

Estd : 1986

||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME, CV & AE), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

www.sjcit.ac.in

I & II Semester
Scheme & Syllabus of B.E. Programme
(AE, ASE, ME)



AICTE

nirf NATIONAL INSTITUTIONAL RANKING FRAMEWORK 151-300

NBA

A+ NAAC

QS I-GAUGE INDIAN UNIVERSITY RATING GOLD

INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Mission

1. **Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.**
2. **Promoting Excellence in Teaching, Training, Research and Consultancy.**
3. **Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.**
4. **Developing Entrepreneurial acumen to venture into Innovative areas.**
5. **Imparting Value based Professional Education with a sense of Social Responsibility.**

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SCHEME OF TEACHING AND EXAMINATION – B.E. ME STREAM (Common to AE, ASE, ME)

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

1st Semester

I SEMESTER: PHYSICS CYCLE													
Sl. No.	**Course Code**	**Course Title**	**Course Type**	**TD/ PSB**	**Teaching Hours / Week**			**Examination**					
					L	**T**	**P**	**SEE Duration (Hrs)**	**CIE Marks**	**SEE Marks**	**Total Marks**	**Credits**
1	BMATM101	Mathematics-I for ME Stream	ASC(IC)	MAT	2	2	2	**3**	**50**	**50**	**100**	**4**
2	BPHYM102	Applied Physics for ME stream	ASC(IC)	PHY	2	2	2	**3**	**50**	**50**	**100**	**4**
3	BEMEM103	Elements of Mechanical Engineering	ESC(IC)	ME	2	0	2	**3**	**50**	**50**	**100**	**3**
4	BESC104x	Engineering Science Course – I	ESC - I	RED	3	0	0	**3**	**50**	**50**	**100**	**3**
5	BETC105x	Emerging Technology Course	ETC	ANY DEPT	3	0	0	**3**	**50**	**50**	**100**	**3**
	OR											
	BPLC105	Introduction to Python Programming	PLC	ANY DEPT	2	0	2	**3**	**50**	**50**	**100**	**3**
6	BENG106	Communicative English	AEC	HSS	1	0	0	**1**	**50**	**50**	**100**	**1**
	OR											
	BPWS106	Professional Writing Skills in English	AEC	HSS	1	0	0	**1**	**50**	**50**	**100**	**1**
7	BICO107	Indian Constitution	HSSMC	HSS	1	0	0	**1**	**50**	**50**	**100**	**1**
8	BSFH108	Scientific Foundations of Health	HSSMC	ANY DEPT	1	0	0	**1**	**50**	**50**	**100**	**1**
									400	**400**	**800**	**20**

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SCHEME OF TEACHING AND EXAMINATION – B.E. ME STREAM (Common to AE, ASE, ME)

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

2nd Semester

II SEMESTER: CHEMISTRY CYCLE

Sl. No.	Course Code	Course Title	Course Type	TD/PSB	Teaching Hours / Week			Examination				
					L	T	P	SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	Credits
1	BMATM201	Mathematics-II for ME Stream	ASC(IC)	MAT	2	2	2	**3**	**50**	**50**	**100**	**4**
2	BCHEM202	Applied Chemistry for ME Stream	ASC(IC)	CHE	2	2	2	**3**	**50**	**50**	**100**	**4**
3	BCED203	Computer-Aided Engineering Drawing	ESC	CV/ ME	2	0	2	**3**	**50**	**50**	**100**	**3**
4	BESC204x	Engineering Science Course-II	ESC-II	RED	3	0	0	**3**	**50**	**50**	**100**	**3**
5	BETC205x	Emerging Technology Course	ETC	ANY DEPT	3	0	0	**3**	**50**	**50**	**100**	**3**
	OR											
	BPLC205	Introduction to Python Programming	PLC	ANY DEPT	2	0	2	**3**	**50**	**50**	**100**	**3**
6	BENG206	Communicative English	AEC	HSS	1	0	0	**1**	**50**	**50**	**100**	**1**
	OR											
	BPWS206	Professional Writing Skills in English	AEC	HSS	1	0	0	**1**	**50**	**50**	**100**	**1**
7	BSKA207/ BBKA207	Samskrutika Kannada/ Balake Kannada	HSSMC	HSS	1	0	0	**1**	**50**	**50**	**100**	**1**
8	BIDT208	Innovation and Design Thinking	AEC	ANY DEPT	1	0	0	**1**	**50**	**50**	**100**	**1**
									400	**400**	**800**	**20**

Engineering Science Course (ESC) – I/II		Emerging Technology Course (ETC)	
Course Code	**Course Title**	**Course Code**	**Course Title**
BESC104A / BESC204A	Fundamentals of Civil Engineering	BETC105A / BETC205A	Introduction to Internet of Things (IOT)
BESC104B / BESC204B	Fundamentals of Electrical Engineering	BETC105B / BETC205B	Introduction to Cyber Security
BESC104C / BESC204C	Introduction to Electronics & Communication	BETC105C / BETC205C	Introduction to Quantum Computing
BESC104D / BESC204D	Fundamentals of Mechanical Engineering	BETC105D / BETC205D	Introduction to AR & VR
BESC104E / BESC204E	Introduction to C Programming	BETC105E / BETC205E	Introduction to Electric and Hybrid Vehicles
		BETC105F / BETC205F	Introduction to xG Communication
Programming Language Course (PLC)		BETC105G / BETC205G	Renewable Energy Sources
BPLC105 / BPLC205	Introduction to Python Programming	BETC105H / BETC205H	Waste Management
		BETC105I / BETC205I	Sustainable Engineering

Credit Definition

1-hour Lecture (L) per week=1Credit	04-Credits courses are to be designed for 50 hours of Teaching-Learning Session
2-hoursTutorial(T) per week=1Credit	04-Credits (IC) are to be designed for 40 hours' theory and 12-14 hours of practical sessions
2-hours Practical / Drawing (P) per week=1Credit	03-Credits courses are to be designed for 40 hours of Teaching-Learning Session
2-hous Skill Development Actives (SDA) per week = 1 Credit	02- Credits courses are to be designed for 25 hours of Teaching-Learning Session
	01-Credit courses are to be designed for 12-15 hours of Teaching-Learning sessions

NOTE:

- The student has to select one course from the ESC-I/II group in 1st semester and one in 2nd semester.
- CS Stream students shall opt for any one of the courses from the ESC-I/II group except, BESC104E / BESC204E -Introduction to C Programming.
- EC Stream students shall opt for any one of the courses from the ESC-I/II group except, BESC104C / BESC204C - Fundamentals of Electronics & Communication.
- ME Stream Students shall opt for any one of the courses from the ESC-I/II group except, BESC104D / BESC204D - Fundamentals of Mechanical Engineering.
- CV Stream Students shall opt for any one of the courses from the ESC-I/II group except, BESC104A / BESC204A - Fundamentals of Civil Engineering
- The students have to opt for the courses from ESC group without repeating the course in either 1st or 2nd semester.
- The students must select one course from ETC group.
- If students study the subject from ETC in 1st semester he/she has to study Introduction to Python Programming in the 2nd semester.
- BMATS101 / BMATS201 / BMATE101 / BMATE201 / BMATM101 / BMATM201 / BMATC101 / BMATC201 shall have the 03 hours of theory examination (SEE), however practical sessions question shall be included in the theory question paper.
- Applied Physics and Applied Chemistry courses of different stream shall have 03 hours of theory examination (SEE) and 02-03 hours of practical examination.
- ESC or ETC of 03 credits Courses shall have only a theory component (L:T:P=3:0:0) or if the nature of the course is practical, then required practical learning syllabus shall be designed as an Integrated course (L:T:P= 2:0:2).
- All 01 Credit courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ

Abbreviations	Expansions
ASC	Applied Science Course
IC	Integrated Course
ESC	Engineering Science Course
ETC	Emerging Technology Course
PLC	Programming Language Course
AEC	Ability Enhancement Course
HSSMC	Humanity and Social Science & Management Courses
MAT	Mathematics
PHY	Physics
CHE	Chemistry
CS	Computer Science
CSE	Computer Science and Engineering
AIML	Artificial Intelligence and Machine Learning
AI&DS	Artificial Intelligence and Data Science
CSD	Computer Science and Design
ISE	Information Science and Engineering
ME	Mechanical Engineering
CV	Civil Engineering
EC	Electronics and Communication
ECE	Electronics and Communication Engineering
AE	Aeronautical Engineering
ASE	Aero Space Engineering
RED	Respective Engineering Department
HSS	Humanity and Social Science
HSSM	Humanity and Social Science & Management
CHE	Chemistry
SEE	Semester End Examination
CIE	Continuous Internal Evaluation
TD	Teaching Department
PSB	Paper Setting Board
ABA	Activity Based Assessment

Rubrics for CIE of Theory, Integrated and Laboratory based courses

CIE Assessment Pattern – Theory-based Courses

Components		Number	Weightage	Max. Marks	Min. Marks
(i)	Tests (A)	2	60%	30	12
(ii)	Quizzes (B)	2	20%	10	04
(iii)	Activity Based Assessment [ABA] (C)	1	20%	10	04
	Total Marks			**50**	**20**

Final CIE Marks = (A) + (B) + (C)

(i) The minimum CIE marks requirement is 40% of maximum marks in each component.
(ii) In Courses where Quizzes (B) and ABA (C) are not the components of assessment pattern, then, Tests (A) will have 100% weightage (50 Marks).
(iii) In Courses where Quizzes (B) is not the component of assessment pattern, then, Tests (A) will have 60% weightage (30 Marks) and ABA will have 40% weightage (20 Marks).
(iv) In Courses where ABA (C) is not the component of assessment pattern, then, Tests will have 60% weightage (30 Marks) and Quizzes (B) will have 40% weightage (20 Marks)

CIE Assessment Pattern – Integrated Courses

Components		Number	Weightage	Max. Marks	Min. Marks
Theory	Tests (A)	2	60%	30	12
Laboratory	Class work (B)	Continuous	20 %	10	04
	Open Ended Experiment/Project Based Learning (PBL)/Model demonstration/Experiential Learning (B)	1#			
	Test (C)	1	20 %	10	04
	Total Marks			**50**	**20**

Mandatory for 2nd and 3rd year integrated courses

Final CIE Marks = (A) + (B) + (C)

CIE Assessment Pattern – Laboratory-based Courses

Applicable to all laboratory-based, activity-based and experiential learning courses viz., Social Innovation, Engineering Exploration, Career Electives (Add-on Courses) etc.

Components		Number	Weightage	Max. Marks	Min. Marks
(i)	Class Work (A)	Continuous	50%	25	10
(ii)	Lab Test (B)	1	30%	15	06
(iii)	Open Ended Experiment/Project Based Learning (PBL)/Model demonstration/Experiential Learning (C)	1	20%	10	04
Total Marks				**50**	**20**

Final CIE Marks = (A) + (B) + (C)

(i) In Courses where Lab Test (B) and Open-Ended Experiments (C) are not the components of assessment pattern, then, Class Work (A) will have 100% weightage (50 Marks).
(ii) In Courses where Open-Ended Experiments (C) is not the component of assessment pattern, then, Class Work (A) will have 60% weightage (30 Marks) and Lab Test (B) will have 40% weightage (20 Marks).

Semester: I						
Mathematics - I for ME Stream (Common for ME, AE & ASE)						
Course Code	**:**	**BMATM101**		**Credits**	**:**	4
Hours/Week (L:T:P)	**:**	2:2:2		**CIE**	**:**	50 Marks
Total Hours	**:**	40L+12P		**SEE**	**:**	50 Marks
Course Type	**:**	ASC(IC)		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Mathematics
Knowledge on Fundamental Concepts	Basic differentiation and matrix theory
Knowledge on Connected Tools (If any)	Basic computer knowledge.

Course Learning Objectives: This course will enable the students to	
CLO1	Familiarize the importance of calculus associated with one variable and two variables.
CLO2	Apply the knowledge of integral calculus techniques to solve real-world problems involving areas, volume and rate of change.
CLO3	Analyze the Engineering problems by applying Ordinary Differential Equations and higher-order linear ODEs with constant coefficients homogeneous differential equations.
CLO4	Develop the knowledge of Linear Algebra to solve system of equation by using matrices
CLO5	Learn making using of modern mathematical tools namely MATHEMATICA/ MATLAB/ PYTHON/SCILAB to find the solution of Calculus, Differentiation and Matrix Concepts.

Module – 1	**08 Hrs**
Differential Calculus: Polar coordinates, Polar curves, angle between the radius vector and the tangent, and angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Polar (Problems). **Applications:** Structural design and paths, Strength of materials. **Self-study:** Center and circle of curvature, evolutes and involutes. **(RBT Levels: L1, L2 and L3)** **Text Book 1: Ch 4: 4.7, 4.8, 4.10, 4.11, 4.12, 4.13.** **Text Book 2: Ch 2: 2.10, 2.40, 2.44, 2.61.**	
Module – 2	**08 Hrs**
Integral Calculus: **Multiple Integrals:** Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates-Problems. **Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions. Problems. **Applications:** Applications to find the Surface area, analysis of probabilistic models**.** **Self-Study:** To find Area and Volume by double integration**.** **(RBT Levels: L1, L2 and L3)** **Text Book 1: Ch 7: 7.1, 7.2, 7.3, 7.5, 7.14, 7.15, 7.16, 7.6, 7.8.** **Text Book 2: Ch 6: 6.45, Ch 7: 7.1, 7.4, 7.12, 7.14, 7.21**	
Module – 3	**08 Hrs**

Ordinary Differential Equations (ODEs) of First Order:
Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $1/N\,(\partial M/\partial y - \partial N/\partial x)$ *and* $1/M\,(\partial N/\partial x - \partial M/\partial y)$, Orthogonal trajectories- Cartesian and polar.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p Problems.

Applications of ordinary differential equations: Newton's law of cooling.

Self-Study: solvable for nonlinear differential equations of x and y.
(RBT Levels: L1, L2 and L3)

Text Book 1: Ch 11: 11.9, 11.10, 11.11, 11.12(4), 12.3.
Text Book 2: Ch 8: 8.10, 8.22, 8.39, 8.50, 9.59.

Module – 4	**08 Hrs**

Ordinary Differential Equations of Higher Order:
Higher-order linear ODEs with constant coefficients - Inverse differential operator (e^{ax}, sin ax, cos ax, Polynomial), method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations - Problems.

Applications: Oscillations of a spring, Transmission lines.

Self-Study: Finding the solution by the method of undetermined coefficients.
(RBT Levels: L1, L2 and L3).

Text Book 1: Ch-13: 13.1,13.2,13.3,13.4,13.5,13.6,13.7,13.8,13.9,Ch: 14.2,14.3,14.4.
Text Book 2: Ch-9: 9.2,9.3,9.4,9.5,9.6,9.7,9.8,9.12,9.15.

Module – 5	**08 Hrs**

Linear Algebra:
Elementary row transformation of a matrix, Rank of a matrix by an echelon form. Consistency and solution of a system of linear equations -Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigen values and Eigen vectors, Rayleigh's power method to find the dominant Eigen value and Eigen vector.

Applications: Balancing Equations.

Self-Study: Solution of a system of linear equations by Gauss elimination method and Gauss-Jacobi iterative method.
(RBT Levels: L1, L2 and L3).

