

Pimpri Chinchwad Education Trust's
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PimpriChinchwad College of Engineering
(An Autonomous Institute, affiliated to Savitribai Phule Pune University)

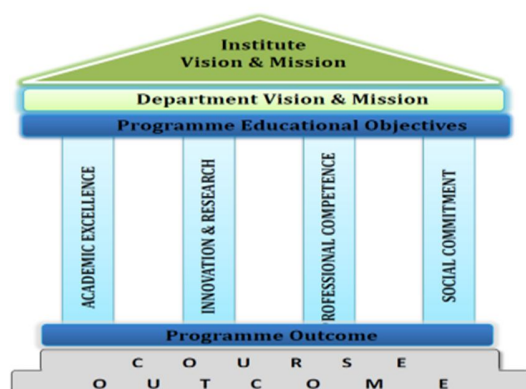
Curriculum Structure & Syllabus of
**Department of Applied Sciences and
Humanities**

[Mechanical Engineering]

(UG Programme- F. Y. B. Tech.)
Effective from Academic Year 2020-21



Approved by
Academic Council, PCCoE, Pune.



Institute Vision

To Serve the Society, Industry and all the Stakeholders through the **Value-Added Quality Education.**

Institute Mission

To serve the needs of society at large by establishing State-of-the-Art Engineering, Management and Research Institute and impart attitude, knowledge and skills with quality education to develop individuals and teams with ability to think and analyze right values and self-reliance.

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of- the-art Engineering and Management Institute through continual improvement in effective implementation of Quality Management System.

List of Abbreviations

SPPU	Savitribai Phule Pune University
A.Y.	Academic Year
HSMC	Humanities/ Social Sciences/Management Courses
B.Tech	Bachelor of Technology
Lec	Lecture
Prac/PR	Practical
Tut	Tutorial
Hrs	Hours
IE	Internal Evaluation
MTE	Mid Term Evaluation
ETE	End Term Evaluation
TW	Term work
OR	Oral
BSC	Basic Science Courses
ECC	Engineering Common Courses
PROJ	Project
HSMC	Humanities
LS	Life Skills
TW	Term Work
MTE	Mid Term Examination
CIE	Continuous Internal Evaluation /Examination
EME	Elementary Mechanical Engineering
UHV	Universal Human Values
Eng.	English
Jap.	Japanese
Ger.	German


Structure of B.Tech. First Year [Mechanical Engineering]

B. TECH. Semester – I

Course Code	Course Type	Course Name	Teaching Scheme				Credit	Evaluation Scheme							
			Lec	Prac	Tut	Hrs		CIE		ETE	T W	P R	O R	Total	
								IE	MTE						
BFE 1201	BSC	Linear Algebra & Univariate Calculus	3	-	1	4	4	20	30	50	50	-	-	150	
BFE1202	BSC	Engineering Physics	4	-	-	4	4	20	30	50	-	-	-	100	
BFE1310	ECC	Engineering Mechanics	2	-	-	2	2	20	30	50	-	-	-	100	
BFE1301	ECC	Engineering Graphics	1	-	-	1	1	-	20	30	-	-	-	50	
BFE1312	ECC	Elements of Mechanical Engineering	2	-	-	2	2	20	30	50	-	-	-	100	
BFE1203	BSC	Engineering Physics Laboratory	-	2	-	2	1	-	-	-	50	-	-	50	
BFE1311	ECC	Engineering Mechanics Laboratory	-	2	-	2	1	-	-	-	50	-	-	50	
BFE1302	ECC	Engineering Graphics Laboratory	-	4	-	4	2	-	-	-	50	-	-	50	
BFE1313	ECC	Elements of Mechanical Engineering Laboratory	-	2	-	2	1	-	-	-	50	-	-	50	
BFE1101/02/03	HSMC	HSMC-1(Eng./Jap./Ger.)	1	2	-	3	2	30	-	20	-	-	-	50	
BFE1901	LS	Life Skill-1	-	2	-	2	-	GRADE							
Total			13	14	1	28	20								750

B. TECH Semester – II

Course Code	Course Type	Course Name	Teaching Scheme				Credit	Evaluation Scheme							
			Lec	Prac	Tut	Hrs		CIE		ETE	T W	P R	O R	Total	
								IE	MTE						
BFE2206	BSC	Multivariate Calculus	3	-	1	4	4	20	30	50	50	-	-	150	
BFE2204	BSC	Engineering Chemistry	4	-	-	4	4	20	30	50	-	-	-	100	
BFE2304	ECC	Basic Electrical & Electronics Engineering	2	-	-	2	2	20	30	50	-	-	-	100	
BFE2308	ECC	Programing & problem solving	1	-	-	1	1	-	20	30	-	-	-	50	
BFE2303	ECC	Workshop practices	-	2	-	2	1	-	-	-	50	-	-	50	
BFE2701	PROJ	Mini project & basics of innovation	-	4	-	4	2	-	-	-	100	-	-	100	
BFE2205	BSC	Engineering Chemistry Laboratory	-	2	-	2	1	-	-	-	50	-	-	50	
BFE2305	ECC	Basic Electrical & Electronics Engineering Laboratory	-	2	-	2	1	-	-	-	50	-	-	50	
BFE2309	ECC	Programing & problem solving Laboratory	-	4	-	4	2	-	-	-	50	-	-	50	
BFE2104/05/06/07	HSMC	HSMC-2(Eng./Jap./Ger./UHV)	1	2	-	3	2	30	-	20	-	-	-	50	
BFE2902	LS	Life Skill-2	-	2	-	2	-	GRADE							
Total			11	18	1	30	20								750



Syllabi

B.Tech. First Year
[2020 Course]

SEM I

Course: Linear Algebra & Univariate Calculus						Code: BFE1201	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
				50	-	-	50
Prerequisites:							
1. Elementary Mathematics. 2. Elementary Calculus.							
Course Objectives: This course aims at enabling students,							
2. To familiarize with concepts and techniques in Calculus and Matrices.							
3. To get acquainted with Mathematical Modelling of physical systems using differential equations.							
4. To acquire techniques of advanced level mathematics and its applications that would enhance analytical thinking power.							
Course Outcomes: After learning the course, the students will be able to:							
1. Apply the concept of rank to solve linear equation systems and problems related to Eigen Values and Eigen Vectors.							
2. Apply the intermediate value theorems for continuous functions.							
3. Expand a function in infinite series using Taylor's and Maclaurin's theorems and apply L'Hospital's rule to evaluate the limits of indeterminate forms.							
4. Solve ordinary differential equations of first order and first degree using appropriate techniques and analyze different problems related to electrical circuits, cooling problems, rectilinear motion and heat flow.							
Detailed Syllabus:							
Unit	Description						Duration (Hrs)
I	Matrices-I: Rank, normal form, system of linear equations, linear dependence and independence, linear and orthogonal transformations.						6
II	Matrices-II: Eigen values, Eigen vectors, Cayley – Hamilton theorem. application to problems in engineering (scaling, translation and rotation of matrix), diagonalization, canonical form.						6
III	Differential Calculus-I: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Successive differentiation, Leibnitz theorem, application to find curvature.						6
IV	Differential Calculus-II: Taylor's series, Maclaurin's series, Indeterminate forms, L' Hospital's rule, evaluation of limits.						6
V	Differential equations: Exact differential equations, differential equations reducible to Exact form, Linear differential equations, differential equations reducible to Linear form.						6
VI	Application of DE: Applications of differential equations to orthogonal trajectories, Newton's law of cooling, Kirchoff's law of electrical circuits, rectilinear motion, one-dimensional conduction of heat.						6
						Total	36
Text Books:							
1. Higher Engineering Mathematics by B.V. Ramana, 34e, Tata McGraw-Hill.							
2. Advanced Engineering Mathematics by Erwin Kreyszig, 9e, Wiley Eastern Ltd.							
Reference Books:							
1. Higher Engineering Mathematics by H. K. Dass, 22e, S. Chand Publication, Delhi.							
2. Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science International, Ltd.							
3. Advanced Engineering Mathematics, by Peter V. O'Neil, 7e, Thomson Learning.							
4. Advanced Engineering Mathematics by M. D. Greenberg, 2e, Pearson Education.							
5. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi.							

Course: Engineering Physics				Code: BFE1202			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
4	-	-	4	20	30	50	100
Prerequisites: <ol style="list-style-type: none"> 1. Wave theory of light 2. Elasticity 3. Atom, molecule & nuclei 4. Current, electricity & magnetism 5. Electromagnetic Induction 							
Course Objectives: <ol style="list-style-type: none"> 1. To build a strong conceptual understanding of Optics, Semiconductor Physics & Quantum Physics. 2. To explore advances in Physics with the introduction of Lasers, Nanotechnology & Superconductivity. 3. To provide consciousness about the importance of Physics principles in various engineering applications. 4. To provide hands on experience for better understanding of concepts as well as the development of experimental skills. 							
Course Outcomes*: After learning the course, students will be able to <ol style="list-style-type: none"> 1. Analyze intensity variation due to optical phenomena like interference and relate these concepts to various engineering applications 2. Apply the working principle of lasing action & interpret working of lasers with its prominent applications 3. Analyze & interpret electrical behavior of materials & relate the working of semiconductor devices with the concept of Fermi level 4. Interpret wave-like behavior of matter and apply Schrodinger's wave equation to study the quantum mechanical phenomenon 5. Interpret properties of superconductors & their applications in advanced technologies 6. Recognize properties, preparation methods of nanomaterials& explore their applications in various engineering fields. <p>*Attainments of the above course outcomes shall be computed on the basis of the evaluation of theory & laboratory work of the same course.</p>							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Wave Optics Interference: Interference at parallel thin film, conditions of maxima and minima, interference at wedge shaped film, anti reflection coating Diffraction: Types of diffraction, single slit diffraction (Derivation), diffraction grating (Qualitative), introduction to X-Ray diffraction Polarization: Law of Malus, Double refraction, Huygens' theory of double refraction, photo elasticity.						8
II	Laser Physics & Fiber Optics Laser Physics: Introduction, absorption,spontaneous emission, stimulated emission, population inversion, characteristics of laser, semiconductor hetero-junction laser, carbondioxide laser , applications of laser-industrial, defense & medical; introduction to holography Fiber Optics: Propagation of light in optical fibers, acceptance angle, numerical aperture, modes of propagation, types of fibers- step index, graded index, single mode & multimode; Losses -attenuation, dispersion; application in fiber optic communication link.						8
III	Semiconductor Physics Limitations of classical free electron theory, Kronig -Penny model (qualitative), band theory of solids, electrical conductivity of conductors & semiconductors, influence of external factors on conductivity (temperature, light & impurity), Hall effect (with derivation), Fermi Dirac probability distribution function, Fermi energy, position of Fermi level in intrinsic semiconductors (with derivation) & in extrinsic semiconductors, dependence of Fermi level on temperature & doping concentration, energy band diagram of P-N Junction diode, solar cell I-V characteristics and						8

