineering Ethics, Sustainability** Importance of Teamwork, Importance of Project Life Cycle, Project Management Tools, Various Tools used in Electronics Documentation, Importance of communication, Usage of Communication Media. **Engineering Ethics**: Introduction to ethics, moral values, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.	**10**

	Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon foot print.	

Reference Books:

1. C. Starkey, "Basic Engineering Design", Butterworth-Heinemann Publisher 1988.
2. Yousef Haik, Sangarappillai Sivaloganathan, Tamer M. Shahin, "Engineering Design Process", Cengage learning, 2011.
3. Hugh Jack, "Engineering Design, Planning, and Management", Academic press 2013.
4. Rattan, S.S. "Theory of Machines", 3rdEdition, Tata McGraw-Hill, 2009.
5. .Khurmi, R.S. "Theory of Machines", 14thEdition, S Chand Publications, 2005.
6. Kenneth Ayala, "The 8051 Microcontroller, Architecture, Programming, and Applications", West publishing Company.
7. Boylsted, "Electronic Devices and Circuits", Person publication, 2013.
8. R. P. Jain, "Modern Digital Electronics" 2/e, TMH publication
9. Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry1st Edition, Wiley publication, 2015.
10. Simon Monk, "Programming Arduino Next Steps: Going Further with Sketches", McGraw-Hill / Tab Electronics.
11. Massimo Banzi, "Make: Getting Started with Arduino, 3rd Edition", Shroff Publications, 2014.
12. Stuart Yarnold, "Arduino in Easy Steps", In Easy Steps Publications, 2015.
13. Blum, "Arduino Programming in 24 Hours, Sams Teach Yourself", 1st Edition, Pearson Publications, 2015.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1033**	Course Name: **Engineering Chemistry**

L	T	P	Credits
3	--	--	3

Course Description:
Engineering Chemistry is offered as the core science course at the semester of first year engineering degree course; containing six modules. The Modules involved in the Course are Basic Concepts in Chemistry, Analytical techniques, Water treatment, Batteries and fuel cell, Corrosion and its Control, Fuels and Lubricants.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Understand basic concepts of Chemistry.
2. Select the correct instrumental techniques for the examination of materials.
3. Demonstrate knowledge of science behind normal polluting influences in water and strategies to treat them.
4. Utilize the electrochemical principle for selection of proper batteries.
5. Apply the science for understanding corrosion and its prevention.
6. Compare types and quality of fuels by different instruments and select the proper lubricant and lubrication method.

Prerequisite:
The prerequisite for this course is applied chemistry including knowledge of XIIth Std. Chemistry. This course intends to build the competency in the students to apply the concepts learnt in respective modules to various engineering fields.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Basic Concepts in Chemistry** Introduction to periodic properties: Atomic size, ionic size, Oxidation state & polarizability, Introduction to orbital theories of compound (VBT & MOT), Phase rule equation: Water system, Thermodynamic functions: Energy, entropy & free Energy, types of organic reactions & stereochemistry of transition metal compounds.	**06**
2.	**Analytical techniques** **A) Principles of spectroscopy & selection rule** **B) Spectrometry:** Introduction, Lamberts Law, Lambert-Beer or Beer's Law of spectrometry, single beam spectrophotometer instrumentation with its applications. **C) Flame photometry:** Principles, instrumentation, and applications of flame photometry. **D) Chromatography:** Introduction, types of chromatography, gas-liquid chromatography (GLC).	**06**
3.	**Water treatment** Introduction, water quality parameters: dissolved oxygen and hardness. Hardness: Types of hardness, causes of hardness, types, units, calculation of hardness, ill effects of hard water in various industries and boilers. Treatment of hard water for domestic purpose by sedimentation, coagulation and sterilization, treatment of water for industrial purposes by cold and hot lime soda, zeolite and ion exchange process.	**06**
4.	**Batteries and fuel cell:** Basic concepts, Battery characteristics – primary, secondary and reserve batteries with examples, super capacitors **Classical batteries**: Construction, working and applications of Zn – MnO_2, Lead acid storage, and Ni – Cd batteries. **Modern batteries**: Construction, working and applications of Zn – air, Ni – metal hydride and Li – MnO_2 batteries. **Fuel cells** – Differences between battery and fuel cell, construction and working of $H_2 – O_2$ and $CH_3OH – O_2$ fuel cells.	**06**
5.	**Corrosion and its Control** Introduction, Causes and types of corrosion, theories of corrosion and mechanism – Dry corrosion, Wet corrosion (Hydrogen evolution and Oxygen absorption), factors affecting corrosion. Corrosion control methods – Use of pure metals and metal alloys, Proper design, Cathodic protection, Surface	**06**

	coatings - methods of application on metals- hot dipping galvanizing, tinning, metal spraying.	
6.	**Fuels & Lubricants:** **Fuels:** Introduction, Types of fuels, calorific value and its types, characteristics of good fuel, Bomb calorimeter and Boy's gas calorimeter, Refining of petroleum: Fractional distillation, cracking & reformation. **Lubricants:** Introduction to lubricants, functions of lubricants, Mechanism of lubrication-thick film, thin film and extreme pressure lubrication, Physical and chemical properties of lubricant (definition and significance)-viscosity, viscosity index, flash and fire point, cloud and pour point, saponification value, acid value, additives of lubricants.	**06**

References -

Text Books:

1. University chemistry, by B. H. Mahan.
2. A Textbook of Engineering Chemistry by S. S. Dara, S. Chand Publications, New Delhi.
3. Engineering Chemistry by B. S. Godbole, Dr. M.H. Pendase, Dr. S.S. Joshi, Nirali Publication.

Reference Books:

1. Engineering chemistry by Jain and Jain, 15th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
2. Instrumental methods of chemical analysis by Chatwal and Anand, Himalaya Publishing House, New Delhi.
3. Engineering chemistry by B Sivasankar, TataMcGraw-Hill Publishing Company Ltd New Delhi.
4. Engineering chemistry by O. G. Palanna McGraw-Hill education (India) Publishing Company Ltd. New Delhi.

Class:- **First Year B. Tech**	Semester-**II**
Course Code : **SH1023**	Course Name : **Engineering Mathematics-II**

L	T	P	Credits
3	1	--	4

Course Description:
Engineering Mathematics – II is offered as the core science course at the second semester of first year of four year engineering degree course. It contains six Units. The Units involved in the Course are: Matrices, Ordinary Differential Equations of First order & First Degree, Application of Ordinary Differential Equation, Solution of Simultaneous Algebraic Equations, Finite Differences and Interpolation, Numerical Solution of Ordinary Differential Equations. This course intends to build the competency in the students to apply the Mathematical concepts to various Engineering Problems.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Use the concepts of matrices that serve as an essential basis for several computational techniques.
2. Solve the differential equations by choosing proper method of solution.
3. Solve the problems on orthogonal trajectories, simple electrical circuits, and heat flow by applying the methods of Ordinary differential Equations.
4. Use the relevant method for solving simultaneous algebraic linear equations.
5. Apply the relevant numerical method for interpolating the polynomial.
6. Apply appropriate numerical method to compute the solution of ordinary differential equations.

Prerequisite: Higher Secondary Mathematics.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Matrices:** Rank of Matrix (Echelon form, Normal form), Linear System of Equations (Homogeneous and Non-homogeneous), Rouche's Theorem (Statement only), Vectors (Linear Dependence & Independence), Orthogonal Matrices (definition), Eigen Values& Eigen Vectors of a square matrix, Properties of Eigen Values& Eigen Vectors, Cayley Hamilton theorem (Without Proof).	**07**
2.	**Ordinary Differential Equations of first order & first degree:** Exact, Linear Equations, Bernoulli's Equations, Equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type.	**06**
3.	**Applications Of Ordinary Differential Equations:** Orthogonal trajectories (Rectangular and Polar), applications to simple electrical circuits, Heat flow.	**06**
4.	**Solution of Simultaneous Algebraic Equations:** Gaussian elimination method, Gauss Jordan method, Gauss-Seidel methods, Jacobi's method, Method of factorization or Triangularization.	**06**
5.	**Finite Differences and Interpolation:** Finite differences, Differences of Polynomial, Other Difference Operators, Newton's forms of interpolating polynomials, Sterling's central difference formula, Lagrange's interpolation formula, Newton's divided difference formula.	**06**
6.	**Numerical Solution of ordinary differential equations:** Introduction, Solution by Taylor's series method, Euler's method, Modified Euler's methods, Runge-Kutta method of fourth order.	**05**

Tutorial:

1. **Matrices (Echelon, normal form)**
2. **Matrices**(Eigen Values& Eigen Vectors of a square matrix)
3. **Ordinary Differential Equations of first order & first degree** (Exact, Linear Equations, Bernoulli's Equations)
4. **Ordinary Differential Equations of first order & first degree** (Equations solvable for p, Equations solvable for y, Equations solvable for x)
5. **Applications Of Ordinary Differential Equations**
6. **Solution of Simultaneous Algebraic Equations** (Gaussian elimination method, Gauss Jordan method)
7. **Finite Differences and Interpolation** (Finite differences, Differences of Polynomial, Other Difference Operators)
8. **Finite Differences and Interpolation** (Newton's forms of interpolating polynomials, Sterling's central difference formula)
9. **Numerical Solution of ordinary differential equations.**(Solution by Taylor's series method, Euler's method)
10. **Numerical Solution of ordinary differential equations** (Modified Euler's methods, Runge-Kutta method of fourth order.)