Text Book 1: Ch 2: 2.7(1), 2.10(1,3), 2.15, Ch 28: 28.6(1,2), 28.7(2).
Text Book 2: Ch 13: 13.3, 13.17, Ch 14: 14.1, 14.9

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the knowledge of calculus to solve problems related to polar curves.
CO2	Learn the notion integral calculus to solve the double and triple integral problems
CO3	Analyze the solution of linear and nonlinear ordinary differential equations.
CO4	Solving the system of linear equations and compute eigen values and eigenvectors.
CO5	Familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB/ PYTHON/SCILAB

Text Books	
1	Higher Engineering Mathematics, B. S.Grewal,44thEdition,2021,Khanna Publishers, ISBN:978-81-933284-9-1.
2	Calculus,SaturininoL.Salas,EinarHilleandGarretJ.Etgen,10thEdition, 2022,WileyIndia, ISBN: 9789390421961.

Reference Books	
1	V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017
2	C. B. Gupta, S. R. Sing and M. Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd, 2015. .
3	H. K. Dass and Er. R. Verma: "Higher Engineering Mathematics", S. Chand Publication, 3rd Ed., 2014.
4	N.P Bali and Manish Goyal: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
5	C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.

Web links and Video Lectures (e – Resources)	
1	http://nptel.ac.in/courses.php?disciplineID=111
2	http://www.class-central.com/subject/math(MOOCs)
3	http://academicearth.org/
4	VTU e-Shikshana Program
5	VTU EDUSAT Program

List of Laboratory experiments (2 hours/week per batch/ batch strength 15) 10 lab sessions + 1 repetition class + 1 Lab Assessment	
1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Program to compute surface area, volume and Centre of gravity.
4	Evaluation of improper integrals.
5	Solution of first-order ordinary differential equation and plotting the solution curves.
6	Solutions of Second-order ordinary differential equations with initial/boundary conditions.
7	Solution of a differential equation of oscillations of a spring/deflection of a beam with different loads.
8	Numerical solution of system of linear equations, test for consistency and graphical representation.
9	Solution of system of linear equations using Gauss-Seidel iteration.
10	Compute eigen values and eigen vectors and find the largest and smallest eigenvalue by the Rayleigh power method.

CO – PO MAPPING

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

Semester: I/II						
COURSE TITLE: Applied Physics for ME stream (Common for ME, AE & ASE)						
Course Code	**:**	**BPHYM102/ BPHYM202**		**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	2:2:2		**CIE**	**:**	50Marks
Total Hours	**:**	40L+12P		**SEE**	**:**	50Marks
Course Type	**:**	ASC(IC)		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basics of Physics
Knowledge on Fundamental Concepts	Principles, assumptions, Fundamentals of Physics
Knowledge on Connected Tools (If any)	Experimental demonstration skills

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the fundamentals of crystal structure.
CLO2	Study the elastic properties of materials and failures of engineering materials.
CLO3	Study the various relevant material characterization techniques.
CLO4	Understand the types of oscillation, shock waves &their generation, and applications.
CLO5	Understand the Concepts in Low temperature phenomena and generation of low temperature and fundamentals of Thermoelectricity.

Module – 1	**08 Hrs**
Crystal Structure: Crystal systems. Lattice parameters. Space lattice, Bravais lattice–Unit cell, primitive cell. Direction and planes in a crystal. Miller indices. Expression for inter–planar spacing. Co-ordination number. Atomic packing factors (SC, FCC, and BCC). Bragg's law, Crystal Structure of NaCl, Diamond, qualitative discussion of Pervoskites. Numerical problems **Text Book 5: Ch 4 Pg. No.: 87-147**	
Module – 2	**08 Hrs**
Elasticity: Types of materials (Metals and Alloys), Engineering materials (Brittle Ductile materials difference), Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio. Beams, Bending moment expression, Cantilever and I section girder and their Engineering Applications. Failures of engineering materials - Ductile fracture, Brittle fracture, Fatigue and factors affecting fatigue (only qualitative explanation), Numerical problems. **Text Book 1: Ch 2:2.3 to 2.12** **Text Book 2: Ch 7: 7.1 to 7.22**	
Module – 3	**08 Hrs**
Material Characterization and Instrumentation Techniques: Introduction to nano materials: Nanomaterial and nanocomposites. Principle, construction and working of X-ray Diffractometer, Crystallite size determination by Scherrer equation, Atomic Force Microscopy (AFM): Principle, construction, working and applications, X-ray photoelectron	

spectroscopy (XPS), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Numerical Problems.

Text Book 1: Ch 49: 49.16
Text Book 2: Ch 59: 59.6 to 59.9, 59.11
Text Book 3: Ch 10(ed16)

Module – 4	**08 Hrs**

Oscillations and Shock waves:

Oscillations: Simple Harmonic motion (SHM), Differential equation for SHM (No derivation), Sprigs: Stiffness Factor and its Physical Significance, Series and Parallel combination of springs (Derivation), Types of Springs and their applications. Theory of Damped oscillations (Qualitative), Types of Damping (Graphical Approach). Engineering applications of Damped oscillations, Theory of Forced oscillations (Qualitative), Resonance, Sharpness of resonance. Numerical Problems.

Shock waves: Mach number and Mach Angle, Mach Regimes, Definition and Characteristics of Shock waves, Construction and working of Reddy Shock tube, Applications of Shock Waves, Numerical problems.

Text Book 1: Ch 1: 1.1 to1.7
Text Book 3: Ch 1, Ch 2 (ed18), Ch 9 (ed16)

Module – 5	**08 Hrs**

Cryogenics and Thermoelectricity:

Cryogenics: Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Liquefaction of Oxygen by cascade process, Liquefaction of Helium and its properties, Applications of Cryogenics, in Aerospace (qualitative), Numerical Problems.

Thermoelectricity: Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2, Thermo couples, thermopile, Applications: Exhaust of Automobiles, Refrigerator, Space Program (RTG).Numerical Problems.

Text Book 1: Ch 22: 22.1 to 22.17
Text Book 4: Ch 6: 6.4, Ch 7, Ch13: 13.17,13.18, 13.19, 13.26, 13.27

Course Out comes: After completing the course, the students will be able to	
CO1	Discuss the various types of crystal systems and the structural properties of materials.
CO2	Elucidate the concepts in oscillations, waves, and elasticity and material failures.
CO3	Explain the various material characterization techniques.
CO4	Summarize the low temperature phenomena and generation of low temperature and Discuss the fundamentals of Thermoelectric materials and their application.
CO5	Conduct experiments to obtain the desired parameter of the given material / physical system.

Text Books:	
1	A Textbook of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar and, TVS Arun Murthy., 11th revised Ed, S. Chand. & Company Ltd, New Delhi. ISBN:978-93-528-3399-3. 2019.
2	Engineering Physics- R K Gaur and S L Gupta-DhanpatRai Publications- Revised, reprint edition - 2018.
3	Engineering Physics – SP Basavaruju, , Subhash Stores., Bangalore. 2016/ 2018 edition.

4	Heat and Thermodynamics, Brijlal&Subramanyam,S. Chand & Company Ltd., New-Delhi.2017.
5	Solid State Physics-S O Pillai, 6th Ed- New Age International Publishers.ISBN:978-81-224-2726-4. 2010.

Reference Books:	
1	Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd, Delhi,2014
2	Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
3	Mechanical Properties of Engineered Materials by WoleSoboyejo, CRC Press; 1st edition, 2002
4	Heat & Thermodynamics and Statistical Physics (XVIII-Edition) – Singhal, Agarwal&Satyaprakash – Pragati Prakashan, Meerut, 2006.
5	Physics of Cryogenics by BahmanZohuri, Elsevier, 2018
6	Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S.RamachandraRao& Shubra Singh, Wiley India Pvt Ltd. ISBN 978-8126542017, 2013.
7	Solid State Physics-S O Pillai, 8th Ed- New Age International Publishers-2018.
8	Nano Composite Materials-Synthesis, Properties and Applications, J. Parameswaranpillai, N.Hameed, T.Kurian, Y. Yu, CRC Press. ISBN 9780367870805, 2020.
9	Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.

Web links and Video Lectures (e – Resources)	
1	Simple Harmonic motion:https://www.youtube.com/watch?v=k2FvSzWeVxQ
2	Shock waves:https://physics.info/shock/
3	Shock waves and its applications:https://www.youtube.com/watch?v=tz_3M3v3kxk
4	Stress- strain curves:https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
5	Stress curves:https://www.youtube.com/watch?v=f08Y39UiC-o
6	Fracture in materials:https://www.youtube.com/watch?v=x47nky4MbK8
7	Thermoelecticity:https://www.youtube.com/watch?v=2w7NBuu5w9c&list=PLtkeUZItwHK5y6qy1GFxa4Z4Rc mzUaaz6
8	Thermoelectric generator and coolers:https://www.youtube.com/watch?v=NruYdb31xk8
9	Cryogenics:https://cevgroup.org/cryogenics-basics-applications/
10	Liquefaction of gases:https://www.youtube.com/watch?v=aMelwOsGpIs
11	Virtual lab:https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham

12	Material characterization :https://onlinecourses.nptel.ac.in/noc20_mm14/preview https://www.encyclopedia.com/science-and-technology/physics/physics/cryogenics https://www.usna.edu/NAOE/_files/documents/Courses/EN380/Course_Notes/Ch10_Deformation.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning	
1	http://nptel.ac.in https://swayam.gov.in
2	https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
3	https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
4	https://virtuallabs.merlot.org/vl_physics.html https://phet.colorado.edu
5	https://www.myphysicslab.com

Laboratory Component:

Ten Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

a) Exercise

b) Demonstration

c) Structured Inquiry

d) Open Ended

Based on the convenience classify the following experiments into above categories selecting at least three experiments for each type. Select at least one simulation/spreadsheet activity.

List of Experiments

1	Determination of Young's modulus of the material of the given bar Uniform Bending.
2	Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
3	Determination of Young's modulus of the material of the given bar Single Cantilever.
4	Determination of the Moment of Inertia of the given irregular body using torsional pendulum.
5	Determination of effective Spring constant of the given springs in series and parallel combinations.
6	Frequency response of series and parallel LCR circuits.
7	Determination of Wavelength of Laser using Diffraction Grating.
8	Determination of Acceptance angle and Numerical Aperture of the given Optical Fiber.
9	Thermocouple experiment
10	Determination of Fermi Energy of the given Conductor
11	Study of motion using spread Sheets

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**										**2**
CO2	**3**	**2**										**2**
CO3	**3**	**2**										**2**
CO4	**3**	**2**										**2**
CO5	**3**	**2**			**2**			**3**	**3**			**2**

Semester: I/II						
Course Title: Elements of Mechanical Engineering **Stream: ME (Common to AE, ASE & ME)**						
Course Code	**:**	**BEMEM103/ BEMEM203**		**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	2:0:2		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC(IC)		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	As it is a basic course, course prerequisites are not defined.
Knowledge on Fundamental Concepts	Materials, Mechanical Components
Knowledge on Connected Tools (If any)	Nil

Course Learning Objectives: This course will enable the students to	
CLO1	Acquire a basic knowledge about role of Mechanical Engineering in the industry and society
CLO2	Acquire basic understanding of various engineering materials, Joining Processes, Machine Tools, Operations and Their advancement.
CLO3	Acquire a basic understanding of the formation of steam, Refrigeration, Air-conditioning and its Industrial application
CLO4	Acquire essential experience on basic power transmission systems, IC Engines including mechanical linkages
CLO5	Acquire a basic knowledge about fundamentals of mechatronic system, applications and Robotics

Module – 1	**08 Hrs**
Introduction to Mechanical Engineering (Overview only): Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Advanced Materials:** Polymers (Thermoplastics, Thermosets and Elastomers), Ceramics, Fiber Reinforced Composites and Shape Memory alloys. **Text Book 1: Ch1- 1.1 -1.8** **Text Book 2: Ch4- 4.1,4.2**	
Module – 2	**08 Hrs**
Machine Tool Operations: **Lathe and Lathe operations:** Working Principle of Lathe, Specifications of a lathe, Lathe operations (Turning, Taper Turning, drilling, boring, knurling, and thread cutting). **Drilling Machine:** Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring. **Introduction to Advanced Manufacturing Systems:** Introduction, Components of CNC, Advantages and applications of CNC, 3D Printing Concept. **Joining Processes:** Definitions of Soldering, Brazing and Welding, Classification of Welding Process, Arc Welding, Gas Welding (types of flames) and Fusion welding. **Text Book 1: Ch5-5.1,5.2,5.3,5.4,5.7,5.9,5.10,5.12, Ch7-7.2,7.3,7.5,7.9,7.12** **Text Book 2: Vol.2, Ch3-3.1,3.2,3.3**	
Module – 3	**08 Hrs**

Steam Formation and Application: Steam formation, Types of Steam, Steam properties and Ppplications of Steam (Simple Numerical).

Introduction to IC Engines: Components and Working Principles, 4-Stroke Petrol and Diesel Engines, Application of IC Engines, Performance of IC engines (Simple Numerical).

Refrigeration: Refrigeration effect, Working principle of Vapour Compression refrigeration Systems, Ton of refrigeration, COP, refrigerants and their properties, Concept of Air Conditioning.

Text Book 1: Ch1-1.16,1.17,1.18,1.29,1.30, Ch3-3.1,3.2,3.5,3.6,3.14
Ch4- 4.2,4.3,4.7,4.8,4.11,4.14,4.15

Module – 4	**08 Hrs**

Mechanical Power Transmission:

Gear Drives: Types -Spur, Helical, Bevel, Worm and Rack and Pinion, Velocity ratio, Simple and Compound gear trains (Simple Numerical)

Electrical Drives: History, Well to Wheel analysis, Electric vehicles, Configurations, EV/ICEV Comparison, Performance, Traction Motor Characteristics, Concept of Hybrid Electric Drive Trains, Classification of Hybrid Electric Vehicles.

Text Book 1: Ch9- 9.1,9.12,9.26

Module – 5	**08 Hrs**

Mechatronics: Evolution of Mechatronic system, Open & Closed loop system, Basic elements of Control System, Applications- Automatic Washing machine, Engine management system (EMS).

Robotics: Robots- Basic Structure of Robots, Robot Anatomy, Complete Classification of Robots, Fundamentals about Robot Technology, Basic Robot Configurations and their Relative Merits and Demerits.

Text Book 2: Ch1-1.8
Refence Book 3: Ch1-1.1,1.4.1-1.4.3,1.5.2

Self-Learning Activity (Experiential Learning)	
SL. No	**Experiments**
01	Demonstrate Simple turning and Facing operation of a given material using Lathe
02	Performance Test on Vapour Compression Refrigeration
03	Demonstrate Joining Process -Fitting (Rectangular Joint and V Joint]
04	Demonstrate Joining Process - Welding (Lap Joint and Butt Joint]
05	Study the Parts of IC Engines

Course Outcomes: After completing the course, the students will be able to	
CO1	Expound the role of mechanical engineering in industry and society and knowledge of about various Engineering materials
CO2	Describe different conventional and advanced machining processes, IC engines, air-conditioning, and refrigeration.
CO3	Elucidate different gear drives, gear trains, aspects of future mobility and fundamentals of robotics.
CO4	Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems
CO5	Illustrate the working of mechanical equipment's and machine tools, prepare a report and presentation which enhance experiential learning

Text Books	
1	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, 18th Edition, 2019, ISBN:5551234002884
2	Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
3	Electric and Hybrid Vehicles, Design Fundamentals – Iqbal Husain, CRC Press, 2nd Edition, 2010. ISBN – 13-978-1439811757.