	applications.	
IV	Quantum Mechanics Wave particle duality of radiation & matter, De Broglie hypothesis, De Broglie wavelength in terms of kinetic & potential energy, concept of wave packet, phase and group velocity, properties of matter waves, Heisenberg's uncertainty principle, wave function & probability interpretation, well behaved wave function, Schrodinger's time independent wave equation, application of independent wave equation to the problem of (i) particle in rigid box (ii) particle in a non rigid box(qualitative), Tunneling effect, example of tunneling in tunnel diode & scanning tunneling microscope (STM).	8
V	Magnetism and Superconductivity Magnetism: Classification of magnetic materials, temperature dependent magnetic transitions (Curie and Neel temperature), magnetic hysteresis loop, magneto-resistance, giant magneto-resistance (GMR), application of magnetic materials in magneto-optical recording , magnetocaloric effect, adiabatic demagnetization Superconductivity: Properties of superconductors-zero resistance, Meissner effect, isotope effect, BCS theory, type I and II superconductors, low Tc and high Tc superconductors, Josephson effect, construction, working and applications of DC-SQUID, applications - superconducting magnets, maglev trains	8
VI	Introduction to Nanoscience Origin of nanoscience, surface to volume ratio, quantum confinement, properties of nanomaterials-optical, electrical, mechanical, magnetic ; methods of preparation of nanomaterials- bottom-up and top-down approaches, physical methods- high energy ball milling, physical vapour deposition; chemical methods-colloidal method, applications- medical, sensors, space, defense, introduction to quantum computing.	8
	Total	48
Text Books:		
<ol style="list-style-type: none"> 1. A text book of Engineering Physics by Dr. M.N. Avadhanulu, Dr.P.G.Kshirsagar, Revised edition 2015 ,S. Chand & Company Pvt.Ltd. 2. Engineering Physics by R.K.Gaur , S. L Gupta, 8e 2012, Dhanpatrai Publications(P) Ltd. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Lasers & nonlinear Optics by B. B. Laud-Third edition ,New Age International (P)Ltd. Publishers. 2. Fundamentals of Optics by Francis A. Jenkins ,Harvey E. White, 4e, McGraw Hill Education (India)Pvt.Ltd. 3. Introduction to Fiber Optics by AjoyGhatak, K. Thyagarajan, First South Asian edition 1999, Cambridge University Press. 4. An introduction to Lasers theory and applications by Dr. M. N. Avadhanulu , Dr.P.S. Hemne, Revised edition 2017, S. Chand & Company Pvt.Ltd. 5. Introduction to Quantum Mechanics by David J. Griffiths, Darrell F. Schroeter, Third edition , Cambridge University Press. 6. Introduction to solid states Physics by Charles Kittel, 8e ,Wiley India Pvt Ltd. 7. Nano: The Essentials by T. Pradeep, 1e, 2007 , McGraw Hill Education. 8. Nanotechnology -Principles & Practices by SulbhaK.Kulkarni , 3e, Capital Publishing Company. 		

Course: Engineering Mechanics				Code: BFE1310			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
2	-	-	2	20	30	50	100
Prerequisites: <ol style="list-style-type: none"> 1. Basic principles of trigonometry 2. Geometry 3. Algebra 4. Linear differentiation and integration 5. Principles of Physics (equations of motions) 							
Course Objectives: <ol style="list-style-type: none"> 1. To provide adequate knowledge of mechanics to formulate and analyze problems based on real life situations. 2. To make aware about basic concepts of statics and dynamics for rigid bodies. 3. To impart fundamental knowledge of analysis of structures, equilibrium of force system and friction. 4. To build conceptual understanding of principles of kinetics and kinematics to solve various engineering problems. 							
Course Outcomes*: After learning the course, students will be able to <ol style="list-style-type: none"> 1. Draw Free Body Diagram (FBD), resolve and compose forces and analyze simple and compound beams. 2. Apply concept of equilibrium to analyze friction, trusses, cables and space force system. 3. Determine centroid of plane lamina & moment of Inertia for standard shapes and composite figures. 4. Apply equation of motion and Newton's second law in different forms like work energy principle and impulse momentum equation. 							
*Attainment of the above course outcomes shall be computed on the basis of evaluation of theory and laboratory work of the same course.							
Detailed Syllabus:							
Unit	Description						Duration (Hrs)
I	Resultant and Equilibrium of Coplanar Force System Introduction and Principle of statics, force systems, resolution and composition of forces, resultant of concurrent forces, moment of a force, Varignon's theorem, couple, resultant of general force system, free body diagram, equilibrium of three forces in a plane, equilibrium of concurrent forces, types of beams: simple and compound beams, type of loads, types of supports, equilibrium of general force system.						6
II	Analysis of Structures , Friction and Space forces Two force members: analysis of plane trusses by method of joint, analysis of plane trusses by method of section, cables subjected to point loads, Friction: laws of friction, ladders friction and application to flat belt, equilibrium of concurrent and parallel forces in a space, resultant of concurrent and parallel forces in a space.						6
III	Centroid of Plane Lamina and Moment of Inertia Centroid of plane lamina, applications of centroid, moment of inertia (MI), perpendicular axis theorem, parallel axis theorem, MI of Standard Shapes, MI of composite figures.						6
IV	Dynamics of Particle Kinematics of particle: constant acceleration, motion under gravity, equations of motions in cartesian and path coordinates for curvilinear motion, projectile motion, kinetics of particle: Newton's second Law and its applications to rectilinear motion, curvilinear motion, introduction to work energy principle and impulse momentum equation, direct and central impact, coefficient of restitution.						6
						Total	24

Text Books:

1. Vector Mechanics for Engineers STATICS by Beer & Johnston, Tata McGrawHill Publications
2. Vector Mechanics for Engineers DYNAMICS by Beer & Johnston, Tata McGrawHill Publications
3. Engineering Mechanics by A. K. Tayal, Umesh Publications
4. Engineering Mechanics by Bhavikatti , Newage Publications

Reference Books:

1. Engineering Mechanics by Singer Harper & Row, Hill Publishers
2. Engineering Mechanics by Meriam and Cragg , Wiley Publications
3. Engineering Mechanics by Timoshenko and Young, McGraw Hill Publications
4. Introduction of Engineering Mechanics by S. Rajshekaran and G Sankarasubramanian, Vikas Publications
5. Engineering Mechanics by R.S. Khurmi, S. Chand Publications



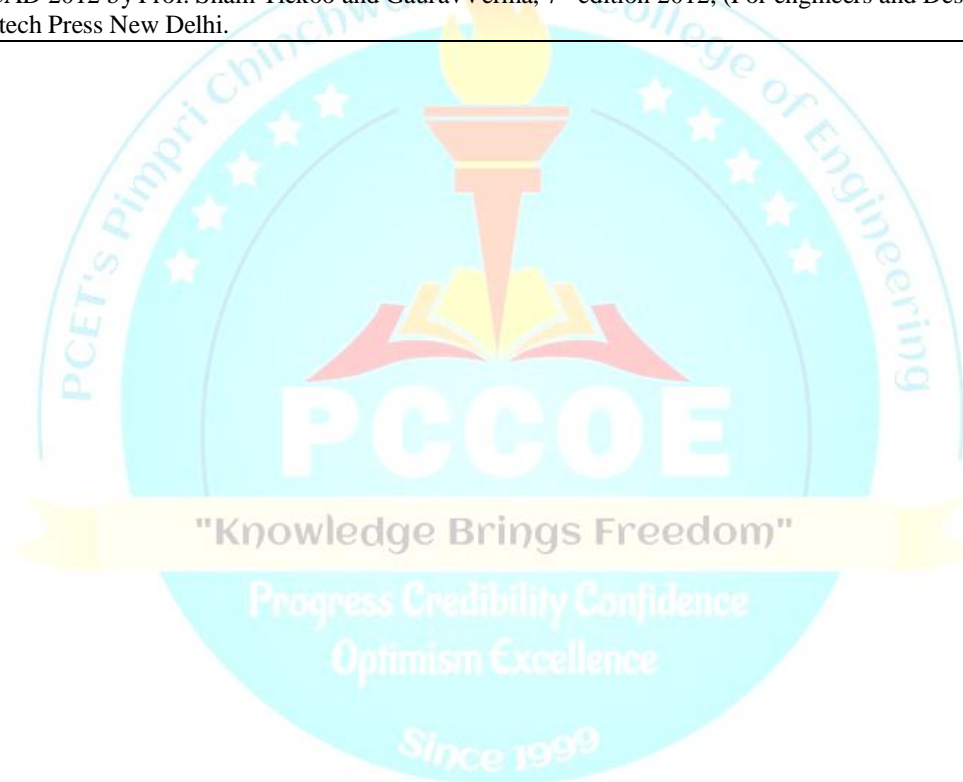
Course: Engineering Graphics				Code: BFE1301			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	-	-	1	-	20	30	50
Prerequisites:							
<ol style="list-style-type: none"> 1. Basic geometry such as different types of planes, solids etc. 2. Virtual imagination. 							
Course Objectives:							
<ol style="list-style-type: none"> 1. Develop imagination of physical objects to be represented on paper for engineering communication. 2. Develop the interpretation and manual drawing skills. 3. Develop the physical realization of the dimension of the objects. 4. Get basic hands-on training on computer aided drafting (CAD) tool. 							
Course Outcomes*:							
After learning the course, students will be able to							
<ol style="list-style-type: none"> 1. Interpret and draw different types of engineering curves and their application. 2. Imagine, interpret, analyze and draw different orthographic views of solids 3. Imagine, interpret, analyze and draw Isometric view from given orthographic view. 4. Draw, edit and modify basic drawings by using various tool bars of CAD software. 							
*Attainment of the above course outcomes shall be computed on the basis of evaluation of theory and laboratory work of the same course.							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Part A: Introduction to engineering drawing Importance of engineering drawing, introduction to drawing instrument and their uses, drawing sheet layout and its sizes, types of lines and their applications, dimensioning terminology and methods, quadrant and its positions, first angle and third angle projection method and their comparison. Part B: Engineering curves Ellipse, parabola, hyperbola by focus-directrix method and rectangle method, cycloid, involute, spiral & helix.						3
II	Orthographic projections Orthographic projection of given pictorial view by first angle method of projection, types of sections, sectional orthographic projection (only full sectional orthographic view)						4
III	Part A: Isometric view Isometric axes, scale, difference between isometric projection and isometric view, isometric view of simple solids and its dimensioning. Part B: Free hand sketching of innovative product Free hand sketching of any existing/innovative product e.g. concept vehicles, computer hardware, bridge design etc.						4
IV	Part A: Development of lateral surface of solids Development of cut section of prism, pyramid, cylinder and cone using single cutting plane. Part B: Introduction to computer aided drafting Introduction to GUI of CAD software, basic operation of CAD software, use of various commands for drawing, dimensioning, editing, modifying and plotting.						2
						Total	13
Note: Hands on practice will be completed during practical sessions.							