References:

Textbook:

B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference Books:

1. Erwin Kreyszig, Advanced engineering mathematics, 9th edition, Wiley, 2011.
2. Raman B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
3. N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi, 6th edition, 2004
4. S. S. Sastry, Introductory Methods of Numerical Analysis.
5. Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing house, 4th edition, 2002.
6. P. N. Wartikar and J. N. Wartikar, A Text book of Applied Mathematics, Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune. 9th Revised edition, October 1984, Reprints: September 2005

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1291**	Course Name : **Electrical Engineering**

L	T	P	Credits
3	--	--	3

Course Description:
Engineering students of almost all disciplines have to undergo this course as a core subject in the first year. It is needless to mention that how much we are dependent on electricity in our day to day life. A reasonable understanding on the basics of applied electricity is therefore important for every engineer. Apart from learning D.C. and A.C. circuit analysis both under steady state and transient conditions, students will learn basic working principles and analysis of transformer, D.C. motors and induction motor. Finally working principles of some popular and useful power converters and electrical components and L.T. switchgear are presented. The course can be broadly divided into 3 major parts, namely: Electrical circuits, Electrical Machines and Components & Converters.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Solve Magnetic circuits, D.C. and A.C. electric circuits
2. Describe construction, working and application of transformers
3. Describe construction, working and application of different types of commonly used rotating machines.
4. Classify power converters on the basis of application.
5. Suggest suitable capacity of wires, cables switchgear and illumination system for low-voltage electrical installations.

Prerequisite:
(Courses: Physics, Mathematics)
Concept of potential difference, current and resistance. Ohm's law. Fundamentals of electromagnetics.

Course Content		
Unit No	**Description**	**Hrs**
1.	**Module 1 : DC Circuits** Voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation (numerical). Superposition, Thevenin and Norton Theorems (simple numerical).	**06**
2.	**Module 2: AC Circuits** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, significance and power factor improvement. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations series and parallel (numerical), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	**06**
3.	**Module 3: Transformers** 1-phase transformer – construction, working, types and emf equation, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency (numerical on efficiency). Auto-transformer and introduction to three-phase transformer.	**06**
4.	**Module 4: Electrical Machines** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor. Single-phase induction motor-Construction, working (double field revolving theory) torque-slip characteristic. DC motor – Construction, working, types. Applications of all electrical machines.	**06**
5.	**Module 5: Power Converters** Introduction to AC-DC converter (uncontrolled), DC-DC buck and boost converters, duty ratio control (simple numerical). Single-phase (half-bridge and full-bridge) and three-phase voltage source inverters (180^0 mode).	**06**
6.	**Module 6: Electrical Installations** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Illumination fundamentals and calculations on illumination layout. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption.	**06**

References -

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. Abhijit Chakrabarti, Sudipta Nath, "Basic Electrical Engineering", McGraw Hill Education (India) Pvt. Ltd., (2013).
4. P. S. Bimbhra, "Power Electronics", Khanna Publishers-Delhi, 2012.

Reference Books:

1. B.L. Theraja, A.K. Theraja, "A Textbook of Electrical Technology" (Volume I, II and III), S. Chand Publications.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. C. L. Wadhwa, "Basic Electrical Engineering" 4th Ed, (2007), New Age International (P) Ltd., Publishers.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
6. V. N. Mittal and Arvind Mittal;, " Basic Electrical Engineering" McGraw Hill, 2015.
7. NPTEL: Electrical Engineering (Web) - Basic Electrical Technology Link: nptel.ac.in/courses/108105053/
8. Bureau of Energy Efficiency (BEE) weblink - https://www.beeindia.gov.in/content/energy-auditors

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH133**	Course Name : **Programming for Problem Solving**

L	T	P	Credits
2	--	--	2

Course Description:
This is an introductory course of C programming language for problem solving so as to improve the computational /logical thinking of students.
This course focuses on basic fundamentals of C language including Data types, Operators, I/O Statements, Control Statements, Function, Array, Pointer and Structure.
This course make students familiar with the use of computers for scientific calculations ,use of programming languages and the logic for writing computer programs involving problems from Mathematics and Statistics, Physics, Chemistry.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Explain the basic terminology and concepts of C programming language.
2. Write Algorithm and draw flow chart for the given problem.
3. Write a C Programs for given problems
4. Analyze the given C Program to predict the output.
5. Evaluate the C program to resolve the errors.

Prerequisite:
This course is programming course to solve the problems, So the students must have basic knowledge of mathematics. No prior programming knowledge is required;

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Introduction to Algorithm and 'C' Language** **Basics of Algorithm and flowchart**: Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **Introduction to 'C' Language:** Importance of 'C' Language, Sample 'C' Program, Structure of 'C' Program, Constants, variables and data types. Operators and expressions. Managing input / output operations	**05**
2.	**Control Statements** Control statements: Decision making and branching, Decision making and looping, Unconditional control statements.	**04**
3.	**Functions** Basics of function, definition, declaration and calling of function, Function prototype, Method of parameter passing- call by value, Recursion	**04**
4.	**Arrays** Array: Basics of Array, Array declaration and initialization, Types of array: One and Two dimensional arrays, Linear Search, Character arrays, String, Passing array to function.	**04**
5.	**Pointer** Pointer: Fundamentals, Pointer declaration, Operations on pointer, Pointer to an array, Method of parameter passing- call by reference.	**03**
6.	**Structures** Basics of Structure, Structure declaration and initialization, Methods of passing structure to function, Nested structure.	**04**

References -

Text Books:

1. K. Balaguruswamy, "Programming in ANSI C", TGMH Publication

Reference Books:

1. Yashwant Kanitkar, "Let us C", BPB publication, 6th Edition.
2. B.W. Kernigghan and D. M. Ritchie, "The 'C' Programming Language", Pearson Education.
3. Sandeep A. Thorat, "C Language Interview Q&A", Shroff Publishers, 2nd Edition.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1532**	Course Name : **Engineering Chemistry Lab**

L	T	P	Credits
--	--	2	2

Course Description:

Engineering Chemistry Laboratory experiments related to the six modules in theory course. The Modules involved in the Course are Analytical techniques, Water treatment, Corrosion and its Control, Batteries and fuel cell, Fuels, and Lubricants.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Examine the materials by using analytical instruments.
2. Identify the quality of water for industrial and domestic purposes.
3. Apply the knowledge of electrochemistry for design of various cells and batteries.
4. Select proper Lubricant for different machines according to working condition.
5. Inspect the quality of fuel.