Reference Books	
1	Manufacturing Technology- Foundry, Forming and Welding, P.N. Rao Tata McGraw Hill 3rd Ed., 2003.
2	Material Science & Engineering- William D Callister, 2 / 10th Edition, ISBN 978-1-119-45520-2.
3	Mechatronics – Electronic control systems in Mechanical and Electrical Engineering, William Bolton, Pearson, 6th Edition, ISBN: 978-1-292-07668-3, 2015.

Web links and Video Lectures (e – Resources)	
1	https://www.forbesmarshall.com/Knowledge/SteamPedia/About Steam/Fundamental-Applications-of-Steam
2	https://www.makino.com/en-us/resources/content-library/videos
3	https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**					**1**				**1**		**1**
CO2	**3**					**1**	**1**			**1**		**1**
CO3	**3**					**1**	**1**			**1**		**1**
CO4		**3**				**1**	**1**					**1**
CO5					**3**	**1**			**3**			**1**

Semester: I / II						
COURSE TITLE: FUNDAMENTALS OF CIVIL ENGINEERING **Stream: CV**						
Course Code	**:**	**BESC104A/BESC204A**		**Credits**	**:**	03
Hours/Week (L: T: P)	**:**	3: 0: 0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	03 Hours

Prerequisites:	
Courses	Physics and Mathematics
Knowledge on Fundamental Concepts	Force, Gravity, Differentiation & Integration.
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Make students learn the scope of various specializations of civil engineering.
CLO2	Develop students' ability to analyze the problems involving forces, moments with their applications.
CLO3	Develop the student's ability to find out the center of gravity and moment of inertia and their applications.
CLO4	Make students learn the concepts of sustainable infrastructure.

Module – 1	**08 Hrs**
Civil Engineering Disciplines and Building Science **Introduction to Civil Engineering:** Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction planning &Project management. **Basic Materials of Construction:** Bricks, Cement & mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. **Structural elements of a building:** Foundation, Plinth, Lintel, Chejja, Masonry Wall, Column, Beam, Slab and Staircase. **Text Book 1: Ch 1: 1.1 – 1.4, 1.9** **Text Book 2: Ch 1: pp-1-20**	
Module – 2	**08 Hrs**
Concurrent system of forces: Introduction, Basic idealization, Definition of a force, Classification of system of forces, Principle of Transmissibility, Principle Physical Independence, Principle of superposition, Resolution of forces, Composition of forces, Resultant and Equilibrant. Parallelogram law of forces. Numerical examples on Resultant of Concurrent	

Coplanar System of Forces.

Non-concurrent system of forces: Moment of a force, Varignon's theorem of moments, Couples and their characteristics. Determination of Magnitude, Direction and Position of Resultant of Non-concurrent Coplanar System of Forces- Numerical examples.

Text Book 1: Ch 4: 4.1 – 4.10, Ch-5: 5.1 – 5.5
Text Book 2: Ch: 2 – 4

Module – 3	**08 Hrs**

Equilibrium of system of forces: Definition, Conditions of Equilibrium for Concurrent Coplanar System of Forces, Lami's theorem. Numerical examples. Types of Beams, Types of Loadings, Types of Supports, Conditions of Equilibrium for Non Concurrent Coplanar System of Forces, Determination of support reactions for statically determinate beams.

Text Book 1: Ch 6: 6.1 – 6.11, Ch 8: 8.1 – 8.5
Text Book 2: Ch 5 – 6

Module – 4	**08 Hrs**

Centroid and Centre of Gravity: Definition, Derivation of expressions for centroidal distances of simple planar laminas like rectangle, triangle, Quarter, and Semi-circle. Determination of centroidal distances of compound laminas.

Moment of Inertia: Introduction, Theorems of perpendicular and parallel axis. Concept of axis of symmetry. Derivations of expressions for moment of inertia of simple planar laminas like Rectangle, Triangle, Circle, Semi-Circle and Quadrant of a Circle, Definitions of polar moment of inertia, Radius of gyration, Determination of moment of inertia, polar moment of inertia, radius of gyration of compound laminas about centroidal axes and about any specified reference line.

Text Book 1: Ch 10: 10.1 – 10.4, Ch 11: 11.1 –11.8
Text Book 2: Ch 9 – 10

Module – 5	**08 Hrs**

Societal and Global Impact of Infrastructure

Infrastructure: Introduction to sustainable development goals, Smart city concept, Clean city concept, Safe city concept.

Environment: Water Supply and Sanitary systems, Urban air pollution management, Solid waste management, Identification of Landfill sites, urban flood control

Built-environment: Energy efficient buildings, Recycling, Temperature and Sound control in Buildings, Security systems; Smart buildings.

Text Book 3: Unit 3: 3.1 – 3.4, Unit 5: 5.1 – 5.3

Course Outcomes: After completing the course, the students will be able to	
CO1	Comprehend the scope of various disciplines of Civil Engineering.
CO2	Compute the Resultant of concurrent and non-concurrent system of forces.
CO3	Analyze the system of forces for support reactions and member forces.

CO4	Locate the centroid and moment of inertia of plane and built-up sections.
CO5	Expose the infrastructure requirement for sustainable development.

Text Books	
1	"Elements of Civil Engineering and Mechanics", H J Sawant and S P Nitsure, 1st Edition 2018, Technical Publications. ISBN 978-93-332-2038-5
2	"Elements of Civil Engineering and Engineering Mechanics", M. N. Shesha Prakash, Ganesh B. Mogaveer, 3rd Edition, 2014, PHI Learning Pvt Ltd, ISBN 978-81-203-3700-8
3	"Civil Engineering Societal and Global Impact", Dr. Shakuntala Acharya, 2023, All India Council for Technical Education (AICTE), ISBN 978-81-963773-7-3

Reference Books	
1	Engineering Mechanics by S Timoshenko, D H Young and J V Rao, 5th Edition, 2017, Pearson Press.
2	Elements of Civil Engineering by Dr. T R Jagadeesh and M A Jayaram, 2018, Sapna Book House, Bangalore.
3	Basic Civil Engineering and Engineering Mechanics, Bansal R. K, Rakesh Ranjan Beohar and Ahmad Ali Khan, 2012, University Science Press, Bangalore.
4	"Elements of Civil Engineering", by S.S. Bhavikatti, 2015, 4th Edition, New age International Publishers, New Delhi. ISBN 978-81-224-3817-8
5	"Elements of Civil Engineering and Engineering Mechanics", Kolhapure B K, 2018, ISBN 978-93-86729-651

Web links and Video Lectures (e – Resources)

- https://www.youtube.com/watch?v=nkg7VNW9UCc
- https://www.youtube.com/watch?v=GNMfnwFfYHM
- https://www.youtube.com/watch?v=6u_rjLjv-MY&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=3
- https://www.youtube.com/watch?v=ljDIIMvx-eg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
- https://www.youtube.com/watch?v=3YBXteL-qY4
- https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
- https://www.youtube.com/watch?v=Zrc_gB1YYS0
- https://www.youtube.com/watch?v=l_Nck-X49qc
- https://www.youtube.com/watch?v=R8wKV0UQtlo

- https://www.youtube.com/watch?v=0RZHHgL8m_A
- https://www.youtube.com/watch?v=Bls5KnQOWkY
- https://www.youtube.com/watch?v=A4KhJYrt4-s
- https://archive.nptel.ac.in/courses/105/106/105106201/

CO – PO MAPPING												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**					**1**						**1**
CO2	**1**	**3**										**1**
CO3	**1**	**3**										**1**
CO4	**1**	**3**										**1**
CO5	**3**					**1**	**3**					**1**

Semester: I/II						
Fundamentals of Electrical Engineering **Stream: ECE (Common to all the branches)**						
Course Code	**:**	BESC104B / BESC204B		**Credits**	**:**	3
Hours/Week (L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	**General Physics:** Electromagnetism, modern physics, emphasizing electric fields, magnetic fields and circuits
Knowledge on Fundamental Concepts	Knowledge of resistors, capacitors, inductors, and their behaviour in circuits. Knowledge of complex number operations and polar forms. Knowledge of Electromagnetism
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
1	Introduce the concepts of electrical circuits and its component
2	Understand DC circuits and AC single phase & three phase circuits.
3	Explain the construction and operation of transformers and induction motors.
4	Introduce concepts of circuit protecting devices and earthing.
5	Interpret the Concepts of Electric Vehicles.

Module – 1	**08 Hrs**

Introduction: Charge, Voltage, Basic circuit, Units and Symbol

Text Book 1: Ch1: 1.1,1.2,1.3,1.4

DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series- parallel circuits, Power and energy, Numerical problems (Numerical problems on KCL and KVL can be solved using Branch current method). **Text Book 2: Ch 2: 2.1,2.2,2.3.6**

DC Generator: Principle of operation, constructional details, Emf equations, Numericals

Text Book 2: Ch 26 :26.1,26.3,26.33

DC Motor: Principle of operation, back emf and its significance, Torque equation. types (shunt and series) Numericals (**Text Book 2**: **Ch 29**:**29.1,29.3,29.6,29.17)**

Module – 2	**08 Hrs**

AC Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor.

AC Circuits: Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor, Simple Numerical.

Text Book 1: Ch 9:9.1,9.2, 9.3,9.5,10.1,10.2,10.3,10.6

Module – 3	08 Hrs
Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Simple Numerical. **Text Book 1: Ch 12: 12.3,12.4,12.6,12.7,12.8,12.9**	
Module – 4	**08 Hrs**
Single Phase Transformers: Construction and principle of operation, emf equation, losses, variationin losses with respect to load, efficiency, condition for maximum efficiency, illustrative examples. **Text Book 2: Ch 32: 32.1,32.2,32.3,32.4,32.6,32.8,32.30** **Three-phase Induction Motors:** Concept of rotating magnetic field, Principle of operation, constructional features of motor, types - squirrel cage and wound rotor, slip and problems on the slip, significance of slip, applications. **Text Book 2: Ch 34:34.3,34.4,34.6,34.10,34.11**	
Module – 5	**08 Hrs**
Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of load. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock. **Text Book1:Ch 19: 19.6,19.8,19.9,19.10** **Introduction to Electric Vehicles**: EV System, EV History, Electric Vehicles and the Environment, EV Advantages, Block diagram of Electric Vehicle. **Text book3: Chapter1**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamental concepts of DC, AC circuits and Electrical Machines
CO2	Apply the basic electrical laws to solve AC and DC circuits.
CO3	Analyze the behavior of circuit elements in single phase and 3 phase AC Circuits.
CO4	Interpret the Concepts of Electric Vehicles, Protective Devices & personal Safety Measures.
CO5	Engage in individual/team work to make effective technical presentation on electrical concepts and communicate effectively to the audience

Text Books	
1	Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2	A text book of Electrical Technology Volume II, AC and DC Machines by B.L. Theraja, S Chand and Company, reprint edition 2014.
3	Electric and Hybrid Vehicles - Design Fundamentals", Iqbal Husain, CRC Press, 2005
Reference Books	
1	Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019
2	Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3	Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.
4	Electric Vehicle Technology Explained", James Larminie, John Lowry, Wiley Publications, 2nd Ed., 2012

Web links and Video Lectures (e – Resources)	
1	www.nptel.ac.in
2	http://nptel.ac.in/courses/108105053/
3	http://nptel.ac.in/courses/108108076/

CO – PO MAPPING

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

Semester: I/II						
Introduction to Electronics & Communication **Stream:** ECE						
Course Code	**:**	BESC104C/ BESC204C		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Physics
Knowledge on Fundamental Concepts	Basics of Diodes, Transistors and Boolean Algebra.
Knowledge on Connected Tools (If any)	Multisim/Discrete components

Course Learning Objectives: This course will enable the students to	
1	Prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.
2	Equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.
3	Inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context.

Module – 1	**08 Hrs**
Power Supplies: Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers. (**Text1: Ch:6**) **Amplifiers –** Types of amplifiers, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback, multi-stage amplifiers (**Text 1: Ch:7**)	
Module – 2	**08 Hrs**
Operational amplifiers- Operational amplifier parameters and characteristics, Operational amplifier configurations, Operational amplifier applications (**Text 1: Ch:8**) **Oscillators:** Conditions for oscillation, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations) (**Text 1: Ch:9**)	
Module – 3	**08 Hrs**
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (**Text 2: Ch1: 1.2, 1.3, 1.4, 1.5 Ch2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7**) **Combinational logic:** Introduction, Design procedure, Adders- Half adder, Full adder (**Text 2: Ch:4 4.1, 4.2, 4.3**) **Sequential Logic:** Introduction, flip flops-RS, D, JK and T (**Text 2: Ch6: 6.1,6.2**)	
Module – 4	**08 Hrs**
Embedded Systems: Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC (**Text 3: Ch1: 1.1,1.2, 1.4, 1.5 Ch:2: 2.1**) **Embedded Systems applications:** Washing Machine, Automotive Domain specific example (**Text 3: Ch:4: 4.1,4.2**)	

Module – 5	08 Hrs
Analog Communication Schemes: Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM, Concept of Radio wave propagation (Ground, space, sky) (**Text 4: Ch1: 1.2, 1.2.1, 1.3, 1.4, 1.4.1, 1.4.2, 1.5, 1.5.2, 1.6, 1.14, 1.15 Ch2: 2.2, 2.2.1, Ch3: 3.2, 3.2.1**) **Digital Modulation Schemes:** Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques (**Text 4: Ch:6 6.12, 6A.1.1, Fig. 6A.1, Fig. 6A.3, 6A.1.4, 6A.1.5**)	

Course Outcomes: After completing the course, the students will be able to	
CO1	Compute the parameters and characteristics of operational amplifiers and oscillators
CO2	Design of Boolean algebraic equations and combinational logic circuits & number base conversions
CO3	Summarize the characteristics of embedded systems, sensors and actuators
CO4	Infer analog and digital communication, modulation techniques & radio wave propagation
CO5	Engage in self-study as team member or individual to design and demonstrate simple circuits

Text Books	
1	Mike Tooley, 'Electronic Circuits, Fundamentals & Applications',4thEdition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980
2	Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203- 0417-84.
3	K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016
4	S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017.

Reference Books	
1	Electronic Devices and Circuits, David A Bell, Oxford, 5th Edition, 2016
2	Basic Electronics, D P Kothari,I J Nagrath, McGraw Hill Higher Ed, 2nd Edition, ISBN: 9789352606467
3	Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition

Web links and Video Lectures (e – Resources)	
1	https://archive.nptel.ac.in/courses/117/103/117103063/

CO – PO MAPPING

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

Semester: I/II						
Course Title: Fundamentals of Mechanical Engineering **Stream: ME**						
Course Code	**:**	**BESC104D/ BESC204D**		**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40		**SEE**	**:**	50 Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	As it is a basic course, course prerequisites are not required.
Knowledge on Fundamental Concepts	Materials, Mechanical Components
Knowledge on Connected Tools (If any)	Nil

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the basic Knowledge on Mechanical Engineering, Fundamentals and Energy Sources.
CLO2	Understand the concept of different types of Machine tool operations and Modern Manufacturing Processes like CNC, 3D printing.
CLO3	Know the working of IC engines and Future Mobility vehicles.
CLO4	Exposure in the field of Engineering Materials and Manufacturing ProcessesTechnology and its applications.
CLO5	Acquire a basic understanding role of Mechanical Engineering in the Robotics and Automation in industry.