Text Books:

1. Engineering Drawing with an introduction to AutoCAD by Dhananjay A. Jolhe, 3rd Edition 2017, Tata Magraw Hill publishing company Ltd. New Delhi, India
2. A text book of Engineering Drawing by R.K. Dhawan, Revised Edition 2012, S. Chand and company ltd. New Delhi, India
3. Engineering Drawing by Basant Agarwal and C.M.Agarwal, 2nd Edition 2015, Tata Magraw Hill publishing company ltd. New Delhi, India

Reference Books:

1. Engineering Drawing, Plane and solid geometry by N.D.Bhatt and V.M.Panchal, 53rd edition 2019, Charotor publication house.
2. Engineering Drawing by M.B Shah and B.C Rana, 2nd edition 2009, Pearson Publications.
3. Engineering Graphics by P.J. Shah, Revised edition 2014, S Chand Publications.
4. Fundamentals of Engineering Drawing by Warren J. Luzzader, 11th edition 2015, Prentice Hall of India New Delhi.
5. Engineering Graphics for Degree by K.C.John, 2nd edition 2009, PHI learning Pvt. Ltd. New Delhi.
6. Auto CAD 2012 by Prof. Sham Tickoo and Gaurav Verma, 7th edition 2012, (For engineers and Designers)", Dreamtech Press New Delhi.



Course: Elements of Mechanical Engineering				Code: BFE1312			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
2	-	-	2	20	30	50	100
Prerequisites:							
<ol style="list-style-type: none"> Elementary mathematics Basic Physics up to higher secondary class 							
Course Objectives:							
<ol style="list-style-type: none"> Impart knowledge of mechanical engineering and describe the scope of mechanical engineering with multidisciplinary industries. Impart knowledge of basic concepts of thermodynamics and heat transfer applied to industrial applications. Understand, identify and get exposure to latest trends in manufacturing processes and materials. Describe the fundamentals of automobile systems and the emerging trends of electric vehicles, hybrid electric vehicles and solar vehicles. 							
Course Outcomes*:							
After learning the course, students will be able to							
<ol style="list-style-type: none"> Identify the basic mechanical elements and the power transmission drives based on their applications. Apply knowledge of basic laws of thermodynamics and heat transfer for real life applications. Identify different manufacturing processes and materials for different applications. Comprehend automotive system for the combustion vehicle, EV's, HEV's and solar vehicles. 							
*Attainment of the above course outcomes shall be computed on the basis of evaluation of theory and laboratory work of the same course.							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Basics of Design Engineering Introduction to mechanical engineering: use of mechanical engineering in day to day life and its interdisciplinary use, introduction to design thinking. Machine elements and power transmission drives: classification, function and applications of shaft, axle, key, bearing and coupling, belt drive, chain drive and gear drive. Mechanisms: four bar and slider crank mechanism with its inversions, robotics (configuration).						6
II	Thermal Engineering Introduction to thermodynamics: concept of a system, types of systems, Zeroth law of thermodynamics, energy interactions: heat and work, First law of thermodynamics & its limitations. Second laws of thermodynamics (simple numericals), modes of heat transfer, thermal resistance, insulation (simple numericals). Introduction to hydraulic turbines, centrifugal pumps, household refrigerator, window and split air conditioner.						7
III	Materials and Manufacturing Engineering Classification of materials, their properties and applications, phase change material (PCM), composite material. Introduction to manufacturing processes: classification and applications: sand casting, plastic moulding, sheet metal working and forging (hot working and cold working). Introduction to industry 4.0						6
IV	Mobility Engineering Classification of automobile, specifications of two wheeler, four wheeler and multi axle vehicles, types of chassis layout and drives, working of I.C. Engine (two and four stroke), gear boxes, single plate clutch, drum and disc brakes, drive train system, simple numericals on gear train. Concept and environmental importance of electric vehicles, construction and working of EV, hybrid electric vehicles and solar vehicles, challenges and future scope of EV's and HEV's.						7
						Total	26
Text Books:							
<ol style="list-style-type: none"> Basic Mechanical Engineering by Basant Agarwal and C.M. Agarwal, First edition 2008, Wiley publication. Engineering Thermodynamics by P.K. Nag, Sixth edition 2017, Tata McGraw-Hill publishing Co. Ltd. Heat and mass transfer by R K Rajput, Revised edition 2007, S Chand publication. A Textbook of Automobile Engineering by Khalil U Siddiqui, Fifth edition 2012, New Age International Publishers. 							
Reference Books:							

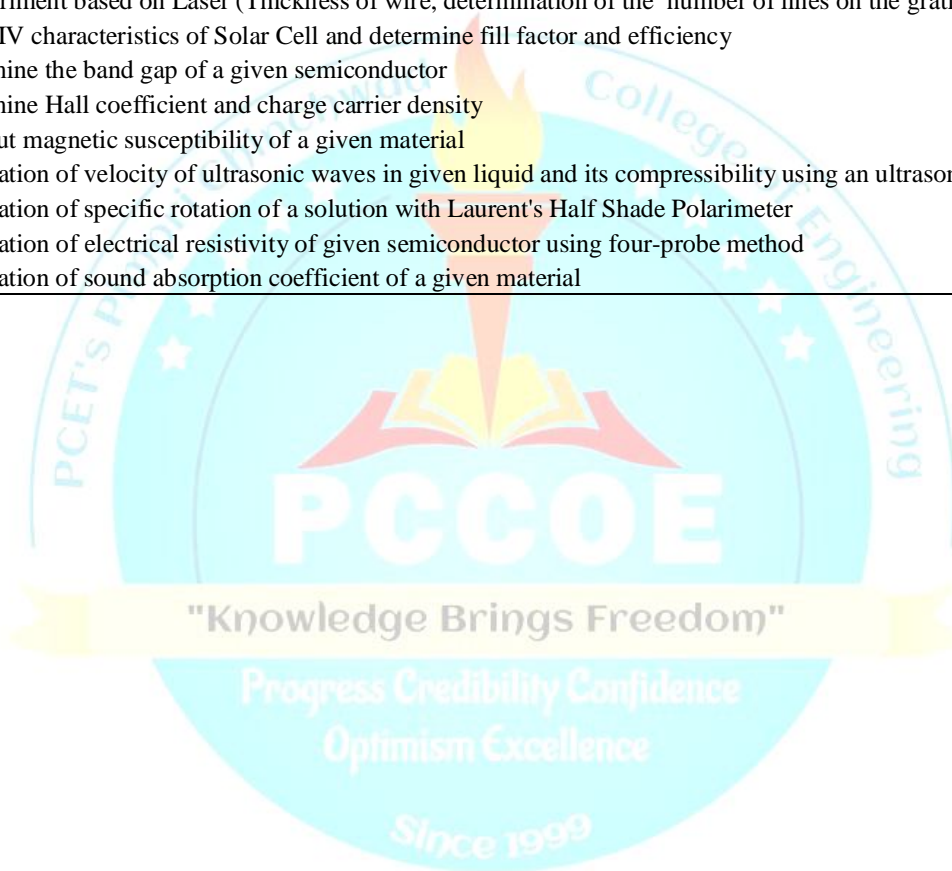
1. Design of Machine Elements by V.B. Bhandari, Fourth edition 2017, Tata McGraw-Hill publishing Co. Ltd.
2. Theory of Machine by S.S. Ratan, Fifth edition 2019, Tata McGraw-Hill publishing Co. Ltd
3. Thermal Engineering by Domkumar, Seventh edition 2014, Dhanpat Rai and Sons
4. Elements of Workshop Technology by Hajra, Chaudhari Volume I, Fourteenth edition 2008 Media Promoters and Publishers, Mumbai.
5. Elements of Workshop Technology by Hajra, Chaudhari Volume II, Twelfth edition 2007, Media Promoters and Publishers, Mumbai.
6. Handbook of Industry 4.0 and SMART Systems by Diego Galar Pascual, Pasquale Daponte, Uday Kumar, First edition 2019, CRC Press.
7. Industry 4.0 by Dr. Bhushankelkar, First edition 2019, Neuflex Publication.
8. Automobile Engineering Volume I by Dr. Kripal Singh, Eleventh edition 2008, Standard Publishers Distributors.
9. Automation, production systems computer integrated manufacturing by Mikell Groover, Fourth edition 2014, Pearson Publication.
10. Automotive Electrical Equipment- P. L. Kohli, First edition 2001, McGraw Hill Education (India) Pvt Ltd.



Course: Engineering Physics Laboratory				Code: BFE1203			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	2	-	1	50	-	-	50

List of Experiments: (Any 10 experiments from the following list)

1. Experiment based on Newton's rings (determination of the wavelength of monochromatic light, determine the radius of curvature of Plano-convex lens)
2. To determine unknown wavelength by using the plane diffraction grating
3. To verify Malus Law
4. Any experiment based on Double Refraction (Determination of refractive indices, identification of types of the crystals)
5. Any experiment based on Laser (Thickness of wire, determination of the number of lines on the grating surface)
6. To study IV characteristics of Solar Cell and determine fill factor and efficiency
7. To determine the band gap of a given semiconductor
8. To determine Hall coefficient and charge carrier density
9. To find out magnetic susceptibility of a given material
10. Determination of velocity of ultrasonic waves in given liquid and its compressibility using an ultrasonic interferometer
11. Determination of specific rotation of a solution with Laurent's Half Shade Polarimeter
12. Determination of electrical resistivity of given semiconductor using four-probe method
13. Determination of sound absorption coefficient of a given material



Course: Engineering Mechanics Laboratory				Code: BFE1311			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	2	-	1	50	-	-	50

List of Experiments:

Experimental work comprises of the following 6 experiments & 4 assignments.

Part A :

1. Verification of law of polygon of forces.
2. Support reactions of simple beam.
3. Determination of coefficient of friction for belt.
4. Determination of forces in space force system (concurrent)
5. Curvilinear motion.
6. Determination of coefficient of restitution.