Prerequisite: The prerequisite for this course is applied chemistry including knowledge of XIIth Std. Chemistry. This course intends to build the competency in the students to apply the concepts learnt in respective modules to various engineering fields.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Determination of concentration of metals by using a spectrophotometer.	**02**
2.	Estimation of iron by photo-calorimeter.	**02**
3.	Estimation of Sodium and Potassium in the given sample of water using Flame Photometer.	**02**
4.	Measurement of pH of different sample solution by pH meter.	**02**
5.	To estimate the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution (0.1N) by a potentiometer.	**02**
6.	Separation of components from the mixture by using TLC/Paper Chromatography.	**02**
7.	Estimation of total hardness/ chloride content of given sample.	**02**
8.	Estimation of acidity /alkalinity of given water sample.	**02**
9.	Determination of corrosion rate of steel in the acid medium by weight loss method.	**02**
10.	Determination of moisture, volatile matter and ash content of a given coal sample by proximate analysis.	**02**
11.	Determination of calorific value of fuel by using bomb calorimeter instrument.	**02**
12.	Determination of viscosity/ Acid value/ Saponification number of given lubricating oil by Viscometer.	**02**

References -

Reference Books:

1. Laboratory manual on Engineering Chemistry by Dr. Sudha Rani.
2. Instrumental Methods of Chemical Analysis by Chatwal and Anand.
3. J.N. Gurtu, Amit Gurtu. Advanced physical chemistry experiments.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1791**	Course Name : **Electrical Engineering Lab**

L	T	P	Credits
--	--	2	1

Course Description:
The experiments are designed to expose students to the practical executions of the fundamental theories of Electrical Engineering. The lab also reinforces the concepts discussed in class with a hands-on approach and allow the students to gain significant experience with electrical circuits and instruments such as ammeter, multimeter and wattmeter.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Acquaint with the basic concepts and properties of electrical circuits and awareness about safety precautions.
2. Select proper meter/s for measuring electrical quantities during experiments.
3. Explain various electrical circuits (DC, AC) and magnetic circuits through laboratory practices.
4. Demonstrate various power converter for desired application.
5. Choose circuit breakers for specific application

Prerequisite:
(Courses: Physics, Mathematics)
Concept of potential difference, current and resistance. Ohm's law. Fundamentals of electromagnetics.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Introduction to basic electrical engineering laboratory, symbols, Electrical Safety.	**02**
2.	Verification of Kirchhoff's Voltage Law and Kirchhoff's Current Law.	**02**
3.	Draw B-H curve for magnetic material.	**02**
4.	Analysis of RLC series and parallel network.	**02**
5.	Verification of relation between Line and Phase quantities in three phase star-delta circuit connection.	**02**
6.	OC/SC test and calculation of efficiency of a 1 phase transformer.	**02**
7.	Calibration of single phase energy meter.	**02**
8.	Simple, Staircase and Godown wiring.	**02**
9.	Demonstration of (a) ac-dc converters (b) dc-dc converters and(c) dc-ac converters – PWM waveform.	**02**
10.	Demonstration of (a) Components of LT switchgear. (b) Switch fuse Unit (c) Miniature Circuit Breaker (MCB), (d) Moulded case circuit breaker (MCCB) and (e) Earth leakage circuit breaker(ELCB)	**02**
11.	Self-Learning Activity	**02**

References -
Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. Abhijit Chakrabarti, Sudipta Nath, "Basic Electrical Engineering", McGraw Hill Education (India) Pvt. Ltd., (2013).
4. P. S. Bimbhra, "Power Electronics", Khanna Publishers-Delhi, 2012.

Reference Books:

1. B.L. Theraja, A.K. Theraja, "A Textbook of Electrical Technology" (Volume I, II andIII), S.Chand Publications.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. C. L. Wadhwa, "Basic Electrical Engineering" 4thEd, (2007), New Age International (P) Ltd., Publishers.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
6. V. N. Mittal and Arvind Mittal; "Basic Electrical Engineering" McGraw Hill, 2015.
7. NPTEL: Electrical Engineering (Web) - Basic Electrical Technology Link: nptel.ac.in/courses/108105053/
8. Bureau of Energy Efficiency (BEE)
   weblink - https://www.beeindia.gov.in/content/energy-auditors

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH191**	Course Name : **Programming for Problem Solving Lab**

L	T	P	Credits
--	--	4	2

Course Description:
This is an introductory course of C programming language for problem solving so as to improve the computational /logical thinking of students.
This course focuses on basic fundamentals of C language including Datatypes, Operators, I/O Statements, Control Statements, Function, Array, Pointer and Structure.
This course make students familiar with the use of computers for scientific calculations ,use of programming languages and the logic for writing computer programs involving problems from Mathematics and Statistics, Physics, Chemistry.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Describe orally the basic terminology and concepts of C programming language.
2. Write an Algorithm and draw the flow chart for the given problem
3. Write a 'C' programs for a given problem
4. Compile , execute and debug the 'C' programs for a given problem

Prerequisite:
This course is programming course to solve the problems, So the students must have basic knowledge of mathematics. No prior programming knowledge is required;

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Write an algorithm and draw the flow chart for given problem statements.	**04**
2.	Implement the C programs to demonstrate basics of C language e.g. datatypes, keywords, variable, operators and input-output statements.	**04**
3.	Implement the C programs using decision making and branching control statements in C.	**04**
4.	Implement the C programs using decision making and looping control statements in C.	**04**
5.	Implement the C programs using function.	**04**
6.	Implement the C programs using 1D array.	**04**
7.	Implement the C programs using 2D array.	**04**
8.	Implement the C programs for string handling operation.	**04**
9.	Implement the C programs using pointer.	**04**
10.	Implement the C programs using structure.	**04**

Strategy for Lab practice:

1. Analyze the given problem statement.
2. Design an algorithm and flowchart for given statement.
3. Write the pseudo code for logic building.
4. Use valid variables or constants and appropriate data types to implement the program.
5. Write a C program for given problem statement. (Follow the coding standards and best practices in programming.)
6. Compile the C program to resolve the syntactical and logical errors in C code to get correct output.
7. Debug and analyze the program to predict the correct output.

***Note:**

1. Formation of Group: There will be 3 students in each group.
2. Students will be required to maintain a 200 pages notebook for program writing and logic building.
3. During practical session more focus is on discussion, logic building, writing and implementation of code for given problem statement.

References -

Text Books:

1. K. Balaguruswamy, "Programming in ANSI C", TGMH Publication

Reference Books:

1. Yashwant Kanitkar, "Let us C", BPB publication, 6th Edition.
2. B.W. Kernigghan and D. M. Ritchie, "The 'C' Programming Language", Pearson Education.
3. Sandeep A. Thorat, "C Language Interview Q&A", Shroff Publishers, 2nd Edition.

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester- **II**
Course Code : **SH162**	Course Name : **English Proficiency Lab II**

L	T	P	Credits
--	--	4	2

Course Description:

This course comprises comprehensive areas i.e. reading, writing, communicative grammar and fundamentals of technical communication. By introducing the units like Technical Paragraph Development, Writing Business Letters, Technical Reports and Information Transfer the syllabus aims at preparing the basics of the future necessities of the aspirants from the technical field. The course aims to equip students with communication skills suitable for their academic purposes. It is further meant to develop in students skills necessary for effective communication in business and life in general.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Demonstrate writing skills through letters, circulars, notices, memos, and emails.
2. Apply report writing skills.
3. Organize message in appropriate structures.
4. Prepare job application addressing requirements of the post.

Prerequisite:

A Student, who is going to enroll himself for this course, should have following English language abilities:

1. A student should have adequate knowledge of basic grammar of English language.
2. A student should have intermediate level vocabulary of English language.
3. A student should be able to communicate moderately using English language.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Attitude Building	**04**
2.	Technical Writing (Characteristics, types, language)	**04**
3.	Technical Paragraph writing	**04**
4.	Information Transfer (Graphs, charts, tables, Venn Diagram and Images)	**04**
5.	Letter Writing: Students' Correspondence	**04**
6.	Letter Writing: Business Letters	**04**
7.	Drafting notices, memos and circulars/ Note Making	**04**
8.	Online Communication	**04**
9.	Resume and Cover Letter	**04**
10.	Report Writing (Formats and Types)	**04**
11.	Report Writing I (Visit and Project Report)	**04**
12.	Report Writing II (Investigation and Progress Report)	**04**

References -

Text Books: John Seely, Oxford Guide to Effective Writing and Speaking, OUP, 2009

Reference Books:

1. D. Sudha Rani, Business Communication and Soft Skills Laboratory Manual, Pearson Education, Mumbai (2012)
2. Krishna Mohan and MeeraBanerji, Developing Communication Skills, 2nd Edition, Macmillan India Ltd., New Delhi (2012)
3. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, Third Edition, Oxford University Press, Third Edition (2015)

Class:- **First Year B. Tech**	Semester-**II**
Course Code : **SH1661**	Course Name : **Japanese Language Lab Level II**

L	T	P	Credits
--	--	4	2

Course Description:
This course is designed to introduce students to the everyday language of Japan. Units will be organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts. Students will learn vocabulary, expressions, and sentence structures to become able to meet basic communication needs in Japanese. This course comprises all four skills (speaking, listening, reading, and writing) of language.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Converse in Standard Japanese to perform basic communicative tasks (e.g., exchange greetings/personal information, give time/directions/daily activities)
2. Make use of Japanese vocabulary effectively.
3. Demonstrate reading comprehension

Prerequisite: Nil

Course Content		
Experiment No	**Description**	**Hrs**
1.	Learning expressions involving "---ni---gaimasu" pattern	**04**
2.	Introduction of counters, simple translations	**04**
3.	Communicative situations—shopping	**04**
4.	Grammar : Introduction of adjectives, na-adjectives	**04**
5.	Time relations	**04**
6.	Communicative situations-confirming schedules etc	**04**
7.	Particles and their functional use in Japanese sentences	**04**
8.	Reading comprehension—a story	**04**
9.	Introduction of past tense aspect in r/o verbs, and adjectives	**04**
10.	Communicative situation : asking questions and answering	**04**
11.	Easy conversation	**04**
12.	Overall revision, and discussion	**04**

***Note**: Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations. Hiragana, Kanji (Chinese characters) and Katakana will be used throughout.