Module-1	**08 Hrs.**
Introduction: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. **Energy**: Introduction and applications of Energy sources like Fossil fuels, nuclear fuels, Power Plants-Hydel, Solar and Wind, Bio-fuels, Environmental issues like Global warming and Ozone depletion. **Text Book 1: Ch1-1.1.1.2,1.3,1.5,1.7,1.9,1.10**	
Module-2	**08 Hrs.**
Machine Tool Operations: Working Principle of lathe, Lathe operations: Turning, facing, knurling. Working principles of Drilling Machine, drilling operations: drilling, boring, reaming. Working of Milling Machine, Millingoperations: Plane milling and Slot milling. (No sketches of machine tools, sketches to be used only for explaining the operations). **Introduction to Advanced Manufacturing Systems:** Introduction, components of CNC, advantages and applications of CNC and Concept of 3D printing. **Text Book 1: Ch5-5.1,5.2,5.3,5.4,5.7,5.9,5.10,5.12**	
Module–3	**08 Hrs.**
Introduction to IC Engines: Components and Working Principles, 4-Strokes Petrol and Diesel Engines,Application of IC Engines. **Insight into Future Mobility;** Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles. **Text Book 1: Ch3-3.1,3.2,3.5,3.6**	

Module–4	**08 Hrs.**
Engineering Materials: Types and applications of Ferrous & Nonferrous Metals, silica, Ceramics, glass, graphite, diamond and polymer, Composites, Shape Memory Alloys. **Joining Processes**: Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames. **Text Book 1: Ch7-7.2,7.3,7.5,7.9,7.12** **Text Book 2: Ch4-4.1,4.2**	
Module–5	**08 Hrs.**
Introduction to Mechatronics and Robotics: open-loop and closed-loop mechatronic systems. Classification based on robotics configuration: Polar, Cylindrical, Cartesian and Jointed Arm Coordinate System, Application, Advantages and Disadvantages. **Automation in industry:** Definition, Types – Fixed, Programmable and Flexible automation, Basic elements with block diagrams, Advantages. **Introduction to IOT**: Definition and Characteristics, Physical Design, Protocols, Logical design of IoT, Functional blocks, and Communication models. **Text Book 2: Ch1-1.8,1.20** **Reference Books 3: Ch1-1.1,1.4 (1.4.1,1.4.2,1.4.3,1.5.2)**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explore the concepts of Role of Mechanical Engineering and Energy sources.
CO2	Describe the Machine Tool Operations and advanced Manufacturing process.
CO3	Illustrate the Working Principle of IC engines and EV vehicles.
CO4	Discuss the Properties of Common Engineering Materials and various Metal Joining Processes.
CO5	Elucidate the fundamental Concepts of Mechatronics, Robotics and Automation in IoT

Text Books	
1	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, 18th Edition. ISBN:5551234002884
2	Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
3	Electric and Hybrid Vehicles, Design Fundamentals – Iqbal Husain, CRC Press, 2nd Edition, 2010. ISBN – 13-978-1439811757.

Reference Books	
1	Manufacturing Technology- Foundry, Forming and Welding, P.N. Rao Tata McGraw Hill 3rd Ed., 2003.
2	Material Science & Engineering- William D Callister, 2 / 10th Edition, ISBN 978-1-119-45520-2.
3	Mechatronics – Electronic control systems in Mechanical and Electrical Engineering, William Bolton, Pearson, 6th Edition, ISBN: 978-1-292-07668-3, 2015.

Web links and Video Lectures (e – Resources)	
1	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing- and-process-industry/)
2	https://www.makino.com/en-us/resources/content-library/videos

CO – PO MAPPING

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

Semester: I / II					
INTRODUCTION TO C PROGRAMMING **(Common to the Branches: CV, ME, AE & ASE)**					
Course Code	**:**	BESC104E / BESC204E	**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	2:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40L+12P	**SEE**	**:**	50 Marks
Course Type	**:**	ESC(IC)	**SEE Duration**	**:**	3 Hours

Prerequisites	
Courses	
Knowledge on Fundamental Concepts	Basic Computer Literacy, Programming Fundamentals, Problem-Solving Skills, Mathematics, Development Tools
Knowledge on Connected Tools (If any)	Visual Studio, Code Blocks, GCC, Clang

Course Learning Objectives: This course will enable the students to	
CLO1	Elucidate the basic architecture and functionalities of a computer
CLO2	Familiarize the design of algorithms and flow charts, understanding the fundamentals of C and philosophy of problem solving.
CLO3	Apply programming constructs of C language to solve the real-world problems.
CLO4	Design and Develop Solutions to problems using modular programming constructs such as functions & Arrays
CLO5	Understanding and implementation of simple programs on string, pointers & structures.

Module – 1	**08 Hrs.**
Computers Fundamentals: Introduction to Computers, Input and Output Devices, Computer software and its classification. **Designing Efficient Programs:** Program Design Tools, Types of Errors. **Introduction to C programming:** Basic Structure of a C Program, Files used in C program, Compiling and executing C programs, Character Set, C Tokens, Keywords, Identifiers, Basic Data Types in C, Variables, Constants **Text Book: Ch:1.1-2.2,6.1-6.2,8.4-8.5,9.1-9.13**	
Module – 2	**08 Hrs.**
I/O Statements & Operators in C: Input/ Output Statements in C, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Operator Precedence Chart, Type Conversion and Type Casting. **Text Book: Ch: 9.14, 9.15-9.16**	
Module – 3	**08 Hrs.**
Decision Control and Looping Statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto Statement. **Functions:** Introduction, Function declaration, Function definition, Function call, return statements, passing parameters to Function, Scope of Variables, Storage Classes, Recursive Functions. **Text Book: Ch: 10.1-10.6, 11.1-11.10**	

Module – 4	**08 Hrs.**
Arrays: Introduction, Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, two dimensional arrays, operations on two-dimensional arrays, Multidimensional Arrays, Applications of Arrays **Text Book: Ch: 12.1-12.5, 12.7-12.8,12.10,12.12**	
Module – 5	**08 Hrs.**
Strings: Introduction, String Taxonomy, String manipulation functions. **Pointers:** Introduction, Pointer Concepts, Pointer Declaration and Definition, Initialization of Pointer Variables. **Structures and Unions:** Declaration, Initialization, Accessing, differences between structures & unions. **Text Book: Ch: 13.1,13.3,13.5,14.1-14.3,15.1,15.6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO2	Demonstrate the use of Operators & Expressions
CO3	Apply logical skills to solve the engineering problems using C programming constructs& functions.
CO4	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
CO5	Demonstrate the use of Modular Programming Constructs involving pointers, Structure & Unions.

Text Books	
1	Computer Fundamentals and Programming in C, Third Edition Reema Thareja, 2023, Oxford University Press 2023. ISBN-13: 978-93-5497-789-3.

Reference Books	
1	E. Balaguruswamy, Programming in ANSI C, Tata McGraw Hill, 8th edition, 2019, ISBN: 978-93-5316-513-0.
2	Behrouz A. Forouzan and Richard F. Gilberg, Computer Science: A Structured Approach Using C, Cengage Learning, 3rd edition, 2013, ISBN: 978-05-3449-132-1.
3	Yashwant Kanetkar Let us C, 19th Edition 2023, BPB publication, ISBN: 978-93-5551-276-5

Web links and Video Lectures (e – Resources)	
1	elearning.vtu.ac.in/e-content/courses/video/BS/15PCD23.html
2	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods.
3	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
4	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem-solving methods
5	elearning.vtu.ac.in/e-content/courses/video/BS/15PCD23.html

CO – PO MAPPING

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

Laboratory Programs

1. C- Program to convert Kilometers into Meters and Centimeters.
2. C- Program to convert temperature from Fahrenheit to Celsius.
3. Develop a C Program to find the roots of quadratic equation for non-zero co-efficient using if-else ladder construct.
4. Program to check whether a number is an Armstrong number.
5. Write a Program to print prime numbers from 1 to N
6. Develop a C program to read n characters and sort the characters using Bubble sort technique.
7. Develop a C program to read two matrices A (m x n) and B (p x q) and compute the product of the two matrices. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only.
8. Write an algorithm and develop a C program to search an integer from N numbers in ascending order using binary searching technique.
9. Write a program in C to convert a decimal number to a binary number using the function.
10. Develop a C program to Check whether a String is Palindrome or not
11. Develop a C program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.
12. C-Program to read, write and Compute average marks and the students scoring above and below the average marks for a class of 'N' students.

Semester: I/II						
Introduction to Internet of Things (IoT) **Stream: EC (Common to all Branch Students)**						
Course Code	**:**	BETC105A/ BETC205A		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Electronic Components
Knowledge on Fundamental Concepts	Knowledge about Data, Devices, Analytics, Connectivity, Security, Artificial Intelligence.
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics
CLO2	Understand the recent application domains of IoT in everyday life
CLO3	Gain insights about the current trends of Associated IoT technologies and IoT Analytics

Module – 1	**08 Hrs**
Basics of Networking: Introduction, Network Types, Layered network models. **Emergence of IoT:** Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components **Textbook1: Ch1: 1.1 to 1.3 Ch4: 4.1 to 4.4**	
Module – 2	**08 Hrs**
IoT Sensing and Actuation: Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics. **Textbook 1: Ch5: 5.1 to 5.9**	
Module – 3	**08 Hrs**
IoT Processing Topologies and Types: Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Off-loading. **IoT Connectivity Technologies:** LoRa, NB-IoT, WiFi and Bluetooth **Textbook 1: Ch6: 6.1 to 6.5; Textbook 3: Ch4: P134, P144; Textbook2: Ch2: 2.2, 2.3**	
Module – 4	**08 Hrs**
Associated IoT Technologies: Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service. **IoT Communication Technologies:** Introduction and Infrastructural. Protocols: IPV4/IPV6 **Textbook1: Ch10:10.1to10.6 Textbook 2: Ch2: 2.1.2.1**	
Module – 5	**08 Hrs**
IoT Case Studies and Future Trends: Vehicular IoT – Introduction, Agricultural IoT – Introduction and Case Studies Health care IoT – Introduction, Case Studies, IoT Analytics – Introduction **Textbook 1: Ch12: 12.1,12.2; Ch13:13.1; Ch14: 14.1-14.2; Ch17: 17.1**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Illustrate the evolution of IoT, IoT networking components, and addressing strategies in IoT
CO2	Understand the significance of various sensing devices and actuator types
CO3	Demonstrate the processing in IoT
CO4	Explain Associated IoT Technologies and IoT Communication Technologies
CO5	Analyze IoT in real world applications

Text Books	
1	Sudip Misra, Anandarup Mukherjee,Arijit Roy,"Introduction to IoT",Cambridge University Press2021.
2	Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri, "Internet of Things: Architectures, Protocols and Standards", ISBN: 978-1-119-35967.
3	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry," IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)

Reference Books	
1	S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press
2	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
3	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/

CO – PO MAPPING

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

Semester: I/II						
Introduction to Cyber Security **Stream: CS (Common to all the Branches)**						
Course Code	**:**	BETC105B / BETC205B		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	
Knowledge on Fundamental Concepts	Basic Knowledge of Computers and Mobile Phone Usage
Knowledge on Connected Tools (If any)	NIL

Course Learning Objectives: This course will enable the students to	
CLO1	Understand Cybercrime Fundamentals
CLO2	Explore Cyber Offenses
CLO3	Examine Cybercrime in Mobile and Wireless Contexts
CLO4	Analyze Tools and Methods in Cybercrime
CLO5	Identify Phishing and Identity Theft Techniques

Module – 1	**08 Hrs**
Introduction to Cybercrime: **Cybercrime:** Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws, Global Perspectives. **Textbook:1 Chapter 1 (1.1 to 1.5, 1.7-1.9)**	
Module – 2	**08 Hrs**
Cyber Offenses: **How Criminals Plan Them:** Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafe & cybercrimes. **Botnets:** The fuel for cybercrime, Attack Vector. **Textbook:1 Chapter 2 (2.1 to 2.7)**	
Module – 3	**08 Hrs**
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of mobile devices, Trends in Mobility, credit card frauds in mobile and wireless computing era, security challenges posed by mobile devices, Registry settings in mobile devices. attacks on mobile/cell phones. **Textbook:1 Chapter 3 (3.1 to 3.6, 3.8)**	
Module – 4	**08 Hrs**
Tools and Methods used in Cybercrime: Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks. **Textbook:1 Chapter 4 (4.1 to 4.9, 4.12)**	

Module – 5	08 Hrs
Phishing and Identity Theft: Introduction, methods of phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft. **Textbook:1 Chapter 5 (5.1. to 5.3)**	

Course Outcomes: After completing the course, the students will be able to	
CO1	**Define** and classify various types of cybercrimes
CO2	**Analyze** the planning and execution of cyber offenses
CO3	**Assess** security challenges associated with mobile and wireless devices,
CO4	Illustrate Tools and Methods used on Cybercrime
CO5	**Explore** the techniques of phishing and identity theft.