Part B:

7. Assignment on Each Unit (considering application based problems)



Course: Engineering Graphics Laboratory				Code: BFE1302			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	4	-	2	50	-	-	50

List of Drawing Sheets:
Sheet no. 1 to 6 should be drawn by students on A2 size drawing sheet and sheet no. 7 by using CAD software

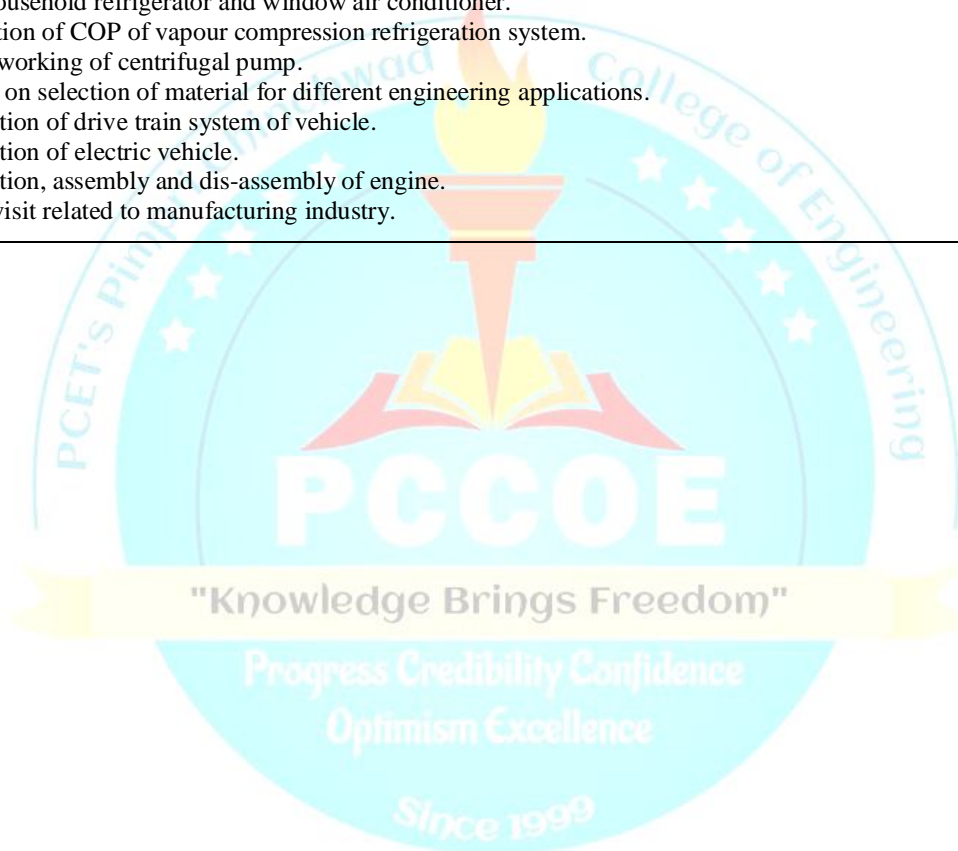
1. Types of lines and dimensioning
2. Engineering Curves (min.5 problems)
3. Orthographic projections (min.2 problems)
4. Isometric views (min. 2 problems)
5. Free hand sketching of any existing/innovative product
6. Development of lateral surface of solids (min.3 problems)
7. One sheet using CAD software package (min. 2 problems)



Course: Elements of Mechanical Engineering Laboratory				Code: BFE1313			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	2	-	1	50	-	-	50

List of Experiments: (Any 10 experiments from following list)

1. Case study on design thinking.
2. Demonstration on power transmission elements: couplings, bearings and gears.
3. Study of mechanisms: four bar, slider crank mechanism and its inversions.
4. Determination of heat transfer rate through the wall.
5. Study of household refrigerator and window air conditioner.
6. Determination of COP of vapour compression refrigeration system.
7. Study and working of centrifugal pump.
8. Case study on selection of material for different engineering applications.
9. Demonstration of drive train system of vehicle.
10. Demonstration of electric vehicle.
11. Demonstration, assembly and dis-assembly of engine.
12. Industrial visit related to manufacturing industry.



Course: HSMC-1 (English)				Code: BFE1101			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prerequisites:							
<ol style="list-style-type: none"> 1. Basic knowledge of grammar and phonetics 2. Basic reading and writing skills 							
Course Objectives:							
<ol style="list-style-type: none"> 1. To apply the basics of grammar accurately and appropriately to develop Language skills. 2. To enhance the skills of reading, writing, listening to English for its accurate and appropriate use. 3. To enhance Language competence. 							
Course Outcomes:							
After learning the course, students will be able to							
<ol style="list-style-type: none"> 1. To acquire a strong foundation in grammar and enhance their vocabulary skills. 2. To develop good listening skills. 3. To write appropriately and communicate effectively. 4. To speak confidently in English 							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Grammar: Introduction, Usage-based understanding of Grammar structures - Tenses, articles, prepositions, conjunctions and sentences						9
II	Building Word Power: Word formation, Words often Confused - Pairs of Words, Synonyms, Antonyms, idioms and phrases, one-word substitution, Foreign Phrases.						9
III	Speaking Skills enhancement: Pronunciation, stress, intonations, pauses and pace, effective use of speech, Comprehension and summation of technical passages and building technical vocabulary.						9
IV	Listening Skill development: Basics of Listening, ways to improve, Difference between talking and speaking, barriers to effective speaking, extempore, presentation skills, public speaking, hearing and listening difference.						9
	Total						36
Reference Books:							
<ol style="list-style-type: none"> 1. English for Engineering Students by Sharma, G.V.L.N. 2. Essential English Grammar (Elementary & Intermediate) by Raymond Murphy, CUP 3. English Grammar and Compositions by Martin, S. Chand Publications 4. Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson) 							

Course: HSMC-1 (Japanese)				Code: BFE1102			
Teaching Scheme			Evaluation Scheme				
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prerequisites:							
<ol style="list-style-type: none"> To make use of learned English/Marathi/Hindi language for learning the Japanese language. Willingness to learn a foreign language and a positive attitude towards the language and culture of Japan. 							
Course Objectives:							
<ol style="list-style-type: none"> To familiarise students to basics of the Japanese language . To develop an ability to understand and articulate themselves in day to day real-life situations. 							
Course Outcomes:							
After learning the course, students will be able to							
<ol style="list-style-type: none"> Read and write Japanese Scripts (Hiragana, Katakana) and Kanjis. Use the Japanese language in day-to-day life. Develop language skills namely listening, speaking, reading, and writing skills for socializing, providing and obtaining information. 							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Introduction Speaking: Greeting and introducing yourself, alphabets, numbers (0-10), Song of greetings and body parts. Listening: Short skit on self-introduction. Writing: Japanese scripts (Hiragana and Katakana) Reading: Lesson reading (1,2,3) Grammar: Particles (は、か、の、も) Test on grammar						11
II	How much is for one flower? Speaking: Framing sentences using counters and prepositions. Listening: Short clips based on counters and prepositions. Writing: Picture description Reading: Lesson reading (4,5,6) Grammar: Prepositions, counters, particles (に、と、や、など、なにも、なにか), introduction to verbs. Test on grammar, listening						11
III	What do you do on Sunday? Speaking: Framing sentences using days and dates. Listening: Video clips for days and dates. Writing: Daily routine writing. (Diary writing) Reading: Lesson reading (6,7,8,9) Grammar: Verbs (past, negative form) introduction to adjectives.						10
IV	I wake early every morning. Speaking: Talking about the daily routine. Listening: Video clips for days and dates. Writing: Daily routine writing. Reading: Lesson reading (6,7,8) Grammar: Verbs (past, negative form) introduction to adjectives. Test on grammar, listening						11
						Total	43
Text Books							
Minna no Nihongo Part I and II , Nihongo Shoho							

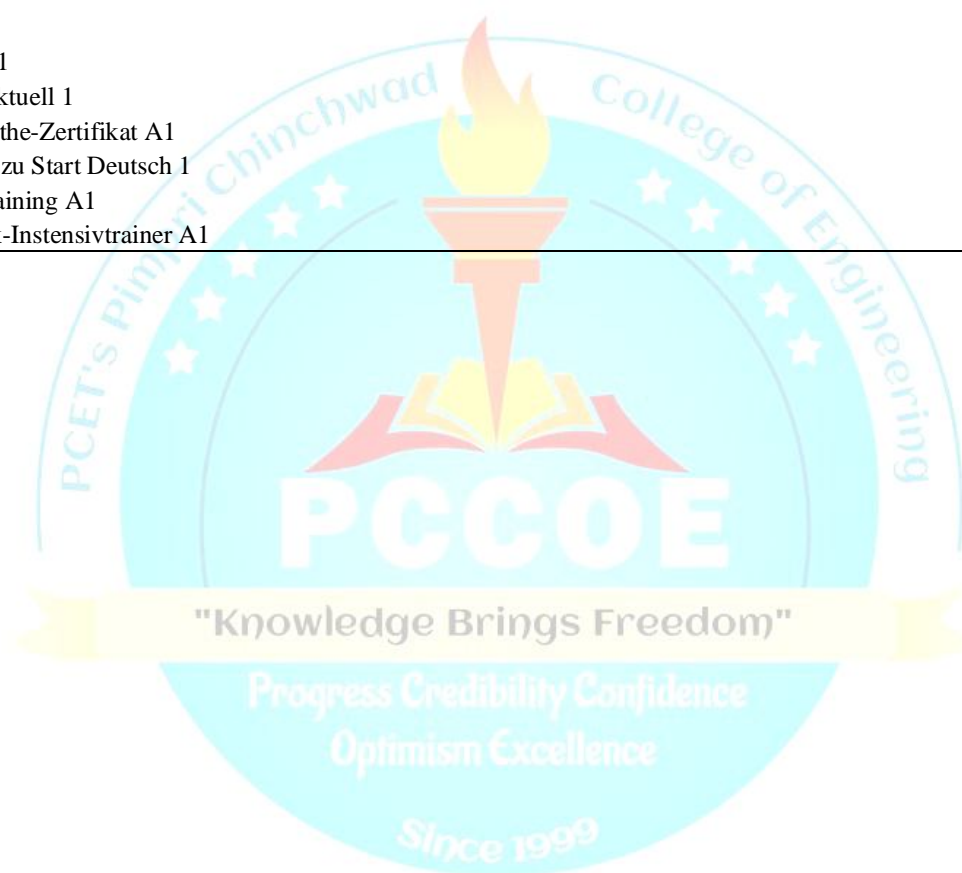
Reference Books:

1. MO MO Japanese for Class VII
2. MO MO Japanese for Class VIII
3. MO MO Japanese for Class VII workbook
4. MO MO Japanese for Class VIII workbook
5. Genki I, I
6. Japanese for busy people.