References –

Text Book:

NihongoShoho I (Japan Foundation Publ.)

Reference Book:

Minna No Nihongo I (3A Corporation, Japan)

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**
Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester-**II**
Course Code : **SH168**	Course Name : **German Language Lab Level II**

L	T	P	Credits
--	--	4	2

Course Description:
This course provides an opportunity to enhance acquisition of the fundamental elements of the German language. Emphasis is on the progressive development of basic listening, speaking, reading, and writing skills through the use of supplementary learning media and materials.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type.
2. Express him/her and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has.
3. Interact in a simple way provided the other person talks slowly and clearly and is prepared to help.
4. Make use of basic grammar concepts correctly.
5. Demonstrate reading and writing skills.

Prerequisite: Nil

Course Content		
Experiment No.	**Description**	**Hrs**
1.	To speak about the appointments in the office. Writing the letters and answering the letters.	**04**
2.	To speak about the language learning. To understand particular information from the texts (comprehension). Understanding dialog situations and dialogs in German	**04**
3.	To understand advertisements related to flats and houses. To describe the flat.	**04**
4.	To learn furniture names and speak about the location of the furniture in the house. Colors.	**04**
5.	To describe the routine about working people. To understand the job advertisement. To speak about Jobs and to understand blogs about jobs.	**04**
6.	To prepare for telephone conversation and to enquire about jobs on telephone.	**04**
7.	To speak about clothes. Understanding the chat about shopping for clothes	**04**
8.	To tell about past things (learning past tense) Dialog between salesman and customer about shopping of clothes.	**04**
9.	To speak about body parts and health. To understand about sports exercise and sentences in imperative	**04**
10.	Dialogs with the doctor understanding and speaking. To understand and to give the health related tips.	**04**
11.	To speak about vacations and plans in vacation. Suggestions about city tour. To write and understand the postcard.	**04**
12.	To speak about weather. To understand texts about vacation. To describe the problems in hotel and to complain regarding the problems.	**04**

Note: *This course (after successful completion of 1st course) will prepare the students for Start Deutsch 1 exam (A1 exam by Goethe Institue, Max Mueller Bhavan). The students will find it very easy to pursue for this exam after completion of this course. They just need some exam training to get acquainted with Goethe pattern.*

Class:- **First Year B. Tech**	Semester-**II**
Course Code :**SH164**	Course Name : **Engineering practice-Lab II**

L	T	P	Credits
--	--	2	1

Course Description:
To familiarise with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections. Essentially student should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Make wooden job.
2. Make Sheet metal job.
3. Make job by various machining processes.
4. Make job by joining processes.

Prerequisite:
Based on the skills acquired by students in Semester-I, they will choose any two jobs of their interest and make them with the help of these skills individually.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Selection of Job and approval from instructor.	**02**
2.	Preparation of drawing, approval of drawing and material selection.	**02**
3.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
4.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
5.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
6.	Assessment of Job. For Job no 1.	**02**
7.	Selection of Job and approval from instructor.	**02**
8.	Preparation of drawing, approval of drawing and material selection.	**02**
9.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
10.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
11.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
12.	Assessment of Job. For Job no 2.	**02**

Class:- **First Year B. Tech**	Semester-**II**
Course Code : **SH106**	Course Name: **Engineering Physics (CSE, Elect., ETC & IT)**

L	T	P	Credits
3	--	--	3

Course Description:

There is symbiotic relation between Physics & Engineering. Broadly speaking Engineering is mainly Applied Physics. The present day technological developments have been the result of joint effort of physicists & engineers. A proper study of Physics is therefore indispensable for Engineering students to excel in his field. The physicist discovers scientific principles and invents devices to describe & explain them. The technician applies and magnifies these devices for human convenience and comfort.

Engineering Physics is undergraduate course for F. Y. B. Tech in semester II. This course is specially designed for CSE, Electrical, ETC and IT branches. This course contains theory of Acoustics, Quantum Physics, LASER, Fiber optics semiconductors & magnetic materials. Student will use this knowledge of physical concepts in different engineering applications.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Use the knowledge of architectural acoustics in the proper design of a Hall/Auditorium.
2. Apply the knowledge of Piezoelectric and Magnetostriction effect for production of ultrasonic waves and its application in various fields.
3. Select appropriate magnetic materials depending on its properties for various applications
4. Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles
5. Apply the knowledge of semiconducting materials in semiconductor devices.
6. Use different optoelectronic devices as per need.

Prerequisite:

Basics in sound, magnetism, semiconductors & optics.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Acoustics & Ultrasonics** **Acoustics:** Introduction, Basic requirements for acoustically good hall, reverberation, time of reverberation, Sabine's formula (No derivation), absorption coefficient, factors affecting architectural acoustics and their remedies, numerical. **Ultrasonic:** Introduction, production of ultrasonic waves by Piezoelectric and Magnetostriction method (Using transistor circuit only), properties of ultrasonic waves, determination of wavelength and velocity of ultrasonic waves, application of ultrasonic waves.	**06**
2.	**Quantum Physics** Dual nature of light, Matter waves and De Broglie's hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle and its application (Non existence of electron in nucleus, time independent and dependent Schrödinger wave equation, wave function and its properties, Particle in a box (One dimension).	**06**
3.	**Laser, Fibre optics & Optoelectronic devices** **Laser**: Introduction, Absorption, spontaneous emission, stimulated emission, population inversion, pumping, characteristics of laser, He-Ne laser. **Fiber Optics**: Principle, propagation of light through cladded fibre, acceptance angle, acceptance cone, fractional refractive index change, Numerical aperture **Optoelectronic Devices:** Photodiode, LCD, Solar cell.	**06**
4.	**Electronic Materials** Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.	**06**
5.	**Semiconductors** Intrinsic and extrinsic semiconductors, Fermi energy and its location in intrinsic and extrinsic semiconductor, Dependence of Fermi level on carrier-	**06**

	concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect.	
6.	**Magnetic Materials** Magnetic properties of materials- Review of basic formulae, Magnetic susceptibility, Classification of magnetic materials (dia, para, ferro, ferri, antiferro), Langevin's Theory of dia and para magnetism (only classical treatment), Ferromagnetic domains , Hysteresis in ferromagnetic materials, Soft and Hard magnetic materials,	**06**

References -

Text Books:

1. Engineering Physics by H. K. Malik and A. K. Singh, Tata McGraw Hill, 2nd Edition, 2012
2. A textbook of Engineering Physics by Avadhanulu & Kshirsagar S. Chand Publications, Revised Edition, 2013.

Reference Books:

1. Principles of Physics by Halliday and Resnick, Physics, Wiley India edition, 9th edition, 2012.
2. Engineering Physics by Pandey & Chaturvedi, Cengage learning Publications, 2012.

Class:- **First Year B. Tech**	Semester-**II**
Course Code : **SH1512**	Course Name: **Engineering Physics Lab (CSE, Elect. ETC & IT)**

L	T	P	Credits
--	--	2	1

Course Description:
Engineering Physics Lab is the undergraduate course designed for F. Y. B. Tech in semester II. This course includes different experiments based on optics, magnetic materials, semiconductors and fiber optics. The main objective of this course is student will be able to verify the theoretical concepts they have studied in practicals.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Apply the theory of semiconductors to calculate band gap energy and carrier concentration
2. Apply theory of interference and grating to calculate radius of curvature of plano convex lens and wavelength of light.
3. Compare B-H curve for different ferromagnetic materials and measure hysteresis loss in it.
4. Determine resolving power of telescope and numerical aperture of optical fiber.
5. Use ultrasonic interferometer to calculate velocity of ultrasound in given liquid.
6. Use Laurent's half shade polarimeter to calculate specific rotation of optically active solution.

Prerequisite:

Basic of semiconductor, wave theory of light, measurement skills, graph plotting and slope calculation.