Text Book	
1	Sunit Belapure and Nina Godbole, "**Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives**", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

Reference Books	
1	"Introduction to Cyber Security : Guide to the World of Cyber Security", Anand Shinde,ISBN 978-1-63781-642-4, 2021
2	"Cybersecurity-Essentials"- 1st Edition, Charles J Brooks, Christopher Grow,PhilipCraig, Donald Short, Sybex Publications. 2018 ISBN: 978-1-119-36239-5
3	Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.2011 eBook ISBN :13: 978-1-4398-5126-5

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=OYsY5B9pqYU&list=PLyqSpQzTE6M-jkJEzbS5oHJUp2GWPsq6e
2	https://www.youtube.com/watch?v=lpa8uy4DyMo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
3	https://www.youtube.com/watch?v=njPY7pQTRWg
4	https://www.youtube.com/watch?v=KqSqyKwVuA8

CO – PO MAPPING

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

Semester: I/II					
INTRODUCTION TO QUANTUM COMPUTING **Stream: CS (Common to all the branches)**					
Course Code	**:**	BETC105C / BETC205C	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50Marks
Total Hours	**:**	40L	**SEE**	**:**	50Marks
Course Type	**:**	ETC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	
Knowledge on Fundamental Concepts	Basic understanding of Algorithms, cryptography, physics and mathematics.
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Develop a foundational understanding of classical and quantum computational models, with an emphasis on the mathematical frameworks of linear algebra
CLO2	Equip students with a deep understanding of the principles of quantum mechanics as they apply to quantum information
CLO3	Introduce students to advanced quantum communication protocols and algorithms
CLO4	Provide students with a comprehensive understanding of error correction techniques in both classical and quantum computing
CLO5	Explore the principles and techniques of quantum information theory and cryptography

Module-1	**08Hrs**
Introduction And Background: Overview, Computers and the Strong Church–Turing Thesis, The Circuit Model of Computation, A Linear Algebra Formulation of the Circuit Model, A Linear Algebra Formulation of the Circuit Model, A Preview of Quantum Physics, Quantum Physics and Computation **Linear Algebra And The Dirac Notation:** The Dirac Notation and Hilbert Spaces**,** Dual Vectors, Operators, The Spectral Theorem, Functions of Operators, Tensor Products, The Schmidt Decomposition Theorem. **Text Book1: Chapter 1,2**	
Module–2	**08Hrs**
Qubits And The Framework Of Quantum Mechanics : The State of a Quantum System, Time-Evolution of a Closed System, Composite Systems, Measurement, Mixed States and General Quantum Operations **A Quantum Model Of Computation:** The Quantum Circuit Model, Quantum Gates, Universal Sets of Quantum Gates, Universal Sets of Quantum Gates, Implementing Measurements with Quantum Circuits. **Text Book1: Chapter 3,4**	
Module–3	**08 Hrs**
Superdense Coding And Quantum Teleportation: Superdense Coding, Quantum Teleportation, An Application of Quantum Teleportation **Quantum algorithms**:, Phase Kick-Back, The Deutsch Algorithm, The Deutsch–Jozsa Algorithm, Simon's Algorithm, Grover's Quantum Search Algorithm **Text Book1: Chapter 5, Chapter 6- 6.1,6.2,6.3,6.4 6.5 , Chapter 8-8.1**	

Module–4	08 Hrs
Quantum Error Correction: Classical Error Correction, The Classical Three-Bit Code, Fault Tolerance, Quantum Error Correction, Three- and Nine-Qubit Quantum Codes. **Text Book 1: Chapter 10**	
Module–5	**08 Hrs**
Quantum information theory and cryptography: Data compression, Classical information over noisy quantum channels, Quantum information over noisy quantum channels, Quantum cryptography. **Text Book 2: Chapter 12-12.2,12.3,12.4,12.6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the principles of the Church-Turing Thesis and the Circuit Model in both classical and quantum.
CO2	Describe the state and evolution of quantum systems, design quantum circuits using a universal set of quantum gates
CO3	Explain and implement quantum communication techniques like superdense coding and quantum teleportation
CO4	Compare classical and quantum error correction methods, design and implement fault-tolerant quantum systems
CO5	Apply quantum information theory to data compression and demonstrate proficiency in quantum cryptographic techniques

Text Books	
1	Phillip Kaye, Raymond Laflamme , MicheleMosca, An Introduction to Quantum Computing, 2007,Oxford University Press, ISBN 0-19-857000-7 978-0-19-857000-4.
2	M. A. Nielsen &I.Chuang,Quantum Computation and Quantum Information, 10th Anniversary edition published 2010 Cambridge University Press, ISBN 978-1-107-00217-3

Reference Books	
1	Chris Bernhardt, Quantum Computing for Everyone, 2020. The MIT Press, Cambridge, ISBN: 9780262539531
2	Eleanor G. Rieffel and Wolfgang H ,Quantum Computing, A Gentle Introduction ,2014 ,The MIT press , ISBN: 9780262526678

Web links and Video Lectures (e – Resources)	
1	https://archive.nptel.ac.in/courses/106/106/106106232/
2	https://www.youtube.com/watch?v=x3DDKrM4ZGs&t=11s
3	https://www.youtube.com/watch?v=ZWCuQD-uIoY&t=2s

CO – PO MAPPING

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

Semester: I / II					
Introduction to AR & VR **Stream: CS (Common to all the branches)**					
Course Code	**:**	BETC105D / BETC205D	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	ETC	**SEE Duration**	**:**	3 Hours

Prerequisites :	
Courses	Mathematics, Basics of Computer.
Knowledge on Fundamental Concepts	In geometry, a three-dimensional space is a mathematical space in which three values are required to determine the position of a point. Working principles of computer
Knowledge on Connected Tools (If any)	Software, Hardware

Course Learning Objectives:	
CLO1	Designed to give historical and modern overviews and perspectives on virtual reality.
CLO2	It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.
CLO3	To understand and design the various geometrical shapes of the objects using tools.
CLO4	Explain the concepts of motion and tracking in VR systems.
CLO5	Describe the importance of interaction and audio in VR systems
CLO6	To provide a foundation to the fast growing field of AR and make the students aware of the various AR devices

Module -1	**08 Hrs**
Introduction: What Is Virtual Reality? Modern VR Experiences, History Repeats, Bird's-Eye View, Hardware, Software, Human Physiology and Perception. **TextBook-1: Chapter 1: 1.1,1.2,1.3 chapter 2: 2.1, 2.2, 2.3**	
Module – 2	**08 Hrs**
The Geometry of Virtual Worlds &The Physiology of Human Vision: Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations. **Case studies:** Installation of Unity tools and Visual Studio, setting up Unity for VR development, understanding documentation of the same. **TextBook-1: Chapter 3: 3.1, 3.2, 3.3, 3.4,3.5**	
Module – 3	**08 Hrs**
Human Eye, eye movements & implications for VR. Evaluating VR Systems and Experiences, Perceptual Training, Recommendations for Developers, Comfort and VR Sickness. **Case studies:** Develop a scene in Unity that includes: A cube, plane and sphere, apply transformations on the 3 game objects. **TextBook-1: Chapter 5:5.1,5.2,5.3,5.4 chapter 12:12.1,12.2,12.3,12.4**	

Module – 4	**08 Hrs**
What Is Augmented Reality - History of augmented reality, Examples, Related fields, Multimodal displays, Visual perception, Requirements and Characteristics. **The future**- What May Drive Business Cases, An AR Developer's Wish List, Taking AR Outdoors. **Case studies:** Timeline of evolution of AR from VR **TextBook-2: Chapter 1,2,14**	
Module –5	**08 Hrs**
Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping. **Augmented Reality Software -** Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application. **Case studies**: Study all the available AR toolkits. **TextBook-2:Chapter 4**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Illustrate how VR systems work and list the applications of VR.
CO2	Design and implement the components that enables VR systems to be built.
CO3	Apply the system of human vision and its implication on perception and rendering.
CO4	Determine how AR systems works
CO5	Apply the computer vision concepts for AR
CO6	Implementation of AR techniques using of software tools.

Text Books	
1	Virtual Reality, Steven M. LaValle, Cambridge University Press, 2019. ISBN:9781108182874
2	Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494.

Reference Books	
1	Bruno Arnaldi, Pascal Guitton, Guillaume Moreau, Virtual Reality and Augmented Reality: Myths and Realities, iSTE and WILEY, First Publication 2018. ISBN 1786301059
2	Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

Web links and Video Lectures (e – Resources)	
1	http://lavalle.pl/vr/book.html
2	https://nptel.ac.in/courses/106/106/106106138
3	https://www.coursera.org/partners/googlearvr
4	https://drive.google.com/file/d/1mdLitgpCbj3DqRBapTKGp_UVgIO2f7ul/view

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**3**	**2**	**2**			**1**	**1**			**1**
CO2	**3**	**3**	**3**	**2**	**2**			**1**	**1**			**1**
CO3	**3**	**3**	**3**	**2**	**2**			**1**	**1**			**1**
CO4	**3**	**3**	**3**	**2**	**2**			**1**	**1**			**1**
CO5	**3**	**3**	**3**	**2**	**2**			**1**	**1**			**1**
CO6	**3**	**3**	**3**	**2**	**2**			**1**	**1**			**1**

Semester: I/II						
Introduction To Electric and Hybrid Vehicles **Stream: ME (Common to all the branches)**						
Course Code	**:**	BETC105E/BETC205E		**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	3:0:0		**CIE**	**:**	50Marks
Total Hours	**:**	40L		**SEE**	**:**	50Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	**Nil**
Knowledge on Fundamental Concepts	**Nil**
Knowledge on Connected Tools (If any)	**Nil**

Course Learning Objectives: This course will enable the students to	
CLO1	Learn the fundamental aspects air pollution and modern transportation
CLO2	Gain Knowledge about Internal combustion engine and their operating parameters
CLO3	Understand the configurations of electric vehicle and transmission in electric vehicles
CLO4	Understand the concept of hybrid electric drive trains and architecture of hybrid electric drive trains
CLO5	Gain knowledge about fundamentals of regenerative braking system

Module-1	**08 Hrs**
Environmental Impact and History of Modern Transportation - Air Pollution, Nitrogen Oxides, Carbon Monoxide, Unburned Hydrocarbons, Other Pollutants, Global Warming Petroleum Resources Induced Costs, Importance of Different Transportation, Development Strategies to Future Oil Supply, History of Electric Vehicles, History of Hybrid Electric Vehicles, History of Fuel Cell Vehicles. **Text Book 2: Ch1(Complete)** **Text Book 3: Ch1-1.1-1.1.4,1.2-1.8**	
Module-2	**08 Hrs**
Internal Combustion Engines- 4S, Spark-Ignited IC Engines, Operating Principles, Operation Parameters, Rating Values of Engines, Indicated Work per Cycles and Mean Effective Pressure, Mechanical Efficiency, Fuel/Air and Air/Fuel Ratio, Volumetric Efficiency, Indicated and Brake Power and Torque, Fuel Consumption Characteristics, Spark Timing 4S, Compression-Ignition IC Engines. Simple problems. **Text Book 1: Ch12-12.1,12.2,12.3,12.4, 12.7, Ch13-13.1,13.2,** **Text Book 3: Ch3-3.1-3.1.7,3.2.**	
Module-3	**08 Hrs**
Electric Vehicles- Configurations of Electric Vehicles, Performance of Electric Vehicles, Traction Motor Characteristic, Tractive Effort and Transmission Requirement, Vehicle Performance, Tractive Effort in Normal Driving, Energy Consumption. **Text Book 2: Ch3(Complete)** **Text Book 3: Ch4 (Complete**)	
Module-4	**08 Hrs**
Hybrid Electric Vehicles- Concept of Hybrid Electric Drive Trains, Architectures of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel Hybrid Electric Drive Trains, Torque-Coupling Parallel Hybrid Electric Drive Trains, Speed-Coupling Parallel Hybrid Electric Drive Trains, Torque-Coupling and Speed-Coupling, Parallel Hybrid Electric Drive Trains	

Text Book 3: Ch5(Complete)	
Module-5	**08 Hrs**
Fundamentals of Regenerative Braking- Energy Consumption in Braking, Braking Power and Energy on Front and Rear Wheels, Brake System of EVs and HEVs, Series Brake — Optimal Feel, Series Brake — Optimal Energy Recovery, Parallel Brake, Antilock Brake System (ABS). **Text Book 3: Ch11(Complete)**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Elaborate the cause of automobile emissions, its effects on environment. Also study History of modern transportation.
CO2	Illustrate different components of 4s SI and CI engines, along with their operating principles and parameters.
CO3	Elucidate about electric vehicles, their configurations, performance and tractive effort.
CO4	Explain about different types of Hybrid engines and their components and hybrid electric drive trains
CO5	Discuss about selection of modern transportation and fundamentals of regenerative braking

Text Books	
1	Automotive Mechanics, S Srinivasan, Second Edition, 2017, McGraw Hill Education ISBN-10:9780070494916
2	Electric vehicle technology, James larminie, Oxford brookes University, Second Edition, 2012, Wiley Publications, ISBN-13:978-1119942733
3	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, Mehrdad Ehsani, Texas A&M University, Yimin Gao, Sebastien E. Gay, Texas A&M University, Ali Emadi, Illinois Institute of Technology, 3rd Edition, CRC Press,2018, ISBN-10:1498761771

Reference Books	
1	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, M. Ehsani, Y. Gao, S. Gay and Ali Emadi, CRC Press 2005
2	Hybrid Electric Vehicles Principles and Applications with Practical Perspectives, Chris Mi, M. Abul Masrur, David Wenzhong Gao, Wiley Publication, 2011

Web links and Video Lectures (e – Resources)	
1	https://archive.nptel.ac.in
2	https://www.cranfield.ac.uk>short>transport systems
3	https://www.nrdc.org.>stories>air pollution-everything

CO – PO MATRIX

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

Semester: I/II						
Introduction to xG Communication **Stream: EC (Common to all the branches)**						
Course Code	**:**	BETC105F /BETC205F		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Wireless Cellular Concepts
Knowledge on Fundamental Concepts	Access Technologies like TDMA, FDMA and CDMA
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
1	Provide a comprehensive overview of wireless network infrastructure and the evolution of cellular networks
2	Familiarize themselves with the key concepts and architecture of 2G communication systems.
3	Understand the technological advancements in cellular wireless data networks.
4	Deepen their understanding of 4G LTE technology by examining its core design principles, enabling technologies, and network architecture.
5	Explore the foundational concepts, use cases, and performance requirements of 5G communication systems.

Module – 1	**08 Hrs**
Introduction Overview of existing Network infrastructure, Wireless Network applications, Different generations of wireless cellular networks, 1G (AMPS Characteristics, AMPS Channels, AMPS Layout), 2G,2.5G,3G and 4G Cellular system, IoT: relation to 5G **Text Book 1: Ch 1: 1.3, 1.5, Ch 2: 2.1-2.6** **Text Book 3: Ch 1: 1.1.4**	
Module – 2	**08 Hrs**
2G Communication GSM system overview: Introduction to GSM and TDMA, GSM Network and System Architecture, GSM channel concept(Logical Channels, Broadcast channels, Common Control Channels, Dedicated Control Channels). CDMA Basics : CDMA channel concept **TextBook 1: Ch 5:5.1-5.3, Ch 6:6.3**	
Module – 3	**08 Hrs**
Cellular Wireless Data Networks-2.5G and 3G Systems Introduction to Mobile wireless data Networks, CDPD, GPRS and EDGE Data Networks (Overview of Packet data network, CDPD, GPRS, GPRS networks, GPRS network details, GPRS Network Layout and Operation), CDMA Data Networks, Evolution of GSM and NA-TDMA to 3G, Evolution of CDMA to 3G, SMS, EMS, MMS and MIM Services. **TextBook 1: Ch 7: 7.1-7.6**	
Module – 4	**08 Hrs**
4G Communication LTE: Key Requirements of LTE Design, Key Enabling Technologies and Features of LTE, LTE Network Architecture, The Broadband Wireless Channel: Fading **TextBook 2: Ch 1: 1.3.2, 1.4,1.5, Ch 2: 2.4**	

Module – 5	08 Hrs

5G Communication

Use cases and requirements: Use cases, Requirements and key performance indicators

5G system concept: Concept overview, Extreme mobile broadband, massive machine-type communication, Ultra-reliable machine-type communication, Dynamic radio access network, Lean system control plane, Localized contents and traffic flows, Spectrum toolbox

TextBook 3: Ch 2: 2.1,2.2

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate an understanding of the evolution and infrastructure of wireless cellular networks from 1G to 4G, and the role of IoT in relation to 5G technology.
CO2	Analyze the architecture, channel concepts, and operational characteristics of 2G communication systems, with a focus on GSM and CDMA technologies.
CO3	Examine the structure and operation of cellular wireless data networks, including 2.5G and 3G systems, and their evolution from earlier technologies.
CO4	Evaluate the key design requirements, enabling technologies, and network architecture of 4G LTE systems, focusing on multi-carrier modulation and multi-antenna techniques.
CO5	Explore and assess the use cases, requirements, and key performance indicators of 5G communication systems, including advanced concepts.