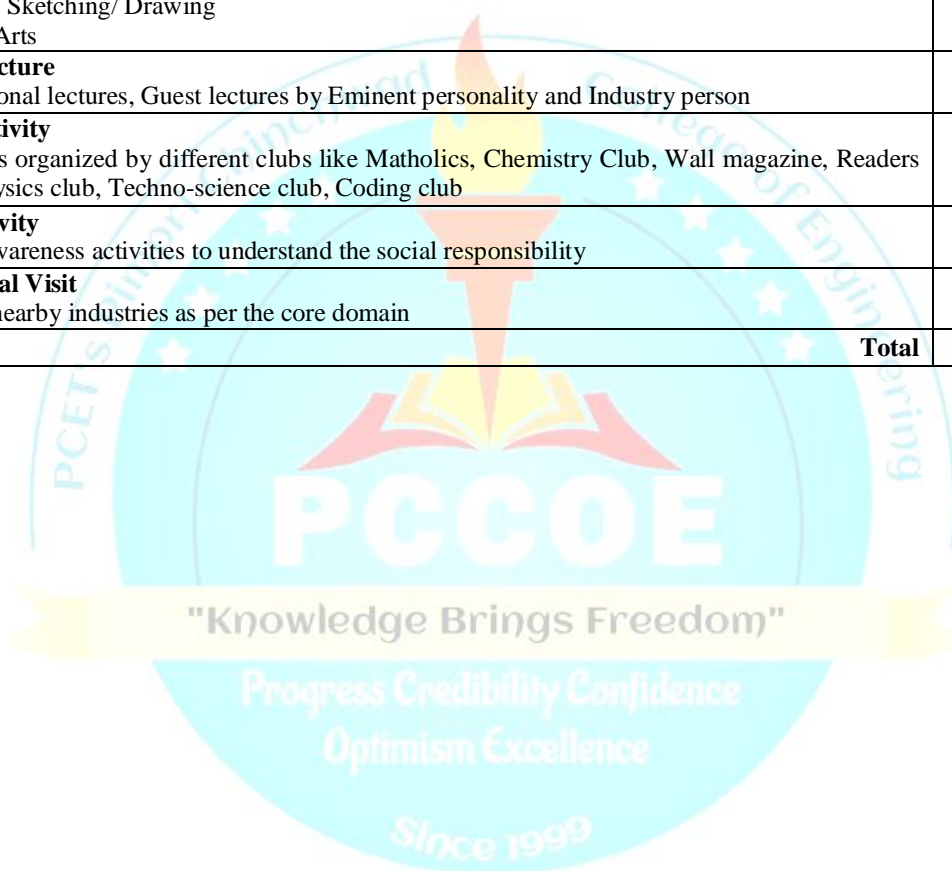


Course: HSMC-1 (German)				Code: BFE1103			
Teaching Scheme			Evaluation Scheme				
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prerequisites: Positive attitude towards and interest in foreign cultures.							
Course Objectives: 1. To familiarise students to the basics of the German language. 2. To develop an ability to understand and articulate themselves in day to day real-life situations							
Course Outcomes: After learning the course, students will be able to 1. Understand and use familiar everyday expressions and very simple sentences, which relate to the satisfaction of concrete needs. 2. Introduce oneself and others; ask and answer questions about personal details such as where he/she lives, people he/she knows, things he/she owns and respond to questions of this nature. 3. Interact in a simple way provided the other person talks slowly and is willing to help.							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Good Day Speaking: greeting and bidding farewell, introducing oneself and other person, spelling names and telling telephone numbers and email address. Vocabulary: numbers 0 to 20, names of countries and languages Listening: information on the origin and languages, telephone numbers and email address Writing: filling up the information in a table Reading: introduction of people Grammar: verbs and personal pronouns in singular, Wh-questions, Statements, Verbs						7
II	Hobbies, Work and Professions Speaking: talking about Hobbies, work and Profession Vocabulary: hobbies and professions, numbers 20 to 100 Listening: making a free time plan Writing: filling up personal data in a form Reading: profiles of working people Grammar: personal pronouns in the plural, irregular verbs and verb conjugations, Yes-No questions						7
III	In the city Speaking: talking about places and buildings in a city, asking for and explaining the direction Vocabulary: names of places and buildings in a city, vehicles, directions, numbers 100 onwards Listening: descriptions of paths Writing: description of cities Reading: events in a city Grammar: definite and indefinite article, negative article Test training and cultural and regional information						9
IV	Food and beverages Speaking: talking about eating habits, playing shopping situations Vocabulary: meal times, food items and beverages, shopping centres Listening: prices Writing: list with Prices, shopping list Reading: profile of a chef Grammar: nominative and Accusative case, Singular and Plural						7

V	<p>Daily routine Speaking: asking for clock time and week days, speaking about day-to-day activities Vocabulary: routine activities, clock time, days, months, seasons Listening: dialogues on free-time activities, schedules Writing: daily schedule, reply on an invitation Reading: appointment schedule Grammar: prepositions with time data, possessive determiners, modal auxiliaries Test training and cultural and regional information</p>	9
Total		39
Text Books: Netzwerk A1		
Reference Books:		
<ol style="list-style-type: none"> 1. Linie A1 2. Studio d A1 3. Tangram aktuell 1 4. Fit für Goethe-Zertifikat A1 5. Mit Erfolg zu Start Deutsch 1 6. Prüfungstraining A1 7. Grammatik-Intensivtrainer A1 		



Course Type : Life Skills		Code: BFE1901
Course Objectives:		
1. To understand importance of physical activities and awareness about the health.		
2. To provide platform to express their mind, body and the emotions through performing arts.		
Detailed Syllabus:		
Unit	Description	Duration (Hrs)
I	Yoga: Physical activities and Meditation Sports: Basket ball, Table tennis, Football and Volleyball	8
II	Performing arts Music Photography and Short Movie Making Painting/ Sketching/ Drawing Theatre Arts	8
III	Guest lecture Motivational lectures, Guest lectures by Eminent personality and Industry person	2
IV	Club activity Activities organized by different clubs like Matholics, Chemistry Club, Wall magazine, Readers club, Physics club, Techno-science club, Coding club	2
V	ISR activity Social awareness activities to understand the social responsibility	2
VI	Industrial Visit Visit to nearby industries as per the core domain	2
Total		24





Syllabi

B.Tech. First Year
[2020 Course]

SEM II

Course: Multivariate Calculus				Code: BFE2206			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
3	-	-	3	20	30	50	100
				Evaluation Scheme			
				TW	OR	PR	Total
-	-	1	1	50	-	-	50
Prerequisites:							
<ol style="list-style-type: none"> Elementary Mathematics. Elementary Calculus. 							
Course Objectives:							
<ol style="list-style-type: none"> To strengthen the concepts of multivariable calculus and its application in maxima & minima, error & approximation area, volume, CG and MI. To familiarize the students with continuous and discrete systems, where knowledge of Fourier series and Harmonic analysis is required. To make students acquainted with advanced techniques to evaluate integrals. 							
Course Outcomes:							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> Evaluate Partial Differentiation and apply the concept of PD in Euler's theorem, Jacobian, Maxima & Minima, and Error & Approximation. Apply Fourier series to represent the periodic time domain function to signal form. Evaluate definite integrals using techniques like reduction formula, Gamma, Beta function, DUIS, and Error function. Apply multiple Integration techniques to analyze area, volume, CG & MI. 							
Detailed Syllabus:							
Unit	Description						Duration (Hrs)
I	Partial Differentiation: Partial derivatives, Euler's theorem on homogeneous functions, implicit functions, and variable treated as constant, total derivatives, change of independent variables.						6
II	Jacobian: Jacobians and their applications, errors and approximations. Maxima and Minima: maxima and minima of functions of two and three variables.						6
III	Fourier Series: Definition, Dirichlet's conditions, full range Fourier series, half range Fourier series, Harmonic analysis and application to the engineering.						6
IV	Integral Calculus: Beta and Gamma functions, Reduction formula, differentiation under integral sign (DUIS), Error functions.						6
V	Double Integration & It's Application: Double integration, change of order of integration, conversion intopolar form,rectification of curves, application of double integration to area, CG, MI						6
VI	Triple Integration & It's Application: Triple integration, Dirichlet's theorem, application of triple integration to Volume, CG, and MI						6
						Total	36
Text Books:							
<ol style="list-style-type: none"> Higher Engineering Mathematics by B.V. Ramana, 34e, Tata McGraw-Hill. Advanced Engineering Mathematics by Erwin Kreyszig,9e, Wiley Eastern Ltd. 							
Reference Books:							
<ol style="list-style-type: none"> Higher Engineering Mathematics by H. K. Dass, 22e, S. Chand Publication, Delhi. Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science International, Ltd. Advanced Engineering Mathematics by Peter V. O'Neil, 7e, Thomson Learning. Advanced Engineering Mathematics by M. D. Greenberg, 2e, Pearson Education. Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi. 							

Course: Engineering Chemistry				Code: BFE2204			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
4	-	-	4	20	30	50	100
Prerequisites: <ol style="list-style-type: none"> 1. Structure of water. 2. Volumetric analysis. 3. Electromagnetic radiations. 4. Classification and properties of polymers. 5. Fossil and derived fuels. 6. Corrosion and its effects. 7. Electrochemical series. 							
Course Objectives: <ol style="list-style-type: none"> 1. To familiarize students with instrumental methods for qualitative and quantitative analysis and explore the importance of green chemistry. 2. To lead students to investigate the advancement in engineering materials, batteries and structural elucidation by spectroscopy. 3. To build consciousness about the recent development in alternate energy sources and corrosion control. 4. To develop experimental skills and thereby forge their conceptual lucidity. 							
Course Outcomes*: After learning the course, students will be able to <ol style="list-style-type: none"> 1. Analyze the water quality, interpret techniques of water purification and compare green over traditional chemical synthesis. 2. Apply basic principles of various electro-analytical techniques for qualitative and quantitative analysis and understand battery technology. 3. Apply the principles, instrumentation of UV & IR spectroscopy for structural elucidation. 4. Interpret the chemical structure, properties and synthesis of various polymers and nanomaterials and their uses. 5. Perceive and analyze fuel quality and identify the scope of derived alternate fuels. 6. Apply the preventive methods of corrosion to real-life problems. <p>*Attainments of the above course outcomes shall be computed on the basis of the evaluation of theory and laboratory work of the same course.</p>							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Water Technology and Green Chemistry. Impurities in water, hard water, hardness of water, its types, units of hardness and hardness calculation. Chemical analysis of water by determination of hardness by EDTA method. Alkalinity of water and its determination. Numericals on EDTA method and alkalinity. Disadvantages of hard water in boilers. Water softening techniques: Permutit and Ion exchange method. Water purification by reverse osmosis and electro-dialysis. Dissolved oxygen (DO), biological oxygen demand (BOD) and Chemical oxygen demand (COD). Introduction of Green Chemistry: Definition, goals, principles and green synthesis of Polycarbonate.						8
II	Instrumental Analysis and battery technology. a) Electrochemistry: fundamentals of an electrochemical cell, EMF of cell, reference and indicator electrodes and Nernst Equation. b) Basic principles, instrumentation and applications of :- i) Conductometry: introduction, Kohlrausch's law, measurement of conductance and conductometric titrations of strong acid versus strong base, strong acid versus weak base and mixture of acids Vs Strong base. ii) pHmetry: theory of buffers and preparation, standardization of pH-meter, titration of weak acid versus strong base, simple and differential plots. Battery technology: introduction and types of batteries, construction, working and applications of Lithium ion battery, charging and discharging reactions at respective electrodes.						8