Course Content:		
Experiment No.	**Description**	**Hrs**
1.	To determine band gap energy of semiconductor using Four Probe Setup	**02**
2.	To determine wavelength of laser using diffraction grating	**02**
3.	To determine numerical aperture of optical fiber using LED.	**02**
4.	To determine resolving power of telescope using auxiliary slit	**02**
5.	To determine wavelength of yellow, green, &violet colours using plane diffraction grating	**02**
6.	To find type and carrier concentration of a given semiconductor using Hall effect.	**02**
7.	To determine velocity of ultrasonic waves in given liquid	**02**
8.	To compare the hysteresis curve of different ferromagnetic material and calculate loss in it.	**02**
9.	To find radius of curvature of given lens using Newton's rings	**02**
10.	To determine specific rotation of optically active solution using Laurent's half shade polarimeter.	**02**

References -

Reference Books:

1. Principles of Physics by Halliday and Resnick, Wiley India edition, 9th edition, 2012.

Open Elective-I Courses

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**
Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SE1011**	Course Name : **Basics of Electronics Engineering**

L	T	P	Credits
2	--	--	2

Course Description:
This course introduces the characteristics and applications of electronics devices and circuits. Emphasis is placed on selection of components, biasing, and building applications. Upon completion, students should be able to construct, verify, and troubleshoot analog/digital circuits using appropriate techniques and test equipment.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Select basic electronic components and devices used for different electronic applications.
2. Apply fundamentals of diode, transistor, OPAMP to build their applications.
3. Compute the conversions of different number systems like Binary, Decimal, Hex, Oct.
4. Simplify the logic expression using Boolean algebra & Karnaugh Map.

Prerequisite:
Basic course on Mathematics.

Course Contents		
Unit No.	**Description**	**Hrs**
1.	**Electronics Devices, Circuits and Instruments** Passive Circuit Components(R,L,C), Semiconductor p-n junction diode, half wave and full wave rectifiers, voltage regulation(SMPS),Regulated power supply, Basics of transformer, Optoelectronic devices: Photoconductive sensors, Photovoltaic sensors, Photo emissive sensors, Light emitters, Liquid Crystal Display, Instruments: working principle of CRO, multimeter, function generator, power supply.	**04**
2.	**Bipolar Junction Transistor and Applications** Introduction to transistors, BJT Characteristics, CB, CE, CC Configurations and Characteristics, transistor as a switch, transistor as an amplifier, simple RC coupled amplifier and frequency response, Cascaded amplifiers.	**04**
3.	**Operational Amplifier & Applications** Block diagram, parameters of ideal and practical op.amp. Specifications of IC 741, concept of virtual ground, inverting and non-inverting mode of operation, differential amplifier, voltage summing, comparator, integrator, and differentiator.	**04**
4.	**Number System** Binary number system, binary to decimal conversion, decimal to binary conversion, Hexadecimal number system, binary to hexadecimal and hexadecimal to binary conversion, binary coded decimal (BCD), binary addition, subtraction.	**04**
5.	**Logic Gates and Applications of Digital Electronics** Logic Gates, De-Morgan's theorem, Boolean algebra, k-map, realization using gates, Adder, sub-tractor, Flip-flops.	**04**
6.	**Memories and Microprocessor** Semiconductor Memories, Introduction to microprocessor and Introduction to computer.	**04**

References -

Text Books:

1. Electronics Devices and Circuits by S. Salivahanan, N. Suresh Kumar, A. Vallavraj, TMH Publication. (Unit I, II, III, VI)
2. Fundamentals Of Digital Circuits by Anand Kumar, TMH publication.(Unit IV, V)

Reference Books:

1. 'Op-amp and Linear Integrated Circuits' by R. Gaikwad, PHI publication.
2. 'Microprocessor Architecture, Programming, and Applications with the 8085' by Ramesh Gaonkar, Penram International Publishing (India) LTD.

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester-**I/ II**
Course Code : **SE1511**	Course Name : **Basics of Electronics Engineering Lab**

L	T	P	Credits
--	--	2	1

Course Description:
The laboratory portion of this course provides students with the opportunity to develop skills in the operation of basic electronics test instruments (dc power supply, digital multimeter, signal generator, and oscilloscope). Students will work in groups of two or more to perform and complete laboratory exercises. Students must be able to communicate, both in oral and written form, using the English language.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Demonstrate use of various electronic components & equipments for building applications.
2. Build the circuits using Diode, Transistor Electronics Devices.
3. Construct various applications using Operational Amplifier like Amplifiers.
4. Test the basic logic gates, adders& substractors.

Prerequisite:
Basic Electronics Knowledge.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Demonstration of Laboratory Instruments (Oscilloscope, Function Generator, Digital Multimeter, DC Power Supply)	**02**
2.	Characterization of Passive Circuit Elements (R, L, C).	**02**
3.	Study of VI Characteristics of PN- junction diode.	**02**
4.	Design & Implementation of Half Wave Rectifier	**02**
5.	Design & Implementation of Full Wave Rectifier	**02**
6.	Study Transistor Characteristics: Common emitter configuration.	**02**
7.	Build & Test Inverting Amplifier using Op -Amp. 741	**02**
8.	Build & Test Non-Inverting Amplifier using Op -Amp. 741.	**02**
9.	Test Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR.	**02**
10.	Build Adder/ Substractor using Logic gates.	**02**
11.	Study Microprocessor/ Microcontroller system.	**02**

References -

Text Books:

1) Handbook of experiments in Electronics & Communication Engineering by S. Poornachandra Rao and Sasikala. Publisher: Vikas Publishing House

Class:- First Year B. Tech	Semester-I/II
Course Code : SE1051	Course Name : Basics of Civil Engineering

L	T	P	Credits
2	--	--	2

Course Description:
Basics of Civil Engineering is an elective course offered in autonomous program at undergraduate level for I/II semester. The main objective of this course is to focus on building components, building planning principles, property transaction procedures, surveying and different modes of transportation. To a civil engineer, study of infrastructural development, its planning and execution is very much important and hence the course is designed to highlight various construction aspects of building and transportation facilities, its management and different modes.

Course Learning Outcomes:
After successful completion of this course, student will be able to:

1. apply fundamental knowledge of civil engineering.
2. identify building components and materials used in construction along with concepts of satiability and safety of buildings.
3. use basic principles of planning in the building design and processes involved in the property transactions.
4. determine horizontal and vertical distances using modern surveying instruments.
5. describe various components of transportation system.

Prerequisite:
Student should possess fundamental knowledge of mathematics and science.

Course Content		
Unit No.	Description	Hrs
1.	**Introduction to Civil Engineering & Building Components** Introduction of all branches of engineering, sub branches of civil engineering and their applications in allied fields. Building components and their functions. Foundations: functions & classification, bearing capacity of soil.	04
2.	**Building Materials and Types of Construction** Building materials- stones, aggregates, bricks, cement, sand, steel, timber, aluminium, plastic, glass, roofing materials and flooring materials. Construction: Concept of Mortar, PCC and RCC, Stone and brick masonry, types and bonds used in stone and brick masonry.	04
3.	**Building Planning Principles Building** Planning principles, rules and regulation – municipal corporation, build Bye-Laws: (building line and control line, open space requirements, built up and super built up area, F.S.I., and height of building), Building plan sanction procedure and fees.	04
4.	**Property Documents and Transactions** Land documents, property purchase and sale procedure. Property selection criteria and precautions (While purchasing property), Property taxes. Introduction to building finance.	04
5.	**Surveying** Horizontal Measurement: Principles of surveying, classification of surveys, linear and angular measurements, bearing systems, introduction to total station, Calculation of included angles. Measurement of area by digital planimeter. Vertical Measurement :Terms used in levelling, introduction to level measuring instruments, methods calculation of RLs, types of levelling, contours, characteristics of contours, use of contour maps.	04
6.	**Infrastructure** Roads: classification, cross section and components of road, classification of roads. Railway: cross section and components of permanent way functions. Water way: docks and harbor, classifications, components. Bridge: components & types of bridge Dams: purpose, selection of site, types of Dams.	04

References:

1. Gupta J P, "Textbook of Engineering Mechanics and Basic Civil Engineering" 6th reprint, 2013
2. B. C. Punmia and Ashok Kumar Jain, "Basic Civil Engineering" 5th reprint. 2016.

Text Books:

1. G. K. Hiraskar, Basic Civil Engineering, Danpat Rai Publication, 1st edition 2004, 6th reprint, 2013.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SE1551**	Course Name : **Basics of Civil Engineering Lab**

L	T	P	Credits
--	--	2	1

Course Description:
Basics of Civil Engineering Lab is a choice based course offered in autonomous program at undergraduate level for I/II semester. Main objective of this lab is to focus on reading of working and submission drawing, use building planning Principles, Study documents required in property transaction procedures and surveying. To a civil engineer use of plans, drawings, calculation of area of irregular shapes and to find the level difference between two points is very much of important.