Text Books	
1	Introduction to Wireless Telecommunications Systems and Networks", Gary Mullet, First Edition, Cengage Learning India Pvt Ltd., 2006, ISBN- 13: 978-81-315-0559-5.
2	"Fundamentals of LTE" Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, Pearson education, ISBN-13: 978-93-530-6239-2
3	5G Mobile and Wireless Communication Technology, Afif Osseran, Jose F Monserrat, Patrick Marsch, Cambridge University Press, 2016.

Reference Books	
1	"Wireless Communications: Principles and Practice" Theodore Rappaport, 2nd Edition, Prentice Hall Communications Engineering and Emerging Technologies Series, 2002, ISBN 0-13-042232-0.
2	LTE for UMTS Evolution to LTE-Advanced' Harri Holma and AnttiToskala, Second Edition - 2011, John Wiley & Sons, Ltd. Print ISBN: 9780470660003.
3	Fundamentals of 5G Mobile Networks, Jonathan Rodriguez, John Wiley & Sons 2015, ISBN: 9781118867525

Web links and Video Lectures (e – Resources)	
1	5G, 4G LTE, 3G, 2G; Mobile/Cellular Networks For Beginners :https://www.udemy.com/course/5g-4g-lte-3g-2g-mobile-cellular-networks-for-beginners
2	"Wireless communication for everybody", https://www.coursera.org/learn/wireless-communications

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	2

Semester: I/II						
Renewable Energy Sources **Stream: ME (Common to all the Branches)**						
Course Code	**:**	**BETC105G/ BETC205G**		**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40 L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	**Nil**
Knowledge on Fundamental Concepts	**Nil**
Knowledge on Connected Tools (If any)	**Nil**

Course Learning Objectives: This course will enable the students to	
CLO1	Understand energy scenario, energy sources and their utilization.
CLO2	Explore society's present needs and future energy demands.
CLO3	Study the principles of renewable energy conversion systems.
CLO4	Exposed to energy conservation methods.

Module – 1	**08 Hrs.**
Introduction: Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale. Introduction to Internet of energy (IOE). **Text Book 1: Ch 1:1.1,1.2,1.3,1.4,1.5** **Text Book 2: Ch 1:1.1,1.2,1.3,1.4**	
Module – 2	**08 Hrs.**
Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. **Solar Thermal systems:** Flat plate collector; Solar distillation; Solar Pond electric power plant. **Solar electric power generation**- Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system. **Text Book 1: Ch 2:2.1,2.2,2.3 Ch 3:3.1,3.2,3.3, Ch 5:5.1,5.2,5.3** **Text Book 2: Ch 2:2.1,2.2,2.3 Ch 3:3.1,3.2,3.3, Ch 6:6.1,6.2,6.3**	
Module – 3	**08 Hrs.**
Wind Energy: Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and multiblade system. Vertical axis- Savonius and darrieus types. **Biomass Energy:** Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft)	

Text Book 1: Ch 6:6.1,6.2,6.5,6.7,6.8, Ch 7:7.1,7.2,7.3,7.4	
Module – 4	**08 Hrs.**
Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations. **Ocean Thermal Energy Conversion:** Principle of working, OTEC power stations in the world, problems associated with OTEC. **Text Book 1: Ch 9:9.1,9.2,9.3,9.4**	
Module – 5	**08 Hrs.**
Green Energy: Introduction, Fuel cells: Classification of fuel cells – H2; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy. **Text Book 1: Ch 11:11.1,11.2,11.3,11.4,11.5,11.6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the environmental aspects of renewable energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
CO2	Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation.
CO3	Elucidate the conversion principles of wind, tidal energy, ocean thermal energy conversion and hydrogen energy.
CO4	Describe the concept of biomass energy resources and green energy

Text Books	
1	Non-conventional Energy sources, G D Rai, Khanna Publication, Fourth Edition, 2002
2	Energy Technology, S.Rao and Dr. B.B. Parulekar, Khanna Publication, Solar energy, Subhas P Sukhatme, Tata McGrawHill, 2nd Edition, 1996.

Reference Books	
1	Principles of Energy conversion, A. W. Culp Jr., McGraw Hill, 1996
2	Non-Convention Energy Resources, Shobh Nath Singh, Pearson, 2018

Web links and Video Lectures (e – Resources)	
1	https://non-conventional-energy-sources-e10086374.html
2	https://renewable-energy-sources-and-their-applications- e33423592.html

CO – PO MAPPING

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

Semester: I/II						
WASTE MANAGEMENT **Stream: CV (Common to all the branches)**						
Course Code	**:**	BETC105H/ BETC205H		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	40L		**SEE**	**:**	50 Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites	
Courses	Basic Science, Environmental Studies
Knowledge on Fundamental Concepts	Types of waste, Waste Hierarchy, Waste Management Strategies
Knowledge on Connected Tools (If any)	**-**

Course Learning Objectives: This course will enable the students to	
CLO1	Learn the principles and processes involved in the collection, transportation, and disposal of solid waste.
CLO2	Explore various solid waste treatment technologies, including composting, incineration, and landfilling, and evaluate their environmental impacts.
CLO3	Develop skills in waste minimization, recycling, and resource recovery to promote sustainable solid waste management practices.
CLO4	Learn the treatment and disposal methods for biomedical waste, including incineration, autoclaving, and chemical disinfection, while focusing on risk management and environmental protection.
CLO5	Explore e-waste recycling and recovery technologies, and develop strategies for reducing e-waste generation through sustainable design, reuse, and refurbishment practices.

Module – 1	**08 Hrs**
INTRODUCTION TO SOLID WASTE MANAGEMENT: Definition and types of waste: Municipal, Industrial, Hazardous, and Special wastes. Importance and objectives of waste management. Overview of global and local waste management challenges. **WASTE GENERATION AND CHARACTERIZATION:** Sources and Types of waste. Waste Composition Analysis. Factors affecting Waste Generation. Methods for Waste Quantification and Characterization. **Self-Learning:** Technological Innovations in Waste Characterization: such as spectrometry, Machine learning, and AI. **Text Book 1: Ch10: 10.1-10.8 ,Ch11: 11.1-11.4**	
Module – 2	**08 Hrs**
SOLID WASTE MANAGEMENT: **Collection, Transportation, and Storage:** Waste collection methods, Door-to-Door, Community bins, etc. Transportation Logistics and Routing. Temporary Storage methods and Facilities.	

Hauled Container System, Stationary Container System. Transfer Station - Factors affecting Transfer station.

Waste Processing Technologies: Mechanical Processing: Shredding, Sorting, and Compaction. Biological Treatment: Composting, Anaerobic Digestion. Thermal treatment: Incineration, Pyrolysis, and Gasification.

Self-Learning: Challenges and opportunities of implementing advanced waste processing technologies in developing countries.

Text Book 1:Ch11: 11.5 -11.17,Ch12 : 12.1-12.4 ,12.8-12.14

Module – 3	**08 Hrs**

Recycling and Resource Recovery: Recycling processes for Paper, Plastics, Glass, and Metals. Resource recovery from waste. Waste-to-Energy Technologies. Recycle and reuse of Construction and Demolition waste

FINAL DISPOSAL TECHNIQUES:

Landfill classification, Types and Methods, landfill-siting consideration, characteristics, collection and use of landfill gas; composition, collection and treatment of leachate, Landfill design - an Overview. Operation and Post-closure care.

Self-Learning: Strategies for mitigating the negative impacts of landfills on local environments and populations.

Text Book 1:Ch 12 : 12.5-12.7,12.10 -12.17,Ch 11: 11.18 -11.21

Module – 4	**08 Hrs**

INTRODUCTION TO BIOMEDICAL WASTE: Sources and classification of Biomedical waste. Hazards associated with biomedical waste. Legal and regulatory framework for biomedical waste management.

Handling, Segregation, and Storage: Guidelines for waste segregation at source. Color coding and storage of biomedical waste. Transportation and handling of biomedical waste.

Treatment and Disposal Methods: Thermal treatment: Incineration and autoclaving. Chemical treatment and disinfection. Disposal methods: Landfilling, deep burial, and other specialized methods.

Self-Learning: Emerging and alternative technologies for the treatment of biomedical waste, such as microwave treatment, plasma pyrolysis, and enzymatic treatment.

Text Book 2 :Ch 1: 1.1-1.2,Ch 2: 2.1-2.4,Ch 3: 3.1-3.6,

Module – 5	**08 Hrs**

INTRODUCTION TO E-WASTE: Definition and types of e-waste. Sources of e-waste: Household, commercial, industrial. Environmental and health impacts of e-waste.

Sustainable E-Waste Management: Strategies for reducing e-waste generation. Reuse and refurbishment of electronic products. Circular economy principles in e-waste management**.**

Policy, Legislation, and Community Involvement: Role of policy and legislation in waste management. Community participation and awareness programs. Waste management in developing countries. **Self-Learning:** Explore the health and environmental risks faced by workers in informal e-waste recycling. **Text Book 3: Ch 1:1.1-1.3,Ch 4: 4.1- 4.4,Ch 5: 5.1- 5.4**

Course Outcomes: After completing the course, the students will be able to	
CO1	Design and implement effective collection, transportation, and disposal systems for solid waste, considering environmental, economic, and social factors.
CO2	Evaluate and select appropriate solid waste treatment technologies, such as composting, incineration, and landfilling, based on waste characteristics and regulatory requirements.
CO3	Develop and apply strategies for waste reduction, recycling, and resource recovery, contributing to sustainable solid waste management practices.
CO4	Design and implement biomedical waste treatment and disposal systems, such as incineration, autoclaving, and chemical disinfection, with a focus on minimizing environmental impact and ensuring compliance with legal standards.
CO5	Assess and implement e-waste recycling and recovery technologies, promoting sustainable practices such as reuse, refurbishment, and reduction of e-waste generation.
Text Books	
1	Environmental Engineering, Peavy, H. S., Rowe, D. R. and Tchhobanoglous, 2017,First Edition, McGraw Hill International Ed**. ISBN:** 9351340260
2	Guidelines for Management of Healthcare Waste as per Biomedical Waste Management Rules, 2016 Directorate General of Health Services, Central Pollution Control Board.
3	Handbook of Electronic Waste Management International Best Practices and Case Studies,Majeti Narasimha Vara Prasad, Meththika Vithanage, Anwesha Borthakur,2020, Butterworth-Heinemann is an imprint of Elsevier

Reference Books	
1	Integrated Solid Waste Management: Engineering Principles and Management Issues, George Tchobanoglous, Hilary Theisen, and Samuel A. Vigil, 1993,2nd Edition, McGraw-Hill Education, **ISBN:** 978-0070632370
2	Safe Management of Wastes from Health-care Activities, Prüss A., Giroult E. and Rushbrook P,1999,Geneva, World Health Organization. **ISBN:** 978-9241545259
3	Manual on municipal solid waste management, Central Public Health and Environmental Engineering Organization,2000, CPHEEO, New Delhi
4	Solid Waste Engineering", Vesilind, P. A., Worrell, W. A. and Reinhart,D. R.,2001 Thomson Brooks/Cole. ISBN: 0534378145

5	Waste Management Practices: Municipal, Hazardous, and Industrial, John Pichtel,(2014), CRC Press, **ISBN:** 978-1466585188
6	Biomedical Waste Management, R. Radhakrishan, 2007, Sumit Enterprises. ISBN:978-8184200010

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=c1t-P8zgmsw
2	https://youtu.be/HsV_Q1r0Ovc
3	https://youtu.be/gKSPSKiB9PE
4	https://www.youtube.com/watch?v=_r5rHyMHKEg&list=PL3MO67NH2XxJngITU5LDb2md2TX4Gqex-
5	https://www.youtube.com/watch?v=W8XAIKvDq_E
6	https://www.youtube.com/watch?v=0wwdfwnp3SU
7	https://www.youtube.com/watch?v=pknpZZBBQlM
8	https://www.youtube.com/watch?v=KOQFYz_-rfA
9	https://www.youtube.com/watch?v=rfaSSu2Ce64

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**3**			**2**	**3**	**2**	**2**			**3**
CO2	**3**	**3**	**2**		**3**	**2**	**3**	**2**	**2**			**2**
CO3	**3**	**2**	**3**		**2**	**2**	**3**	**2**	**2**			**3**
CO4	**3**	**2**	**3**		**2**	**2**	**3**	**2**	**2**			**2**
CO5	**3**	**3**	**2**		**2**	**2**	**3**	**2**	**2**			**2**

Semester: I/II						
SUSTAINABLE ENGINEERING **Stream: CV (Common to all the Branches)**						
Course Code	**:**	BETC105I/BETC205I		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50Marks
Total Hours	**:**	40		**SEE**	**:**	50Marks
Course Type	**:**	ETC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	**Basic Sciences, Environmental Science**
Knowledge on Fundamental Concepts	Sustainability Principles, Climate Change Mitigation and Adaptation
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Learn about the principles, indicators and general concept of sustainability.
CLO2	Apply the fundamentals of energy sources, energy use, energy efficiency, and resulting environmental implications of various energy supplies.
CLO3	Apply the sustainability concepts in engineering applications
CLO4	Analyze the principles and frame work of sustainable engineering
CLO5	Apply Life Cycle Assessment tool in sustainable engineering

Module – 1	**08Hrs**
The climate understanding: Preamble- The epic history of Earth- The great climate system- The collapse of Biodiversity- The overexploitation of Resources- Impact on human Societies **The climate Course Act:** Building Roadmap to Action- Acting on the carbon footprint- Acting on the ecological footprint- The low carbon transition- Acting on your own footprint (IT, Finance, legal, HR, Marketing and Communications) **Text Book 2: Ch 2: 2.1- 2.2**	
Module – 2	**08Hrs**
Basics of sustainability: Environmental Awareness- Definition and Key terms-Climate change and Climate systems- Effect of climate change and Managing climate change- Action guide for environmentally conscious lifestyle, what is GHG reporting- What is EPD & LCA (building a product) **Circular Economy:** Understanding the circular economy- Designing for a circular economy and making the shift **Use of renewable Energy:** Energy efficiency- Energy Storage- Wind, Solar, Geothermal, Hydro, Biomass, Hydrogen and Heat pumps **Text Book 1: Ch 2: 2.1-2.2**	
Module – 3	**08 Hrs**
Sustainable Materials: Design for sustainability- Sustainable Packaging-Transparency, LCA & EPD with case studies- Green building and Certifications- Sustainable supply chain **Decarbonization:** Climate change and greenhouse gases -Monitoring, measuring and reducing carbon emissions- Carbon management measures, carbon foot printing, carbon trading &carbon offsetting- Developing and managing carbon accounting systems	

Text Book 1: Ch 2: 2.1-2.2 , Ch 4: 4.2-4.4 **Text Book 2: Ch 16: 16.1- 16.6**

Module – 4	**08 Hrs**

Emission Reduction: GHG accounting and reporting principles- Business goals and inventory design- Reporting GHG emissions- Setting Organizational boundaries- Setting Operational Boundaries- Tracking emissions over a time - Identifying and calculating GHG emissions with example

Environmental Audits: ISO 9001 and ISO 14001

Natural Resource conservation: Lower water and energy consumption.