III	<p>Spectroscopic techniques: Ultra Violet and IR spectroscopy</p> <p>a) UV Spectroscopy: nature of electromagnetic radiation and its characteristics. Interaction of matter with UV radiations leading to different electronic transitions. Beer's & Lambert's law, their derivations and applications. Instrumentation of UV -Visible spectrophotometer. Terms used in UV spectroscopy- chromophore, auxochrome, bathochromic shift (red shift), hypochromic shift (blue shift), hyper chromic and hypochromic effect.</p> <p>b) IR spectroscopy: principle, types of vibrations (stretching and bending), Hooks law. Different regions of IR spectrum such as fundamental group region, finger print region and aromatic region. Instrumentation of IR spectrophotometer with applications.</p>	8
IV	<p>Chemistry of Polymers and Novel Carbon Compounds</p> <p>a) Polymers : definition, classification of polymers on the basis of thermal behavior, reaction mechanism of free radical and condensation polymerization with suitable examples. Advanced polymeric materials: Structure, properties and applications of liquid crystal polymer – Kevlar, conducting polymers - Polyacetylene, electroluminescent polymer - PPV, biodegradable polymers - PHBV, polymer composite - fibre reinforced polymer and recycling of polymers.</p> <p>b) Nanomaterials: definition, types of nanomaterials and properties of nanomaterials. Quantum dots, structure, synthesis, properties and applications of CNTs, Fullerenes and Graphene.</p>	8
V	<p>Fuels and combustion</p> <p>a) Fuels: definition, classification of fuels, calorific value and its units. Calorific value (CV), gross calorific value (GCV), net calorific value (NCV). Determination of calorific value - Bomb calorimeter, Boy's calorimeter and numericals.</p> <p>i) Solid fuels: coal, classification of coal, proximate and ultimate analysis of coal, numericals based on analysis of coal.</p> <p>ii) Liquid fuels: origin of petroleum, composition of petroleum, refining of petroleum, Octane number of petrol and Cetane number of diesel. Synthesis reaction, properties, advantages and disadvantages of Power alcohol and Biodiesel.</p> <p>iii) Gaseous fuels: Hydrogen gas as a future fuel, production by steam reforming of methane and coke, storage and transportation. H₂- O₂ fuel cell.</p> <p>b) Combustion: chemical reactions, calculations on air requirement for combustion.</p>	8
VI	<p>Corrosion and Corrosion control</p> <p>a) Corrosion: introduction, types of corrosion, mechanism of atmospheric corrosion and wet corrosion. Electrochemical and galvanic series. Factors affecting corrosion: nature of metal and nature of environment.</p> <p>b) Corrosion control: methods of prevention of corrosion - cathodic and anodic protection, metallic coatings and its types - anodic and cathodic coatings. Method to apply metallic coatings - hot dipping, cladding, electroplating and cementation. Non-metallic coating - powder coating.</p>	8
	Total	48
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Engineering Chemistry by S.S. Dara, S.Chand Publications (2010). 2. Engineering Chemistry by B.S. Chauhan, UnivSc Press.(2015). 3. A Text Book Of Engineering Chemistry by ShashiChawla, DhanpatRai & Co. (2015). 4. Spectroscopy of Organic Compounds by P. S. Kalsi, New Age International (2007). 5. Nanotechnology: principles and practices by S.K. Kulkarni, Springer (2014). 6. Instrumental methods of Chemical Analysis by GurdeepChatwal, Himalaya publishing house (1996). 7. Engineering Chemistry by Jain and Jain, DhanpatRai Publishing Co.(2016). 8. Engineering Chemistry by Wiley India (2012). 9. Engineering Chemistry by O.G. Palanna, McGraw-Hill Education. 10. Introduction to Nanoscience and Nanotechnology by K. K. Chattopadhyay, A. N. Banerjee. PHI Learning (2009). 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Hydrogen as a fuel by Ram D. Gupta, C.R.C.Publication (2009). 2. Instrumental Methods of Analysis by H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, 6 th Edition, CBS Publisher. 3. Organic Spectroscopy by William Kemp, 3rd edition, John Wiley and Sons, Palgrave publication. 4. Polymer Science by V.R.Gowariker,, New Age International Publication (2015). 5. Nanotechnology by T. Gregory, Springer Verlag New York (1999). 6. Introduction to Nanotechnology by Charles P. Poole, Frank Owens, John Wiley & Sons (2003) 7. Engineering Chemistry by Wiley India Pvt. Ltd, First edition 2011. 		

8. Inorganic Chemistry by Shriver and Atkins ,5e,Oxford University Press..
9. Hydrogen fuel-production transport and storage by Ram Gupta,CRC Press.
10. Basic concepts of analytical Chemistry by S.M.Khopkar, 2e, New Age International Publications.



Course: Basic Electrical & Electronics Engineering				Code: BFE2304			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
2	-	-	2	20	30	50	100
Prerequisites: <ol style="list-style-type: none"> 1. Electron theory 2. Ohms law 3. Magnetism 4. Number system 5. Semiconductor theory 							
Course Objectives: <ol style="list-style-type: none"> 1. To provide working knowledge for the analysis of basic DC circuits. 2. To build strong conceptual understanding of single phase and polyphase AC circuits with phasor diagram representation. 3. To provide hands on experience for conceptual understanding of DC and AC machines. 4. To introduce fundamental concepts of analog and digital electronics. 							
Course Outcomes*: After learning the course, students will be able to <ol style="list-style-type: none"> 1. Analyze DC circuits as well as compare electric and magnetic circuits. 2. Analyze single phase and three phase circuits to determine various computed electrical parameters. 3. Demonstrate the constructional features and operational details of DC and AC machines. 4. Identify type of diodes, transistor configurations as well as to build and test digital circuits using logic gates and flipflops. 							
*Attainment of the above course outcomes shall be computed on the basis of evaluation of theory and laboratory work of the same course.							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Electric and magnetic circuit Electric Circuits: Classification of electrical networks, ideal and practical voltage and current sources, Source transformation, Simplification of networks using series and parallel combinations, Star delta transformation, Kirchhoff's laws (loop Current analysis), Magnetic Circuit: Flux, flux density, reluctance, MMF, permeability and field strength, their units and relationships; comparison of electric and magnetic circuit, Series magnetic circuit						6
II	Single and three phase AC circuits Single phase AC Circuits: Elementary idea about power generation, transmission and distribution, Generation of single-phase sinusoidal A.C voltages, AC Quantities, Single phase ac circuit analysis (R, L, C, R-L-C series) on the basis of impedance, admittance, concept of active, reactive, apparent power and power factor etc. Three phase AC Circuits: Introduction to 3 phase supply and its necessity, balance three phase system, relation between line and phase quantities (with phasor diagram), power in three phase circuits for star and Delta connection						6
III	DC and AC machines DC Machines: Construction, working principle of D.C. generator, emf equation of D. C. generator (derivation not expected), working principle of D.C. motor, types of D.C. motor, Back emf (Numerical), Industrial applications. AC Machines: Single phase transformers: Construction, operating principle, emf equation, voltage and current ratios. Losses, Efficiency and regulation, Concept of ideal transformer, Auto-transformer						6

IV	<p>Analog and digital electronics Analog Electronics</p> <p>Diode: Ordinary Diode, LED, Photodiode and Zener Diode: Construction, symbol, working, characteristics, applications etc.</p> <p>Transistor: construction, types, operation; transistor configuration (CE, CB and CC): characteristics.</p> <p>Digital Electronics</p> <p>Logic Gates: Fundamental, derived and exclusive logic gates: symbol, operation, truth table, timing diagram; concept of universal gates</p> <p>Combinational Logic Circuit: Reduction of digital expressions by Boolean algebra and De Morgan's Theorem, half and full adder</p> <p>Sequential Logic Circuit: Flip – Flop (SR, D, JK & T): construction, working, truth table; types of triggering, 2 bit synchronous & asynchronous counter: construction and operation</p>	6
	Total	24
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Theory and problems of Basic Electrical Engineering by I. J. Nagrath and Kothari ,Eastern Economy edition, PHI learning Pvt.Ltd. 2. Fundamentals of Electrical Engineering by AshfaqHusain , 4e, DhanpatRai&Co. 3. Basic Electrical Engineering by V. N. Mittal and Arvind Mittal,2e, McGrawHill. 4. Basic Electrical Engineering by V.K. Mehta ,1st revised edition, S. Chand & Co. Pvt. Ltd. New Delhi. 5. Electronics Devices by Thomas. L. Floyd, 9e,Pearson. 6. Modern Digital Electronics by R.P. Jain, 4e, Tata McGrawHill 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Basic Electrical Engineering by D. C. Kulshreshtha,1 e, Tata McGraw hill. 2. A textbook of Electrical Technology (Vol I & II) by B. L. Theraja and A. K. Theraja, 1st edition, S. Chand & Co. Pvt. Ltd. New Delhi. 3. Electrical Technology by Edward Hughes ,10e,Pearson. 4. Digital Fundamentals byThomas L Floyd, 10e, Pearson. 5. Digital design by M. Morris Mano, 3e, Pearson. 6. Fundamentals of digital circuits by Anand Kumar, 2e, Prentice Hall of India 		

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Course: Programing & Problem Solving				Code: BFE2308			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	-	-	1	-	20	30	50
Prerequisites: Students are expected to have a good understanding of basic computer principles.							
Course Objectives:							
<ol style="list-style-type: none"> To acquaint with problem solving, problem solving aspects, programming and various program design tools. To develop problem solving skills with computers. To develop competency for the design, coding and debugging. To build the programming skills using 'Python Language'. 							
Course Outcomes*:							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> Apply skills in problem solving for finding solutions to real life problems. Analyze the methods and apply the most appropriate one for solving problems. Apply Programming logic/logical constructs of Python language for problem solving. Demonstrate significant experience with the 'Python' program development environment. 							
*Attainment of the above course outcomes shall be computed on the basis of evaluation of theory and laboratory work of the same course							
Detailed Syllabus:							
Unit	Description						Duration (Hrs)
I	Problem Solving Using Computers: General problem solving strategies, Top down design, Introduction to program planning tools- algorithm, flowcharts, pseudo codes. Introduction to Logic Structures: Sequential structure, decision Structure, Basics of Python Programming: Features of Python, literal constants, variables and identifiers, input operation, Reserved words, Indentation, Operators and expressions. Case Study: Exchanging the values of two variables, summation of a set of numbers.						2
II	Decision Control Statements: Decision control statements, selection/conditional branching statements, loop Structures/Iterative statement, selecting appropriate loop. Nested loops, the break, continue, pass, else statement used with loops. Other data types- Tuples, Lists and Dictionary. Case Study: Factorial Generation of the Fibonacci Sequence, reversing the digits of an integer.						3
III	Functions and Modules: Need for functions, Function: definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function, documentation string, good programming practices. Introduction to modules and packages, Introduction to standard library modules and packages.						4
IV	Strings and Operations: concatenation, appending, multiplication and slicing. Strings are immutable, strings formatting operator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, iterating strings, the string module.						3
						Total	12
Text Books:							
<ol style="list-style-type: none"> How to Solve it by Computer by R. G. Dromey, 1e Pearson Education. Python Programming Using Problem Solving Approach by ReemaThareja, 2e, Oxford University Press. Core Python Programming by R. NageswaraRao, 2e, Dreamtech Press. 							
Reference Books:							
<ol style="list-style-type: none"> Problem Solving and Programming Concepts- by Maureen Spankle, 9 e, Pearson. Head First Python:-A Brain Friendly Guide by Paul Barry , 2e, O'Reilly Media, Inc. Python: The Complete Reference by Martin C Brown, 4 e, McGraw Hill Education. Programming and Problem Solving with Python by Ashok NamdevKamthane, , 1e, McGraw Hill Education. 							