Course Learning Outcomes:
After successful completion of the course, student will be able to,

1. draw dimensioned sketch/plan of building.
2. plan building using principles and bye laws.
3. perform horizontal and vertical measurement.
4. use modern surveying techniques.

Prerequisite:
Student should have fundamental knowledge of Mathematics and Science.

Course Content		
Experiment No.	Description	Hrs.
1.	Collection of samples of modern building materials (any five) along with salient features and applications.	02
2.	Preparation of sectional view (dimensioned sketch) of a load bearing and RCC framed structure indicating labels and dimensions of the components.	02
3.	Measurements of existing building and preparation plan and elevation. (free hand dimensioned sketch)	02
4.	Reading of submission and working drawings of existing building.	02
5.	Collection of rules and regulations (Building Bye-laws) of any one municipal council/ corporation and its study.	02
6.	Preparation of simple building plan by using principles of planning. (dimensioned sketch)	02
7.	Study of various property documents used in property transaction.	02
8.	Measurement of area using digital planimeter.	02
9.	Determination of Reduced Levels and included angles by using Total Station.	02
10.	Determination of length and area of land/plot using GPS.	02

References:

Text Books:

1. G. K. Hiraskar, Basic Civil Engineering, Danpat Rai Publication, 1st edition 2004, 6th reprint, 2013.

Reference Books:

1. Gupta J P "Engineering Mechanics and Basic Civil Engineering" 6th reprint, 2013
2. B C Punmia and Ashok Kumar Jain, "Basic Civil Engineering" 5th print 2016.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SE1071**	Course Name : **Thermodynamics**

L	T	P	Credits
2	--	--	2

Course Description:
The aim of this course is to provide students the basic concepts of thermodynamic systems and their applications. It also covers the basic properties of gases, liquids and vapors (specific heat capacities), energy, entropy, enthalpy, exergy, anergy, laws of thermodynamics, ideal gas mixtures; and efficiencies of energy conversion systems, such as boilers, turbines, condensers, pump.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Apply thermodynamics principles to mechanical engineering applications
2. Describe entropy, change in entropy and increase of entropy principle.
3. Differentiate between available and unavailable energy with examples.
4. Apply mathematical fundamental to study the properties of steam, gas and gas mixtures.

Prerequisite:
Students should know Concept of energy, work, heat and conversion between them.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Basic Concepts:** Microscopic & macroscopic point of view, thermodynamic system and control volume, thermodynamic properties, processes and cycles, Thermodynamic equilibrium, Quasistatic process	**04**
2	**First law of Thermodynamics**: First law for a closed system undergoing a cycle and change of state, energy, PMM1, first law of thermodynamics for steady flow process, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heatexchanger and throttling process, filling and emptying process(Numerical Treatment)	**04**
3	**Second law of thermodynamics**: Limitations of first law of thermodynamics, Kelvin Planck and Clausius statements and their equivalence, PMM2, causes of irreversibility, Carnot theorem, corollary of Carnot theorem(Numerical Treatment)	**04**
4.	**Entropy:** Clausius theorem, property of entropy, inequality of Clausius, entropy change in an irreversible process, principle of increase of entropy, entropy change for non-flow and flow processes, third law of thermodynamics (Numerical Treatment)	**04**
5	**Availability**: Energy of a heat input in a cycle, exergy destruction in heat transfer process, exergy of finite heat capacity body, exergy of closed and steady flow system, irreversibility (Numerical Treatment)	**04**
6	**Properties of gases and gas mixtures:** Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, (Numerical Treatment)	**04**

References -

Text Books:

1. P.K. Nag,Engineering Thermodynamics, Tata McGraw Hill,New Delhi, 4th edition, 2013.
2. Ballaney P.L., Thermal Engineering, Khanna Publishers, New Delhi. 9th edition, 2014.
3. Kumar and Vasandani, Thermal Engineering, Metropolitan Book Co, Delhi, 3rd edition, 1979.
4. B. K. Sarkar, Thermal Engineering, Tata McGraw Hill. 8th edition, 2005.
5. R. K. Rajput, Thermal Engineering, Laxmi Publications, New Delhi. 9th edition, 2014.
6. Mahesh M Rathore, Thermal Engineering, McGraw Hill Education, New Delhi. 8th edition, 2013.

Reference Books:

1. Holman, Thermodynamics, McGraw Hill, London, 3rd edition, 1980.
2. Wylen Van, G. J. & Sonntag R. E., Fundamentals of Classical Thermodynamics, John Wiley & Son, 6th edition, 2002.
3. Yunus A. Cengel, Thermodynamics an Engineering Approach, Tata McGraw Hill, 9threprint, 2014.

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester-I/II
Course Code : **SE1571**	Course Name : **Thermodynamics Lab**

L	T	P	Credits
--	--	2	1

Course Description:

The main objective of this lab is to develop an idea of fuel properties and their variation with temperature, determination of kinematic viscosity and calorific value of fuels. It also covers study of boiler and their mountings.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Conduct test to find properties of oils
2. Explain boilers and mountings
3. Estimate the properties of steam, interpret and comment on the results.

Prerequisite:

Students should know Concept of energy, work, heat and conversion between them.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Significance and Relevance of Lubrication Properties and Systems	**02**
2.	Test on Grease Penetrometer	**02**
3.	Test on Dropping Point Apparatus	**02**
4.	Test on Carbon Residue Apparatus	**02**
5.	Test on Aniline Point Apparatus	**02**
6.	Test on Cloud and Pour Points Apparatus	**02**
7.	Hands on models of Water Tube and Fire Tube Boilers	**02**
8.	Hands on Boiler Mountings and Accessories	**02**
9.	Estimate calorific value of fuel	**02**
10.	Estimate dryness fraction of steam	**02**

References -
Laboratory manual

Text Books:

1. P.K. Nag,Engineering Thermodynamics, Tata McGraw Hill,New Delhi, 4th edition, 2013.
2. Ballaney P.L., Thermal Engineering, Khanna Publishers, New Delhi. 9th edition, 2014.
3. Kumar and Vasandani, Thermal Engineering, Metropolitan Book Co, Delhi, 3rd edition, 1979.

Reference Books:

1. R. K. Rajput, Thermal Engineering, Laxmi Publications, New Delhi. 9th edition, 2014.
2. Mahesh M Rathore, Thermal Engineering, McGraw Hill Education, New Delhi. 8th edition, 2013

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**
Department of Sciences and Humanities

Class:- **First Year B. Tech**	Semester- **I/II**
Course Code :**SE1091**	Course Name : **Engineering Materials**

L	T	P	Credits
2	--	--	2

Course Description:
This course will familiarize the student with the properties of engineering materials and composite materials. The students will be introduced to evaluation of mechanical properties by destructive testing and flaw detection by nondestructive testing methods.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Illustrate stress strain diagram for different materials.
2. Explain evaluation of mechanical properties using destructive testing methods.
3. Select suitable non destructive testing method for flaw detection in component.
4. Select suitable material for different components.

Prerequisite: students should have knowledge of crystal structures of metals.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Classification of Materials:** Historical Perspective, Importance of Engineering Materials, Classification of Materials, Advanced Materials, Needs of Modern Materials, Material structures.	**04**
2.	**Properties of Engineering materials** **Magnetic Properties:** Diamagnetism and Paramagnetism, Ferromagnetism, Antiferromagnetic and Ferromagnetism, The influence of temperature on Magnetic behavior **Thermal properties:** Introduction, Heat capacity, Thermal Expansion, Thermal conductivity, Thermal stresses. **Optical properties:** Electromagnetic Radiation, light interactions with solids Atomic and Electronic Interactions, Optical property of metals and non-metals. **Electric properties:** Introduction, Electrical Conductivity, Electronic and Ionic Conduction, Intrinsic semi conduction, Extrinsic Semi conduction.	**04**
3.	**Destructive testing of Metals:** Introduction, Concept of stress strain (Tension test) Elastic Deformation, Plastic Deformation, Hardness Testing, Fatigue Tets and Impact Test	**04**
4.	**Non Destructive Testing of Metals:** Visual Inspection, Magnetic particle inspection, dye penetrant inspection, ultrasonic testing, radiography, eddy current testing	**04**
5.	**Composite Materials:** Types of Composite materials (MMC, PMC, CCC, Hybrid composite), Processing of composites, Application of composites.	**04**
6.	**Economic, Environmental, Social considerations** Introduction, Recycling issues in material science and engineering, component Design, Materials, manufacturing techniques, Importance—Biodegradable and Biorenewable Polymers/ Plastics.	**04**

References -

Text Books:

1. Callister W.D., "Materials Science and Engineering" Wiley India (P) Ltd.ISBN:978-81-265-21-43-2, 2010

Reference Books:

1. V.D .Kodgire and S.V. Kodgire, "Material Science and Metallurgy for Engineers, Everst publishing house, pune, 2008
2. Raghavan V., " Materials science and Engineering- A first course," 5th edition, ISBN: 978-81-203-2445-8, 2011
3. R.A. Higgins, "Engineering Metallurgy: Part 1", 1996

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

First Year B. Tech	Semester- **I/II**
Course Code : **SE1591**	Course Name : **Engineering Materials Lab**

L	T	P	Credits
--	--	2	1

Course Description: This lab familiarizes the students with evaluation of mechanical properties by destructive testing methods

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Illustrate stress strain diagram for different materials.
2. Use Rockwell Hardness testing machine to measure hardness of material.
3. Measure impact strength of the metals
4. Determine fatigue strength of metals.
5. Determine flaws in the component using non destructive testing methods.
6. Explain working principle of emission spectrometer.