Text Book 1: Ch 3: 3.2-3.3

Text Book 3: Ch 3: 3.3-3.5

Module – 5	**08 Hrs**

Environmental Life Cycle Costing, Social Life Cycle Assessment, and Life Cycle Sustainability Assessment: Introduction, Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability, LCA Applications in Engineering: Environmental Product Declarations and Product Category Rules, Buildings and the Built Environment, Chemical and Chemical Production Food and Agriculture.

Integrating Sustainability in Engineering Design: Problems Solving in Engineering, conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process – Sustainable Process in Design, Production and product design in Engineering fields.

Text Book 1: Ch 3: 3.2- 3.3, Ch 4: 4.3-4.4

Text Book 2: Ch 17:17.1-17.5

Course Outcomes: After completing the course, the students will be able to	
CO1	Expose the concepts related to the study of sustainability, climate change, and ecological footprint
CO2	Application of Sustainable Engineering Concepts and Principles in Engineering
CO3	Elucidate the basics of sustainable development, sustainable engineering and its role in engineering
CO4	Problem solving by proposing creative, balanced solutions to sustainability challenges
CO5	Apply the Principle and methodology of Life Cycle Assessment Tool to engineering systems and integration methods of sustainability to Engineering Design.

Text Books	
1	Introduction to Sustainability for Engineers, Toolseeram Ramjeawon, 1st Edn., 2020,CRC Press, ISBN: 978-0367254452
2	Sustainable Engineering: Drivers, Metrics, Tools, and Applications, Krishna R. Reddy, Claudio Cameselle, Jeffrey A. Adams Wiley publications, ISBN: 978-1-119-49394-5, April 2019

3	Sustainable Engineering Concepts, Design, and Case Studies, David T. Allen David R. Shonnard, Prentice Hall ,ISBN-13: 978-0-13-275654-9, December 2011

Reference Books	
1	Introduction to Sustainable Engineering, Rag. R.L. and Ramesh Lakshmi Dina chandran, 2nd Edn, 2016,PHI Learning Pvt.Ltd., ISBN: 978-8120352636
2	System Analysis for sustainable Engineering: Theory and applications, Ni bin Chang, McGraw Hill Publications, 1stEdn., 2010
3	Engineering for Sustainable development: Delivery a sustainable development goals, UNESCO, International Centre for Engineering Education, France, 1stEdn., 2021

Web links and Video Lectures (e – Resources)

- https://youtu.be/_jqqfR2-X8w
- https://nptel.ac.in/courses/127105018
- https://unesdoc.unesco.org/ark:/48223/pf0000375644.locale=en
- https://www.youtube.com/watch?v=vgTSEqSlEVI
- https://youtu.be/uxDlOTp9-KU

CO – PO MAPPING

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

Semester: I/II						
Introduction to Python Programming (Common to All the Streams)						
Course Code	**:**	BPLC105/ BPLC205		**Credits**	**:**	3
Hours/Week (L:T:P)	**:**	2:0:2		**CIE**	**:**	50 Marks
Total Hours	**:**	40L+12P		**SEE**	**:**	50 Marks
Course Type	**:**	PLC(IC)		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic computer skills, Algebra or mathematics, Problem-solving skills
Knowledge on Fundamental Concepts	Basic math concepts, Programming fundamentals
Knowledge on Connected Tools (If any)	Text Editors, Integrated Development Environments (IDEs)

Course Objectives:	
CLO1	Learn the syntax and semantics of the Python programming language.
CLO2	Illustrate the process of structuring the data using lists, tuples
CLO3	Demonstrate the use of built-in functions to navigate the file system.
CLO4	Implement the Object-Oriented Programming concepts in Python.
CLO5	Demonstrate the use of method concepts in Python.

Module-I	**08 Hrs**
Python Basics: Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, Flow control: Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit(), **Text Book 1:** Ch 1, 2	
Module – II	**08 Hrs**
Functions: def Statements with Parameters, Return Values and return Statements,The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling. Lists: The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, List, List-like Types: Strings and Tuples, Example of Tuples, References, Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing. **Text Book 1:** Ch 4, 5	
Module –III	**08 Hrs**

Manipulating Strings: Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup Reading and Writing Files: Files and File Paths, The
os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print.format() Function, Project: Generating Random Quiz Files, Project:
Multiclip board

Text Book 1: Ch 6, 9

Module –IV	**08 Hrs**

Classes and objects: Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying, Classes and functions: Time, Pure functions, Modifiers, Prototyping versus planning,

Classes and methods: Object-oriented features, Printing objects, Another example, A more complicated example, The init method, The __str__ method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation

Text Book 2: Ch 15:15.1-15.6, Ch 16:16.1-16.4, Ch 17:17.1-17.9, 17.11

Module –V	**08 Hrs**

The NumPy Library: Ndarray: the heart of the library, Basic operations, indexing, slicing and iterating, conditions and boolean arrays, array manipulation, general concepts, reading and writing array data on files. The pandas Library: an introduction to Data structure, other functionalities on indexes, operations between data structures, function application and mapping.
Data Visualization with matplotlib -- The matplotlib Library – Installation, IPython and IPython QtConsole
Matplotlib Architecture -- Backend Layer, Artist Layer, Scripting Layer (pyplot) -- pylab and pyplot
-- pyplot , A Simple Interactive Chart -- Set the Properties of the Plot, matplotlib and NumPy, Working with Multiple Figures and Axes, Adding Further Elements to the Chart -- Adding Text -- Adding a Grid -- Adding a Legend ,Saving Your Charts

Text Book 3: Ch 3, Ch 4 and Ch 7

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate proficiency in handling loops and creation of looping functions.
CO2	Identify the methods to create and manipulate lists, tuples and dictionaries.
CO3	Develop programs for string processing and file organization
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.
CO5	Use the NumPy, Pandas and Matplotlib constructs for matrix manipulations and data analytics.

Text Books	
1	Al Sweigart,"Automate the Boring Stuff with Python",1 st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)

2	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2 nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf
3	Fabio Nelli, "Python Data Analytics", Apress, Publishing, 1st Edition, 2015.

Reference Books

1	Zero To Mastery In Python Programming
2	https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=MONU+SINGH+RAKESH+K.+YADAV%2C+SRINIVAS+ARUKONDA&search-alias=stripbooks. U Dinesh Kumar First Edition: 2019 ISBN: 978-81-265-7990-7ISBN: 978-81-265-8855-8(ebk) www.wileyindia.com
Web links and Video Lectures (e – Resources)	
1	https://www.learnpython.org/
2	https://www.learnpython.org/
3	https://pythontutor.com/visualize.html#mode=edit.
4	https://dineshkvs.wordpress.com/class-xics/

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2						1			
CO2	2	2	3		1							1
CO3	3	2	2						1			
CO4	2	2	2									
CO5	2	2	2						1		1	
CO6	2	2	2			1				1		1

Programming Exercises:

1. a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.

   b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.

2. a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.

   b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).

3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.

4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.

5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]

6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].

7. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.]

8. a. Write a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib.
b. Write a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib.

9. a. Write a Python program to Demonstrate how to Draw a Histogram Plot using Matplotlib.

b. Write a Python program to Demonstrate how to Draw a Pie Chart using Matplotlib.

10. a. Write a Python program to illustrate Linear Plotting using Matplotlib.
b. Write a Python program to illustrate liner plotting with line formatting using Matplotlib.

Additional Problems to Solve

1. Given an integer, n, perform the following conditional
   actions: If n is odd, print Weird
   If n is even and in the inclusive range of 2 to 5, print
   Not Weird If n is even and in the inclusive range of 6
   to 20 print Weird
   If n is even and greater than 20, print Not Weird

2. Given the participants' score sheet for your University Sports Day, you are required to find the runner-up score. You are given scores. Store them in a list and find the score of the runner-up.
3. Given the names and grades for each student in a class of students, store them in a nested list and print the name(s) of any student(s) having the second lowest grade.

   Note: If there are multiple students with the second lowest grade, order their names alphabetically and print each name on a new line.

4. Read in a dictionary containing key/value pairs of name:[marks] for a list of students. Print the average of the marks array for the student name provided, showing 2 places after the decimal.
5. Given a string. Split the string on a " " (space) delimiter and join using a – hyphen.
6. Given an integer, n , print the following values for each integer i from 1 to n:

a) Decimal
b) Octal
c) Hexadecimal (capitalized)
d) Binary

7. Given two complex numbers, and you have to print the result of their addition, subtraction, multiplication, division and modulus operations using class concept. The real and imaginary precision part should be correct up to two decimal places.

Semester: I/II						
Communicative English **(Common to all the branches)**						
Course Code	**:**	**BENG106 / BENG206**		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	1 Hour

Prerequisites:	
Courses	**English**
Knowledge on Fundamental Concepts	**Parts of Speech, Communication Skills**
Knowledge on Connected Tools (If any)	**NA**

Course Learning Objectives: This course will enable the students to	
CLO1	To know about Fundamentals of Communicative English and Communication Skills in general.
CLO2	To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
CLO3	To impart basic English grammar and essentials of important language skills.
CLO4	To enhance English vocabulary and language proficiency for better communication skills.
CLO5	To learn about Techniques of Information Transfer through presentation

Module – 1	**3 Hrs**
Introduction to Communicative English: Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills. Life History of Ratan N Tata by Dr. Thomas Mathew. **Text Book 1: Ch 1: 1.4 ,1.12, 1.11.3-4, 1.13**	
Module – 2	**3 Hrs**
Introduction to Phonetics : Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants andvowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation. **Text Book 1: Ch 7: 7.1 to 7.63** **Text Book 2: Ch 2: 2.1 to 2.13**	
Module-3	**3 Hrs**
Basic English Communicative Grammar and Vocabulary PART – I: Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it. **Text Book 1: Ch 2: 2.1, 2.2, 2.2.1 to 2.2.6** **Text Book 2: Ch 3: 3.1- 3.5** **Text Book 3: Ch 4: 4.14, Ch :43**	
Module-4	**3 Hrs**
Basic English Communicative Grammar and Vocabulary PART – II: Words formation – Prefixes and Suffixes, Contractions and Abbreviations.	

Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it. **Text Book 2: Ch 4: 4.3-4.4**
Module-5 **3Hrs**
Communication Skills for Employment: Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises. **Text Book 2: Ch 5: 5.1-5.4**

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the fundamentals of communication skills in their conversation.
CO2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
CO3	Impart basic English grammar and essentials of language skills as per present requirement.
CO4	Recognize and habit all types of English vocabulary and language proficiency.
CO5	Adopt the techniques of Information Transfer through presentation.
CO6	Prepare brief report on achievements of Ratan Tata.

Text Books	
1	**Communication Skills** by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt. Ltd. – 2019.
2	**Technical English -1** by Latha Mohan Shetty**,** (ISBN-9788193783887), Published by Pristine Publishing House, Mangaluru - 575006
3	**High School English Grammar and Composition** by P.C. Wren and H. Martin, (ISBN: 81-219-0009-3) S Chand & Company Ltd. Ram Nagar, New Delhi - 110055

Reference Books	
1	**English Language Communication Skills – Lab Manual cum Workbook,** Cengage learning India Pvt. Limited– (ISBN-978-93-86668-45-5), 2019.
2	**Communicative English Part -1** by Dr. Binoy Mathew, Jayvee Digital Publishing, Bangalore – 560083 (ISBN: 9-789395-333047)
3	**A Course in Technical English – D Praveen Sam, KN Shoba,** Cambridge University Press – 2020.

Web links and Video Lectures (e – Resources)	
1	https://learnenglish.britishcouncil.org/
2	https://www.eslcafe.com/
3	https://www.bbc.co.uk/learningenglish/
4	https://www.youtube.com/user/bbclearningenglish
5	https://www.bbc.com/learningenglish/english/intermediate-grammar

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2								1	3		2
CO2									1	3		2
CO3									2	3		2
CO4									1	3		2
CO5					2				1	3		2
CO6	1				1			2	1	3		1

Semester: I/II						
Professional Writing Skills in English (Common to all the branches)						
Course Code	**:**	BPWS106 / BPWS206		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15		**SEE**	**:**	50 Marks
Course Type	**:**	AEC		**SEE Duration**	**:**	1 Hour

Prerequisites:	
Courses	**English**
Knowledge on Fundamental Concepts	**Technical English Skills**
Knowledge on Connected Tools (If any)	**NA**

Course Learning Objectives: This course will enable the students to	
CLO1	Identify the Common Errors in Writing and Speaking of English.
CLO2	Achieve better Technical writing and Presentation skills for employment.
CLO3	Read Technical proposals properly and make them to Write good technical reports.
CLO4	Acquire Employment and Workplace communication skills.
CLO5	Learn about Techniques of Information Transfer through presentation in different level.

Module – 1	**3 Hrs**
Identifying Common Errors in Writing and Speaking English: Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused. Inspiring stories of Sudha Murthy by Prachi Kiran **Text Book 1: Ch: 1.1 – 1.10**	
Module – 2	**3 Hrs**
Nature and Style of sensible writing: Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words. **Text Book 1: Ch: 2.1 – 2.12**	
Module-3	**3 Hrs**
Technical Reading and Writing Practices: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises. **Text Book 1: Ch: 3.1 – 3.14**	
Module-4	**3 Hrs**
Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos. **Text Book 1: Ch: 4.1 – 4.15**	
Module-5	**3Hrs**

Professional Communication at Workplace: Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills. **Text Book 1: Ch: 5.1 – 5.9**

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand and identify the common errors in writing and speaking.
CO2	Achieve better technical writing and presentation skills.
CO3	Read and write technical proposals and reports.
CO4	Acquire employment and workplace communication skills.
CO5	Learn about techniques of information transfer through the presentation at different levels.
CO6	Prepare brief report on inspiring stories written by Sudha Murthy.