Course: Workshop Practices				Code: BFE2303			
Teaching Scheme			Evaluation Scheme				
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	2	-	1	50	-	-	50
Prerequisites:							
<ol style="list-style-type: none"> Algebra Geometry 							
Course Objectives:							
<ol style="list-style-type: none"> To introduce various machine tools and demonstration on machining To introduce different materials in engineering practices with respect to their workability, formability and machinability. To develop skills through hands on experience. 							
Course Outcomes:							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> Identify and choose various manufacturing processes for given material. Use various hand tools and basic measuring instrument used for carpentry, welding, fitting, and sheet metal operation. Identify advanced manufacturing processes. Follow safety practices on shop floor. 							
List of Experiments:							
<ol style="list-style-type: none"> Introduction to safety measures. Demonstration of Manufacturing processes (Machining: Turning, Drilling, Milling and grinding using one simple machine component and sheet metal operations): Working, operation and types Demonstration of sand casting and plastic molding: Preparation of sand mold and molding of simple plastic component Finishing, inspection and assembly of machine components using different tools (Finishing, assembly) and measuring instruments. (For jobs made during preceding practical) Demonstration of Advanced Manufacturing processes (CNC Machining, Additive manufacturing using one simple machine component) Demonstration of electrical and electronic component assembly Carpentry-1 Job involving joint and wood turning Fitting – 1 Job involving fitting to size, male female fitting with drilling and tapping. Joining – 1 Job involving welding (Arc), soldering, brazing etc. Dismantling and Assembly of simple machines. 							
Note:							
<ol style="list-style-type: none"> Assignment one is mandatory. Any four from experiment number 2 to 6. Students will perform any two utility jobs from experiment number 7 to 10. 							
Submission: Two jobs as mentioned above and write up of demonstration with sketches/illustration.							

Course: Mini Project and Basics of Innovation				Code: BFE2701			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	4	-	2	100	-	-	100
Prerequisites: Knowledge of basic sciences till higher secondary level.							
Course Objectives: 1. To develop innovative thinking, research attitude and project-based learning ability. 2. To provide every student the opportunity to get involved either individually or as a group so as to develop the team skills and learn professionalism.							
Course Outcomes: After learning the course, the students will be able to: 1. Understand concepts of Research, Innovation, Invention and IPR. 2. Identify projects relevant to societal needs/conservation of environment/scope of the subject. 3. Apply the technological knowledge to find feasible solutions for the selected problem.							
Detailed Syllabus:							
Unit	Description						Duration (Hrs)
I	Introduction to Research, Innovation & Invention: What is Research, Innovation and Invention, interdisciplinary view, fundamental and applied research with examples and importance of both, engineering inventions, Information about some great inventions (In form of videos).						2
II	Literature Review: Effective searching of literature, a summary of literature review. Research Ethics: Plagiarism, authorship, use of language, protecting confidentiality, conflicts of interest. Publication Platforms: Conferences (national and international), journals (national and international), the meaning of impact factor and citation index, Web of Science, Scopus, etc.						2
III	Structure of Concept Note: Title of an idea, introduction, brief description with sketch, goal and objectives, impact and uniqueness of the idea, time required for developing the prototype, approximate cost analysis. Structure of Research Paper: Research paper (national and international), Title and abstract, introduction, method, evaluation, conclusion, references, writing a research paper-style of writing and formatting.						2
IV	Introduction to Design Thinking (DT): What is Design Thinking? Phases of DT, DT or 'Out of the Box' thinking, DT: an iterative and non-linear process, SCAMPER technique for DT, Case studies.						2
V	Intellectual property (IP): Introduction to IPR, patents, copyrights, role in commerce, overview and importance, case studies in IPR. Patent Search: What is a patent search? Types of patent search, step to start a patent search, patent search in Google patent search						2
VI	Basics of Entrepreneurship: Introduction, types of entrepreneurship, the process of entrepreneurship, theories of entrepreneurship, social responsibility of entrepreneur, startup policies.						2
						Total	12
Activities: (Any 3 of the following) 1. Assignment on Identifying International/National Journals in your project domain. 2. Assignment on patent search in your project domain through Google patents. 3. Presentation/Report based on literature survey for the project. 4. Small activity based on SCAMPER technique for DT.							
Mini Project: 1. Idea Inception. 2. Model/poster (A3 Size)/report writing/research article based on the project. 3. Demonstration/exhibition based on carried out work.							

Course: Engineering Chemistry Laboratory				Code: BFE2205			
Teaching Scheme			Evaluation Scheme				
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	2	-	1	50	-	-	50

List of Experiments: (Any 10 experiments from the following list)

- Determination of total hardness of water sample by EDTA method.
- Determination of total alkalinity of the water sample.
- Titration of a mixture of weak acid and strong acid with st. base using a Conductivity meter.
- To determine the dissociation constant of a weak acid (acetic acid) using pH meter
- Study Practical:- A) Potentiometric titration of ferrous versus Cerium.
- To determine the maximum wavelength of absorption of CuSO₄, verify Beer's law and find unknown concentration in the given sample.
- Study Practical:- B) Structural identification of unknown compounds by UV and IR.
- To prepare the Phenol formaldehyde resin or polypropylene.
- Proximate analysis of Coal.
- To determine the Electrochemical equivalent (ECE) of Cu.
- Chromatographic separation of Ortho and para nitro-phenol .
- Study of corrosion of metals in a medium of different PH

Laboratory manual :

- Vogels Text book of Qualitative Chemical Analysis by J.Mendham,R,C,Denny,J.D.Barnes,M.J.K.Thomas, 6 e, Pearson Education Ltd.
- Applied Chemistry Theory and Practice by O.P.Virman and A.K.Narula, 2e, New age International (P) Ltd.

Course: Basic Electrical & Electronics Engineering Laboratory						Code: BFE2305	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	2	-	1	50	-	-	50

List of Experiments: Group A

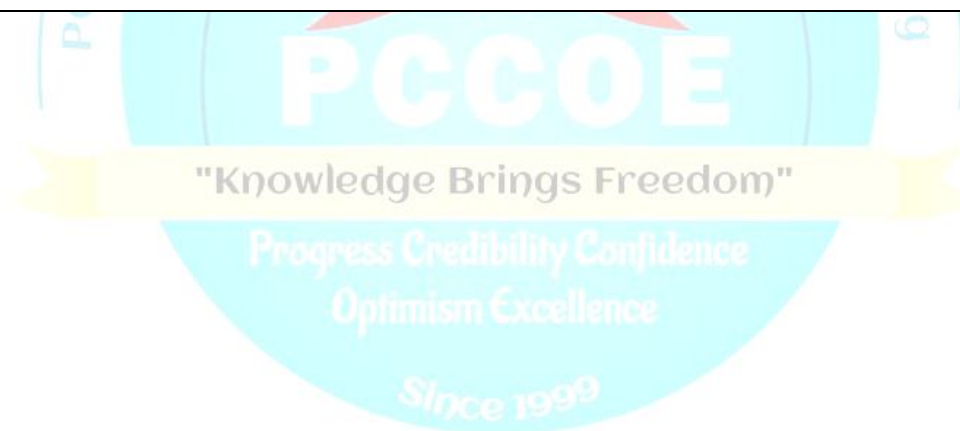
From following any **three** Practical are to be study:

1. To study of various wiring accessories, earthing system and safety precautions while working with electrical systems.
2. Study of Electricity bill of LT consumer.
3. Study of Single Line diagram of Power System
4. To study various electronics circuit components and allied accessories
5. To study digital multimeter, digital trainer kit and CRO

Group B

From following any **seven** Practical are to be performed:

1. To verify Kirchhoff law in a DC network
2. To measure steady state response of series RL and RC circuits on AC supply and observations of voltage and current waveforms.
3. To verify the relation between phase and line quantities in three phase balanced star and delta connections of load.
4. Perform load test on DC Shunt Motor to plot characteristics
5. To determine efficiency and regulation of single-phase transformer by direct loading test.
6. To Plot V-I characteristics of P-N Junction Diode and Zener Diode
7. To Plot input and output characteristics of CE Transistor configuration
8. Implementation of Half Adder & Full Adder using Logic Gate IC's
9. Verify its truth table SR, D, JK & T flipflops.



Course: Programing & Problem Solving Laboratory				Code: BFE2309			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	OR	PR	Total
-	4	-	2	50	-	-	50
Assignment No.	List of Experiments(Any 10) Write a program in Python (with function as applicable)						Duration (Turns)
1	Give the values of the variables x,y and z, Write a program to rotate their values such that x has the value of, y has the value of z, and z has the value of x.						1
2	Write a program to find roots of quadratic equations.						1
3	To calculate salary of an employee given his basic pay (take as input from user). Calculate salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate salary payable after deductions.						1
4	To accept total number of minutes as input and then output as hrs + minutes. Ex:- 90 minutes=1hr 30 mins						1
5	To accept an object mass in kilograms and velocity in meters per second and display its momentum. Momentum is calculated as $e=mc^2$ where m is the mass of the object and c is its velocity.						1
6	To accept marks of five courses of students and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is $60 \geq$ and <75 then the grade is first division. If aggregate is $50 \geq$ and <60 , then the grade is second division.If aggregate is $40 \geq$ and <50 , then the grade is third division.						1
7	Write a program to check whether number is odd or even.						1
8	Write a program to find GCD/LCM of two numbers.						1
9	Write a program that extracts and prints the rightmost digit of the integer value.						1
10	Write a program to check whether input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself. Ex. 371.						1
11	To accept some N numbers from user. Compute and display maximum in list, minimum in list, the count, sum and average of numbers.						1
12	Write a program to check if two given non-negative integers have the same last digit.						1
13	Write a program to simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division with special operations like computing xy and $x!$.						1
14	Write a program to accept number from 1 to 7 and print equivalent day of the week (i.e. 1 Monday).						1
15	Write a program to accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number, e) prime factors.						1
16	Write a program to accept a number from user and print digits of number in a reverse order.						1
17	Write a program to input binary number from user and convert it into decimal number.						1
18	Write a program to accept list of N integers and partition list into two sub lists even and odd numbers .						1
19	Write a program to generate Fibonacci series.						1
20	Write a program to convert small letter in to capital letter.						1
21	Write a program to generate Pascal's triangle.						1
22	Write a program that accepts a string from user and perform following string operations- a)Calculate length of string, b)String reversal, c)Equality check of two strings, d)Check palindrome, e)Check substring.						1
23	Write a program to accept password from user with following condition: 1. Minimum characters 6 and maximum are 12 2. Atleast one digit and one characters. 3. Atlest one special symbol (@, \$,#).						1
24	**** Implement a Mini Project to use all the concepts of Computer Programming and						1