Prerequisite: Students should have knowledge of crystal structures of metals.

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Tensile test on metals	**02**
2.	Brinell hardness test on metals	**02**
3.	Rockwell Hardness test on metals.	**02**
4.	Charpy impact test on metals	**02**
5.	Izod impact test on metals	**02**
6.	Fatigue testing of metals.	**02**
7.	Dye penetrant testing of metals	**02**
8.	Magnetic particle inspection of the parts.	**02**
9.	Demonstration of ultrasonic testing.	**02**
10.	Demonstration of Spectrometer.	**02**

References -

Text Books:

1. V.D. Kodgire and S.V. Kodgire, "Material Science and Metallurgy for Engineers, Everst publishing house, pune, 2008

Reference Books:

1. Callister W.D., "Materials Science and Engineering" Wiley India (P) Ltd.ISBN:978-81-265-21-43-2, 2010
2. Raghavan V., " Materials science and Engineering- A first course," 5th edition, ISBN: 978-81-203-2445-8, 2011
3. R.A. Higgins, "Engineering Metallurgy: Part 1", 1996

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SE1131**	Course Name: **Green Technology.**

L	T	P	Credits
2	--	--	2

Course Description:
Today entire globe is facing problem of global warming and climate change. This course is to create awareness among young engineers who will take this challenge for caring nature. Green Technology course is offered as an elective course for first year engineering all programmes. This course deals with continuously evolving group of methods, materials and processes from environmentally caring techniques. The goals of this rapidly growing highly interdisciplinary course focuses on- i) sustainability - meeting the needs of society in ways that without damaging or depleting natural resources ii) innovation - developing alternatives to technologies to those that have been demonstrated to damage health and the environment and source reduction iii) reducing waste and pollution by changing patterns of production and consumption. This course will help to create awareness about eco-friendly technology.

Course Learning Outcomes:
After successful completion of the course, student will be able to,

1. Explain the basic principles of green chemistry and ecology.
2. Discuss different waste processing techniques.
3. Describe various Green innovations for sustainability.
4. Discuss concept of green buildings and green management.
5. Prepare energy and water budget for a building.

Prerequisite:
Student should have fundamental knowledge of basic science.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Introduction to Green Technology and Ecological principles** Concept of green technology, principles of green chemistry and green engineering, concept of green processes. **Ecological principles** Ecological principles, concept of ecosystems, energy resources and energy flow, the impacts of human activities on energy flow in major man-made ecosystems-agricultural, industrial and urban ecosystems.	**04**
2.	**Green Buildings and green management** Concept of Green Building, Green building materials, energy efficiency, water efficiency, energy ratings-green construction management. The concept of green management; evolution; nature, scope, importance and types; developing a theory; green management in India; relevance in twenty first century	**04**
3.	**Energy sources** Energy sources, Environment and Sustainable Development; Energy transformation from source to services; biological processes; photosynthesis; food chains, classification of energy sources, quality and concentration of energy sources, renewable resources; overview of global/ India's energy scenario.	**04**
4.	**Waste and Waste processing for green development** Definitions, sources, types and composition of various types of wastes; Industrial waste and Biomedical Waste (BMW), waste collection and transportation; waste processing-size reduction, separation; waste management hierarchy, waste minimization and recycling of MSW; Life Cycle Analysis (LCA), Material Recovery Facilities (MRF), recycling processes of solid waste.	**04**
5.	**Waste to Energy Conversion.** Energy from waste- Bio-chemical Conversion: Anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, industrial waste, agro residues, anaerobic digestion biogas production, land fill	**04**

	gas generation and utilization, present status of technologies for conversion of waste into energy, design of waste to energy plants for cities, small townships and villages.	
6.	**Green innovation & sustainability.** Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends – process/product innovation-, technological/ environmental leap-frogging; Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity- WEHAB (eco-restoration/ phyto-remediation, ecological sanitation, renewable energy technologies, industrial ecology, agro ecology and other appropriate green technologies); design for sustainability.	**04**

References:

Reference Books:

1. New Approaches on Energy and the Environment: Policy Advice for the President, by Richard D. Morgenstern,
2. Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, by Gary C. Young, ISBN:9780470539675, Publisher: John Wiley & Sons, Publication Date: June 2010
3. Green Management and Green Technologies: Exploring the Causal Relationship by Jazmin Seijas Nogarida, 2008.
4. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007
5. BEE India reference books.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SE1631**	Course Name : **Green Technology Lab.**

L	T	P	Credits
--	--	2	1

Course Description:
Today entire globe is facing problem of global warming and climate change. This course is to create awareness among young engineers who will take this challenge for caring nature. Green Technology course is offered as an elective course for first year engineering all programmes. This course deals with continuously evolving group of methods, materials and processes from environmentally caring techniques. The goals of this rapidly growing highly interdisciplinary course focuses on- i) sustainability - meeting the needs of society in ways that without damaging or depleting natural resources ii) innovation - developing alternatives to technologies to those that have been demonstrated to damage health and the environment and source reduction iii) reducing waste and pollution by changing patterns of production and consumption. This course will help to create awareness about eco-friendly technology.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Explain the concept of green technology/green building.

2. Prepare energy and water budget for a building.

3. Design rainwater harvesting for a small catchment area.

4. Analyze air quality by using HC/CO analyzer.

Prerequisite: Nil

Course Content		
Experiment No.	**Description**	**Hrs**
1.	Study of Green building with detail case study.	**02**
2.	Study of conventional and non-conventional energy sources.	**02**
3.	Preparation of energy audit for a small building.	**02**
4.	Estimation of water budget for a small building.	**02**
5.	Design of rainwater harvesting system for a small catchment area.	**02**
6.	Experimental study on thermal performance of water heater OR solar dryer OR solar power plant.	**02**
7.	Demonstration of HC/CO analyzer for air quality analysis.	**02**
8.	Demonstration of calorific value of solid fuels.	**02**
9.	Demonstration of wind/solar simulator.	**02**
10.	Site visit to Bio-gas plant/waste recycling plant/MSW plant for collection of information.	**02**

Class:- **First Year B. Tech**	Semester- **I/II**
Course Code : **SE143**	Course Name : **Basics of Mechanical Engineering**

L	T	P	Credits
2	--	--	2

Course Description:

This is a basic course at first year engineering level. It consists of basic knowledge in Mechanical and Automobile engineering, which is of key importance to the students of all engineering streams. There are total six units covering all the basic fundamentals of Mechanical and Automobile engineering. Few units deal with power generation systems, power transmission and energy conversion devices. While others are related to Vehicles and their prime components, IC engines, material used in engineering and different manufacturing processes. At the end of successful completion of this course, the students will be perfectly clear regarding the basic concepts of Mechanical and Automobile engineering.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain different power generation systems.
2. Select appropriate energy conversion device for the given application.
3. Classify vehicles on the basis of different parameters.
4. Compare two stroke and four stroke IC engines.
5. Describe different transmission devices in a given system.
6. Choose suitable materials and manufacturing processes for a given application.

Prerequisite: Nil

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Power Plants:** Current Energy scenario of India and Maharashtra, Hydroelectric-power, Thermal, Nuclear power plants. Solar, Wind, Solar-wind Hybrid power plants. (Description with block Diagrams).	**04**
2.	**Energy Conversion Devices:** Pumps, Compressor and Hydraulic Turbines: Types, Construction, working and applications.	**04**
3.	**Introduction to Vehicles:** Classification of vehicles on the basis of load, wheels, drive line arrangement, fuel used, axles, position of engine, body and load etc. Vehicle layout and functions of major components.	**03**
4.	**IC Engines:** Working of two stroke and four stroke engines, petrol and diesel engines, Comparison of two stroke and four stroke engines & petrol and diesel engines. Introduction to alternative fuels.	**03**
5.	**Transmission Devices:** Basic transmission devices like gears, belts and ropes. Calculation of length of belt drive. Functions of transmission system, types and working of clutch, gear box, propeller shaft and differential.	**05**
6.	**Materials and Manufacturing Processes:** Materials Used in Engineering and their Applications Metals – Ferrous and Non-Ferrous, Nonmetallic materials, Material selection criteria Design considerations Steps in Design Introduction to manufacturing processes and Their Applications: Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.	**05**

References -

Text Books:

1. Arora and Domkunwar, Power Plant Engineering, Dhanpat Rai and Sons.
2. S. Rao and Dr. B. B. Parulekar - Energy Technology, Khanna Publication
3. Dr. Kirpal Singh, Automobile Engineering, Volume 1 and 2, Standard Publishers Distributors, Delhi, 2013.

Reference Books:

1. Workshop Technology Vol. - I&II, Hajara and Choudhari.
2. R. B. Gupta, Automobile Engineering, Satya Prakashan, New Delhi.
3. K. M. Gupta, Automobile Engineering, Volume 1 and 2, Umesh Publications, New Delhi

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SE165**	Course Name : **Basics of Mechanical Engineering Lab**

L	T	P	Credits
--	--	2	1

Course Description:
This is laboratory course which will demonstrate the different components of power generation systems. Also students will get the hands on experience related to day to day maintenance work of machines.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Explain the different components of power generation systems.
2. Identify the systems and components of vehicle.
3. Distinguish between two stroke and four stroke engines.
4. Carry out day to day life maintenance of machines.
5. Explain the different components of power generation systems.

Prerequisite: Nil

Course Content (Any TEN of the following)		
Experiment. No.	**Description**	**Hrs**
1.	Demonstration/trial on Steam Power plant.	**02**
2.	A trial on solar panel system.	**02**
3.	Assembly and disassembly of Bicycle.	**02**
4.	To build simple working mechanism.	**02**
5.	Experiment to correlate head with discharge of centrifugal pump.	**02**
6.	Demonstration of vehicle layout and drawing of vehicle layouts.	**02**
7.	Demonstration of two stroke and four stroke engines.	**02**
8.	Demonstration of types of clutches, gear boxes.	**02**
9.	Demonstration of vehicle body structures.	**02**
10.	Report preparation on "General Specifications of Automobiles" by collecting data of given type of vehicles.	**02**
11.	Visit to power plant.	**02**

References -

Text Books:

1. Arora and Domkunwar, Power Plant Engineering, Dhanpat Rai and Sons.
2. S. Rao and Dr. B. B. Parulekar - Energy Technology, Khanna Publication
3. Dr. Kirpal Singh, Automobile Engineering, Volume 1 and 2, Standard Publishers Distributors, Delhi, 2013.

Reference Books:

1. R. B. Gupta, Automobile Engineering, Satya Prakashan, New Delhi.
2. K. M. Gupta, Automobile Engineering, Volume 1 and 2, Umesh Publications, New Delhi

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

Class-First Year **B. Tech**	Semester-**I/II**
Course Code: **SE145**	Course Name: **Creativity, Design Thinking and Entrepreneurial Mindset**

L	T	P	Credits
2	--	--	2

Course Description:

This course helps students to learn creativity in the context of Entrepreneurship. It provides a structured approach for applying creativity, problem identification and problem solving in order to cope up with challenges under constrained and uncertain environment. It provides a systematic approach for design thinking and Jobs-to-be-Done to innovate and develop solutions. It provides ingredients to develop a mindset of a successful entrepreneur.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Learn structured approach to creativity, problem identification and problem solving in a new venture context
2. Apply design thinking approach to identify innovation opportunities and develop solutions
3. Identify, validate and define specific innovation opportunities through Jobs-to-be-Done methodology
4. Develop mindset of a successful entrepreneur

Prerequisite: Nil

Course Content		
Unit No.	**Description**	**Hrs.**
1.	**Creativity**: What is innovation? Creativity is not magic and can be learned, mastering creative mindset, learn to connect and combine, question assumptions, thinking outside the box, courage to challenge status quo, reframing the problem, incubation: generate multiple ideas, intersection of disciplines and domains for creative solutions, critical thinking for down selection and verification of ideas.	**04**
2.	**Problem identification:** Identify unexplored areas, question in a structured way, identify customer needs and pain areas, evaluate existing solutions and identify gaps and future possibilities, how to set a long-term goal that helps setting up a pathway to solve the problem, Define problem.	**02**
3.	**Problem solving:** Ideation philosophy and tools, generate multiple ideas, out of box solutions, criteria for down selection of solution, how to check feasibility of solution, learn tools such as mind mapping, sketching, storyboard, divide or swarm and apply to problem solving.	**04**
4.	**Design Thinking:** Empathize, Define, Ideate, Prototype, Test, apply iterative design thinking steps to solve problem.	**06**
5.	**Jobs-to-be-Done (JBTD)**: Outcome driven innovation using JBTD, Framework: define, locate, prepare, confirm, execute, monitor, modify, conclude, define the market around JTBD, uncover customer needs, mapping a customer job, define desired outcome statements and quantify, discover hidden segments of opportunity, align existing products with market opportunity, conceptualize new products.	**06**
6.	**Entrepreneurial Mindset:** Mental attitude or inclination toward entrepreneurship, what does it mean to be entrepreneur? Learn to discover, evaluate, and exploit opportunities, creation of value, embracing uncertainty, putting it all together.	**02**

Workshops / Assignments:

1. Apply creativity to identify a problem from a selected domain and provide innovative solution for it.
2. Apply Design Thinking for solving a problem selected in workshop 1.
3. Apply Jobs-to-be-Done methodology to the problem selected in workshop 1.
4. Make a presentation on understanding of Entrepreneurial Mindset.
5. Prepare presentation and report on new venture opportunity based on above workshops.

References -

Reference Books:

1. The Four Steps to the Epipheny, S. G. Blank, 2007.
2. Design Thinking: Understand-Improve-Apply, C. Meinel and L. Leifer, Springer, 2011.
3. Finding Fertile Ground, S. A. Shane, Wharton School Publishing, 2005.
4. E.D.P. Study Material by by Dr. Dinesh Awasthi, Mr. Raman Jossi V Padmananal E.D.I Ahmedabad
5. E.D.P. Study Material by MITCON Pune
6. E.A.P. Study Material by Mr. Raman Gujaral E.D.I. Ahmedabad

K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)
Syllabus (Theory & Laboratory Course)
To be implemented from **2018-19**

Department of Sciences and Humanities

Class-First Year **B. Tech**	Semester-**I/II**
Course Code: **SE167**	Course Name: **Creativity, Design Thinking and Entrepreneurial Mindset Lab**

L	T	P	Credits
--	--	2	1

Course description/ Course Objectives:

This practical work provides a structured approach for applying creativity, problem identification and problem solving. It provides a systematic approach for design thinking and Jobs-to-be-Done to innovate and develop solutions. This work helps students to develop the Entrepreneurial mind set.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Learn structured approach to creativity, problem identification and problem solving in a new venture context.
2. Apply design thinking approach to identify innovation opportunities and develop solutions.
3. Develop mindset of a successful entrepreneur.

Prerequisite: Nil

Course Content		
Experiment No.	**Description**	**Hrs.**
1	Idea Generation By Brain storming.	**02**
2	Apply creativity to identify a problem from a selected domain and provide innovative solution for it.	**02**
3	Apply creativity to identify a problem from a selected domain and provide innovative solution for it.	**02**
4	Apply Design Thinking for solving a problem selected in workshop	**02**
5	Apply Design Thinking for solving a problem selected in workshop	**02**
6	Apply Jobs-to-be-Done to the problem selected in workshop 1	**02**
7	Apply Jobs-to-be-Done to the problem selected in workshop 1	**02**
8	Interaction with successful entrepreneur	**02**
9	Make a presentation on understanding of Entrepreneurial mindset.	**02**
10	Visit to Industries & Interaction with Successful Entrepreneur.	**02**
11	Prepare presentation and report on new venture opportunity based on above workshops.	**02**
12	Prepare presentation and report on new venture opportunity based on above workshops.	**02**