Problem solving using PYTHON *****(Subject Activity)		
	Total	24
Text Books:		
<ol style="list-style-type: none"> 1. How to Solve it by Computer, R. G. Dromey, 1st edition, Pearson Education 2. “Python Programming Using Problem Solving Approach”, ReemaThareja, 2nd edition Oxford University Press. 3. “Core Python Programming”, R. NageswaraRao, Second edition, Dreamtech Press. 		
Reference Books:		
<ol style="list-style-type: none"> 1. “Problem Solving and Programming Concepts”, Maureen Spankle, 9th edition, Pearson 2. “Head First Python- A Brain Friendly Guide”, Paul Barry , 2nd Edition, O'Reilly Media, Inc. 3. “Python: The Complete Reference”, Martin C, 4th edition Brown, McGraw Hill Education.. 4. “Programming and Problem Solving with Python” ,Ashok NamdevKamthane, ,1st edition, McGraw Hill Education 		



Course : HSMC-2 (English)				Code :BFE2104			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prerequisites:							
<ol style="list-style-type: none"> 1. Basic knowledge of grammar and phonetics 2. Basic word power, speaking and listening skills 							
Course Objectives:							
<ol style="list-style-type: none"> 1. To develop reading and writing skills for effective communication. 2. To develop a sense of confidence among students to present themselves at professional as well as societal level. 3. To enhance the language competence. 							
Course Outcomes:							
After learning the course, students will be able to							
<ol style="list-style-type: none"> 1. Demonstrate an ability to articulate themselves in an appropriate manner. 2. Demonstrate their intellectual ability to think, review, express on various societal concerns. 3. Write and communicate effectively in formal and informal scenarios. 4. Present themselves in front of large audiences in a variety of situations related to group communication and effective writing and oral presentation skills. 							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Overview of basic concept/ fundamentals of English proficiency-I Introduction, overview of Grammar, word power, enhancement of reading and writing skills.						9
II	Reading skill enhancement: Meaning, Importance of reading with punctuations, types of readings, types of reading, Reading between and beyond the lines, Barriers to Reading and Techniques to improve reading, focus on syllable stress intonation and pitch, Reading Comprehension, Active & Passive voice.						9
III	Writing skill enhancement: Focus on writing structure, stages of writing (Pre, while and post), effective writing, mechanics of writing, importance of punctuations.						9
IV	Communication as a skill: Importance of communication, process of communication, Barriers in communication, ways to improve, importance of effective communication. [Business letters, CV, email, report writing, technical writing, Presentation (written/ oral) (During Lab hours)]						9
						Total	36
Reference Books:							
<ol style="list-style-type: none"> 1. Effective Technical Communication by Rizvi, M. Ashraf. McGraw – Hill 2. Communication Skills for Engineers by S. Mishra & C. Muralikrishna, Pearson Education 3. English for Technical Communication by K.R Lakshminarayana, SCITECH 4. Creative English for Communication by Krishnaswami, N. and Sriraman, T., Macmillan. 5. Written Communication in English by Saran Freeman, Orient Longman 							

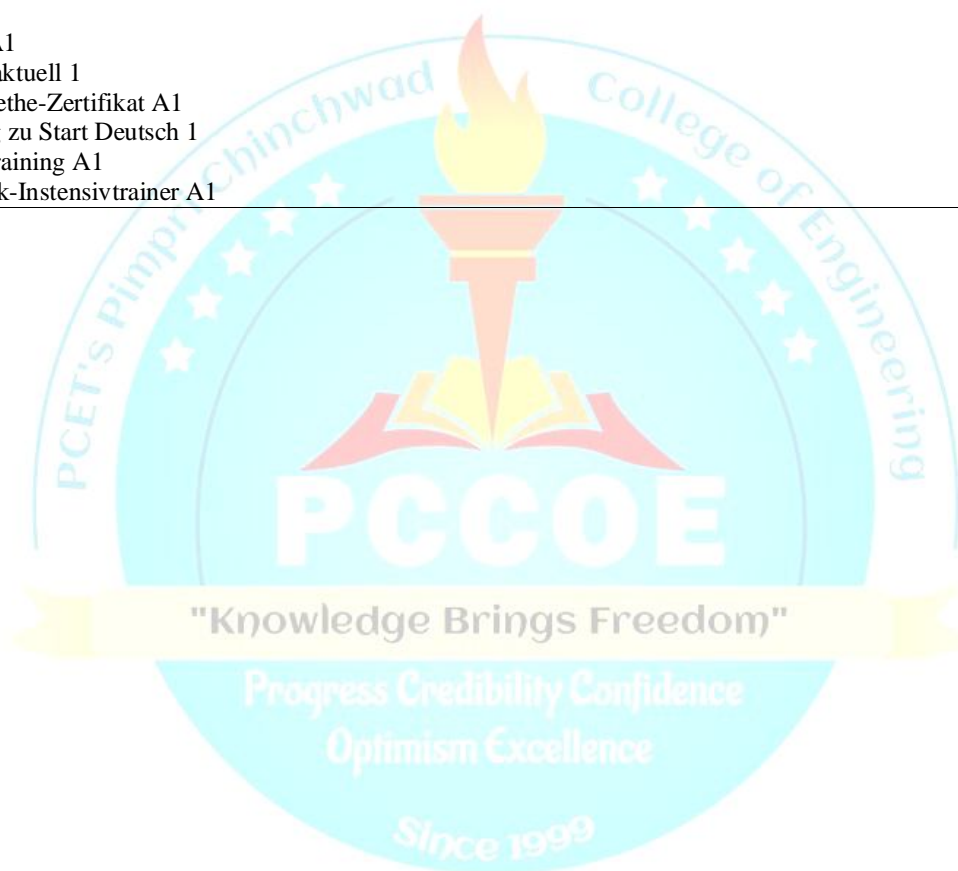
Course : HSMC-2 (Japanese)				Code : BFE2105			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prerequisites:							
<ol style="list-style-type: none"> To make use of learned English/Marathi/Hindi language for learning Japanese language. Willingness to learn a foreign language and positive attitude towards the language and culture of Japan. 							
Course Objectives:							
<ol style="list-style-type: none"> To familiarise students to basics of Japanese language . To develop an ability to understand and articulate themselves in day to day real life situations. 							
Course Outcomes:							
After learning the course, students will be able to							
<ol style="list-style-type: none"> Read and write Japanese Scripts (Hiragana, Katakana) and Kanjis. Use Japanese language in day-to-day life. Develop language skills namely listening, speaking, reading, and writing skills for socializing, providing and obtaining information. 							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Please do / do not do. Speaking: Requesting someone to do or not to do something. Listening: Video clips based on grammar. Writing: Dialogue writing (at shop / library.) Reading: Lesson reading (9,10,11,12) Grammar: Verbs (conjugation form) Test on grammar, listening						11
II	What do we call this in Japanese language? Speaking: Asking the things / meanings in Japanese. Listening: Video clips Writing: Describing a person wearing accessories. Reading: Lesson reading (13,14,15,16) Grammar: Special verbs, transitive and intransitive verbs.						11
III	What is your hobby? Speaking: Talking about a future plan. Listening: Video clips Writing: Writing about an experience of something. Reading: Lesson reading (17,18,19,20) Grammar: Verb's 'form .root verbs. Test on grammar , listening						11
IV	I also think the same. Speaking: Telling about how to reach the place. Listening: Video clips Writing: Dialogue writing in casual form (plain form). Reading: Lesson reading (21-24) Grammar: Verb's casual form, pattern, あげる、くれる、もらう(verbs).						11
						Total	44
Text Book							
Minna no Nihongo Part I and II , NihongoShoho							
Reference Books:							
<ol style="list-style-type: none"> MO MO Japanese for Class VII MO MO Japanese for Class VIII 							

3. MO MO Japanese for Class VII workbook
4. MO MO Japanese for Class VIII workbook
5. Genki I, I
6. Japanese for busy people.



Course: HSMC-2 (German)						Code: BFE2106	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Internal Evaluation	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prerequisites: Positive attitude and interest in foreign cultures.							
Course Objectives: 1. To familiarise students to basics of German language. 2. To develop an ability to understand and articulate themselves in day to day real life situations.							
Course Outcomes: After learning the course, students will be able to 1. Understand and use familiar everyday expressions and very simple sentences, which relate to the satisfaction of concrete needs. 2. Introduce oneself and others; ask and answer questions about personal details such as where he/she lives, people he/she knows, things he/she owns and respond to questions of this nature. 3. Interact in a simple way provided the other person talks slowly and is willing to help.							
Detailed Syllabus							
Unit	Description						Duration (Hrs)
I	Leisure Time Speaking: talking about leisure time and party planning Vocabulary: free time activities, calendar date Listening: birthdays of people, radio article, Writing: invitation email Reading: an invitation to surprise party Grammar: separable verbs, personal pronouns in accusative case, simple past: had and was						7
II	New in Company Speaking: taking an official appointment Vocabulary: departments and positions in company Listening: schedule agreements, conversation in company Writing: formal email Reading: formal email Grammar: dative case, dative prepositions						7
III	The Living Speaking: describing one's living area Vocabulary: rooms of a house, furniture, household goods Listening: planning of furnishing a new house Writing: writing invitation to housewarming party, replying to the invitation Reading: apartment advertisements Grammar: Changing prepositions, adjectives Test training and cultural and regional information						10
IV	Clothing and Fashion Speaking: likes and dislikes about clothes, handling shopping conversations Vocabulary: types of clothes, floors and departments in a mall Listening: shopping conversations Grammar: verbs with dative case, personal pronouns in dative case						7

V	<p>Health Speaking: visiting a doctor, making requests and suggestions Vocabulary: body parts, ailments Listening: explaining health problems Writing: writing invitation to housewarming party, replying to the invitation Reading: health problems and Tips Grammar: imperative Test training and cultural and regional information</p>	10
Total		41
<p>Text Book: Netzwerk A1</p>		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Linie A1 2. Studio d A1 3. Tangram aktuell 1 4. Fit für Goethe-Zertifikat A1 5. Mit Erfolg zu Start Deutsch 1 6. Prüfungstraining A1 7. Grammatik-Instensivtrainer A1 		



Course Type: Life Skills		Code: BFE2902
Course Objectives:		
1. To understand importance of physical activities and awareness about the health.		
2. To provide platform to express their mind, body and the emotions through performing arts.		
Detailed Syllabus:		
Unit	Description	Duration (Hrs)
I.	Yoga: Physical activities and Meditation Sports: Basketball, Table tennis, Football and Volleyball	8
II.	Performing arts Music Photography and Short Movie Making Painting/ Sketching/ Drawing Theatre Arts	8
III.	Guest lecture Motivational lectures, Guest lectures by Eminent personality and Industry person	2
IV.	Club activity Activities organized by different clubs like Matholics, Chemistry Club, Wall magazine, Readers club, Physics club, Techno-science club, Coding club	2
V.	ISR activity Social awareness activities to understand the social responsibility	2
VI.	Industrial Visit Visit to nearby industries as per the core domain	2
Total		24