Text Books	
1	**Professional Writing Skills in English** by Dr. Binoy Mathew, (ISBN: 9-789356-484429)Jayvee Digital Publishing, Bangalore – 560083
2	**Technical English -1** by Latha Mohan Shetty**,** (ISBN-9788193783887), Published by Pristine Publishing House, Mangaluru - 575006
3	**Soft Skills & Employability Skills** by Sabina Pillai, (ISBN: 9781316981320) Cambridge University Press India Pvt. Ltd. New Delhi – 110025

Reference Books	
1	**Technical Communication,** Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
2	**English for Engineers** by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3	**Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
4	**Communicative English Part -1** by Dr. Binoy Mathew, Jayvee Digital Publishing, Bangalore – 560083 (ISBN: 9-789395-333047)

Web links and Video Lectures (e – Resources)	
1	https://www.free4talk.com/
2	https://www.hellotalk.com/?lang=en
3	https://basicenglishspeaking.com/daily-english-conversation-topics/
4	https://learnenglish.britishcouncil.org/skills/speaking

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1									**1**	**3**		**2**
CO2									**1**	**3**		**2**
CO3								**1**	**2**	**3**		**2**
CO4									**1**	**3**		**2**
CO5					**2**				**1**	**3**		**2**
CO6					**1**			**1**	**1**	**3**		**2**

Semester: I / II						
Indian Constitution (Common to all the branches)						
Course Code	**:**	BICO107/ BICO207		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15 L		**SEE**	**:**	50 Marks
Course Type	**:**	HSSMC		**SEE Duration**	**:**	1 Hours

Prerequisites:	
Courses	Social Science
Knowledge on Fundamental Concepts	Constitution, History
Knowledge on Connected Tools (If any)	NA

Course Learning Objectives: This course will enable the students to	
CLO1	Know about the basic structure of Indian Constitution
CLO2	Know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution
CLO3	Know about our Union Government, political structure & codes, procedures.
CLO4	Know the State Executive & Elections system of India.
CLO5	Learn the Amendments and Emergency Provisions, other important provisions given by the constitution

Module – 1	**08 Hrs**
Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly. **Text Book 1: Ch 1: 1.1 – 1.3,** **Text Book 2: Ch: 2.1 – 2.4**	
Module – 2	**08 Hrs**
Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations building. **Text Book 2: Ch: 3**	
Module – 3	**08 Hrs**
Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet. **Text Book 1: Ch: 4.1 – 4.12** **Text Book 2: Ch: 11**	
Module – 4	**08 Hrs**
Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism. **Text Book 2: Ch: 12**	
Module – 5	**08 Hrs**
State Executive and Governer, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions **Text Book 2: Ch: 13**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Analyze the basic structure of Indian Constitution.

CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
CO3	Know about our Union Government, political structure & codes, procedures.
CO4	Understand our State Executive & Elections system of India.
CO5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Text Books	
1	**Constitution of India** (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022
2	**Introduction to the Constitution of India**, (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008

Reference Books	
1	**Constitution of India**, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2	**The Constitution of India**, by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru
3	**Samvidhana Odu** - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
4	**Engineering** Ethics, M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004.

Web links and Video Lectures (e – Resources)	
1	https://legislative.gov.in/constitution-of-india/
2	https://www.india.gov.in/my-government/constitution-india
3	https://www.india.gov.in/topics/governance-administration/constitution
4	https://www.sci.gov.in/constitution/

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**1**							**3**				**3**
CO2	**1**							**3**				**3**
CO3	**1**							**3**				**3**
CO4	**1**							**3**				**3**
CO5	**1**							**3**				**3**

Semester: I/II						
Scientific Foundations of Health **(Common to all the branches)**						
Course Code	**:**	BSFH108 / BSFH208		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15		**SEE**	**:**	50 Marks
Course Type	**:**	HSSMC		**SEE Duration**	**:**	1 Hour

Prerequisites:	
Courses	Biology, Chemistry
Knowledge on Fundamental Concepts	Psychology, Health Sciences
Knowledge on Connected Tools (If any)	**NA**

Course Learning Objectives: This course will enable the students to	
CLO1	Know about Health and wellness (and its Beliefs) & It's balance for positive mindset.
CLO2	Build the healthy lifestyles for good health for their better future.
CLO3	Create a Healthy and caring relationships to meet the requirements of good/social/positive life.
CLO4	learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future
CLO5	Prevent and fight against harmful diseases for good health through positive mindset

Module – 1	**3 Hrs**
Good Health & It's balance for positive mindset: Health -Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health. **Text Book 1: Ch 1** **Text Book 2: Ch 2**	
Module – 2	**3 Hrs**
Building of healthy lifestyles for better future: Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries **Text Book 1: Ch 2** **Text Book 2: Ch 6**	
Module-3	**3 Hrs**
Creation of Healthy and caring relationships: Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering. **Text Book 1: Ch 3** **Text Book 2: Ch 7**	
Module-4	**3 Hrs**

Avoiding risks and harmful habits: Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and non-addictive people & their behaviors. Effects of addictions Such as…, how to recovery from addictions **Text Book 1: Ch 4** **Text Book 2: Ch 5**

Module-5	**3Hrs**
Preventing & fighting against diseases for good health: How to protect from different types of infections, How to reduce risks for good health, Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth :a challenge for upcoming future, Measuring of health & wealth status. **Text Book 1: Ch 5** **Text Book 2: Ch 10**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand and analyze about Health and wellness (and its Beliefs) & It's balance for positive mindset.
CO2	Develop the healthy lifestyles for good health for their better future.
CO3	Build a Healthy and caring relationships to meet the requirements of good/social/positive life.
CO4	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.
CO5	Prevent and fight against harmful diseases for good health through positive mindset.

Text Books	
1	"Scientific Foundations of Health" – Study Material Prepared by Dr. L Thimmesha, Published in VTU- University Website.
2	Health Psychology - A Textbook, FOURTH EDITION by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press.

Reference Books	
1	Health Psychology (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2	"Scientific Foundations of Health", (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore – 2022.
3	HEALTH PSYCHOLOGY (Ninth Edition) by SHELLEY E. TAYLOR - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press.
4	SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos and other materials / notes.
5	Scientific Foundations of Health (Health & Wellness) - General Books published for university and colleges references by popular authors and published by the reputed publisher

Web links and Video Lectures (e – Resources)	
1	https://www.studocu.com/in/document/visvesvaraya-technological-university/scientific-foundations-for-health/scientific-foundations-of-health-22sfh18-module-5vtu/80370995

2	https://www.researchgate.net/publication/375893223_Visvesvaraya_Technological_University_Scientific_Foundations_of_Health_SFH
3	https://www.slideshare.net/slideshow/scientific-foundations-of-health22sfh18module-1vtupdf/264794582

CO – PO MAPPING

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

Semester:I / II						
SAAMSKRUTHIKA KANNADA (Common to all the branches)						
Course Code	:	**BSKA107 / BSKA207**		**Credits**	:	1
Hours/Week(L:T:P)	:	**1:0:0**		**CIE**	:	50Marks
TotalHours	:	**15 Hours**		**SEE**	:	50Marks
Course Type	:	**HSSMC**		**SEEDuration**	:	1 Hours

Prerequisites:	
Courses	**KANNADA**
Knowledge on Fundamental Concepts	**To understand the language, cultural nuances, rituals and celebrations that makes Karnataka unique.**
Knowledge on Connected Tools (If any)	**Not applicable.**

CourseLearning Objectives: This course will enable the students to	
CLO1	ವೃತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ ,ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
CLO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನುಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸುವುದು.
CLO3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಮೂಡಿಸುವುದು.
CLO4	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
CLO5	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಘಟಕ – 1	**03Hrs**
ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು – **1. ಕರ್ನಾಟಕದ ಸಂಕ್ಷಿಪ್ತ ಇತಿಹಾಸ ಮತ್ತು ಸಾಹಿತ್ಯದ ಬೆಳೆವಣಿಗೆ – ಹಂಪನಾಗರಾಜಯ್ಯ** **2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ :ಒಂದು ಅಪೂರ್ವಚರಿತ್ರೆ - ಜಿ . ವೆಂಕಟಸುಬ್ಬಯ್ಯ** **3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ .ಎಲ್ .ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೋ. ವಿ .ಕೇಶವಮೂರ್ತಿ** **ಪಠ್ಯಪುಸ್ತಕ:** - ಘಟಕ 1: 1.1 : 12 – 15, 1.2:23-25, 1.3:28-30	
ಘಟಕ – 2	**03Hrs**
ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯಭಾಗ - **1. ವಚನಗಳು :ಬಸವಣ್ಣ , ಅಕ್ಕಮಹಾದೇವಿ , ಅಲ್ಲಮಪ್ರಭು ,ಜೇಡರದಾಸಿಮಯ್ಯ ,ಆಯ್ದಕ್ಕಿಮಾರಯ್ಯ,ಆಯ್ದಕ್ಕಿಲಕ್ಕಮ್ಮ.** **2. ಕೀರ್ತನೆಗಳು :ತಲ್ಲಣಿಸದಿರುಕಂಡ್ಯತಾಳುಮನವೇ – ಕನಕದಾಸರು** **3. ತತ್ವಪದಗಳು :ಸಾವಿರಕೊಡಗಳಸುಟ್ಟು- ಶಿಶುನಾಳಶರೀಫ** **4. ಜನಪದಗೀತೆ :ಯಾಕೆಬಡಿದಾಡ್ತಿತಮ್ಮ –ಎಂ.ಎಸ್. ರವಿಗೌಡ** **5.** **ಪಠ್ಯಪುಸ್ತಕ :- ಘಟಕ 2: 2.1:34-35 2.2:40-42 2.3: 44 2.4: web link 4**	
ಘಟಕ - 3	**03Hrs**

ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ- **1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವುಭಾಗ** **2. "ಒಳಿತು ಮಾಡು ಮನುಸ" -ಋಷಿ.** **3.ಹೊಸ ಬಾಳಿನ ಗೀತೆ–ಕುವೆಂಪು** **ಪಠ್ಯಪುಸ್ತಕ :- ಘಟಕ 3: 3.1:52-53 3.2: web link 3 3.3: 55-56**	
ಘಟಕ - 4	**0Hrs**
ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯಮತ್ತುಪ್ರಚಲಿತವಿದ್ಯಾಮಾನಗಳು - **1.ಡಾ .ಸರ್ .ಎಂ .ವಿಶ್ವೇಶ್ವರಯ್ಯ :ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್** **2. ಷೇರುಪೇಟೆ ,ಹಣಕಾಸು ನಿರ್ವಹಣೆ ಮತ್ತು ಮಾರುಕಟ್ಟೆ : ಟಿ. ಎಲ್ .ರವೀಂದ್ರ** **ಪಠ್ಯಪುಸ್ತಕ :- ಘಟಕ 4 4.1: 78-83 4.2: 98-10**	
ಘಟಕ– 5	**03 Hrs**
ಕಥೆಮತ್ತುಜೀವನದನೈಜಕ್ಷಣಗಳು - **1.ಯುಗಾದಿ :ವಸುಧೇಂದ್ರ** **2.ವೈಚಾರಿಕತೆಯಲೇಖನನೇಮಿಚಂದ್ರರವರ – "ಸೋಲೆಂಬುವುದುಅಲ್ಪವಿರಾಮ"ಲೇಖನ** **ಪಠ್ಯಪುಸ್ತಕ :-5.1:87-98 5.2: 65-70**	

Course Out comes:After completing the course,the students will be able to	
CO1	ಕನ್ನಡಭಾಷೆ ,ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.
CO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿಯು ಮೂಡುತ್ತದೆ
CO3	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
CO4	ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ,ಸಾಮಾನ್ಯ ಕನ್ನಡ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.
CO5	ಮಾನವೀಯ ಮೌಲ್ಯಗಳ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು.

TextBooks	
1	ಪಠ್ಯಪುಸ್ತಕ :ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಕನ್ನಡ ಮಾತೃ ಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ – ಡಾ ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ, ಡಾ.ಎಲ್ . ತಿಮ್ಮೇಶ ,
2	ಸಾಹಿತ್ಯಸಿಂಚನ೧-೨ - ಡಾ.ಎಲ್ . ತಿಮ್ಮೇಶ.

ReferenceBooks	
1	ಶಿಶುನಾಳಶರೀಫರವರ ದುಡ್ಡು ಕೆಟ್ಟದ್ದು ನೋಡಣ್ಣ
2	ಕುವೆಂಪುರವರ ಕಿಂದರಜೋಗಿ,ಪ್ರೇಮಕಾಶ್ಮೀರ,ಕೊಳಲು

3	ಡಿವಿಜಿಯವರ ವಿಶ್ವೇಶ್ವರಯ್ಯನವರನ್ನು ಕುರಿತು ಜ್ಞಾಪಕ ಚಿತ್ರಕಲೆ ಸಂಪುಟ 4

Web links and Video Lectures (e – Resources)	
1	https://dtek.karnataka.gov.in/storage/pdf-files/CDC/sahitya%20sinchana-1.pdf
2	https://dtek.karnataka.gov.in/storage/pdf-files/C-20%20syllabus/Sahitya%20sinchana-2.pdf
3	https://publictv.in/a-tragic-story-behind-makers-of-olithu-madu-mansa-song/
4	https://www.youtube.com/watch?v=Lmuk_1CmUWo

CO – PO MAPPING

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

Semester: I/II						
Balake kannada (Common to all the branches)						
Course Code	:	**BBKA107/ BBKA207**		**Credits**	:	**1**
Hours/Week(L:T:P)	:	**1:0:0**		**CIE**	:	**50 Marks**
Total Hours	:	**15**		**SEE**	:	**50 Marks**
Course Type	:	**HSSMC**		**SEE Duration**	:	**1 Hour**

Prerequisites:	
Courses	**Kannada**
Knowledge on Fundamental Concepts	**Understanding of kannada lauguage, Cultural nuances, rituals etc.**
Knowledge on Connected Tools (If any)	**NA**

Course Objectives: ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆ ಉದ್ದೇಶಗಳು:	
This Course will enable the students to,	
CO1	Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
CO2	Enable learners to Listen and understand the Kannada language.
CO3	Speak, read and write Kannada language conversations.
CO4	Train the learners for correct and polite conservation.
CO5	Know about Karnataka state language and literature.

Module -1	**03 Hrs**
Introduction, Necessity of learning a local language. Methods to learn the Kannada language. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listen in and Speaking Activities, Key to Transcription, ವೈಯಕ್ತಿಕ ,ಸ್ವಾಮ್ಯಸೂಚಕ/ ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words **Text Book: Lesson 1-3**	
Module - 2	**03 Hrs**
ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು- Possessive forms of nouns, dubitive question and Relative nouns ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣ ಬಣ್ಣ ವಿಶೇಷಣಗಳು ,ಸಂಖ್ಯಾ ವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals **Text Book: Lesson 4-5**	
Module - 3	**03 Hrs**
ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative Cases, and Numerals, ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು -Ordinal numerals and Plural markers, ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ Locative Case **Text Book: Lesson 6-7**	
Module - 4	**03 Hrs**
ನ್ಯೂನ /ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು -Defective/Negative Verbs & Colour Adjectives ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು - Accusative Cases and Potential Forms used in General Communication **Text Book: 1, Lesson 8-10**	

Module - 5	03 Hrs
ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು- Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs, ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾ ಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - Different types of Tense, Time and Verb, Kannada Vocabulary List : ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -Kannada Words in Conversation **Text Book: 1, Lesson 11-12**	

Course Outcomes: After completing the course the students will be able to	
CO1	Understand the importance of kannada language.
CO2	Articulate in the kannada language properly.
CO3	Apply various forms of nouns, verbs & adjectives in their conversations.
CO4	Read and write kannada language.
CO5	Prepare a report on current affairs by reading kannada news papers.

Text Books	
1	**Dr. L . Thimmesha, ಬಳಕೆ ಕನ್ನಡ : ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ**

Web links and Video Lectures (e – Resources)	
1	https://t.me/+vEVI_pwdtaIzMjM1
2	https://www.youtube.com/watch?v=QJJ9dPDNvgQ
3	https://vtu.ac.in/wp-content/uploads/2020/09/Balake.pdf

CO – PO MAPPING

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

Semester: II						
Mathematics - II for ME Stream (Common for ME, AE & ASE)						
Course Code	**:**	**BMATM201**		**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	2:2:2		**CIE**	**:**	50 Marks
Total Hours	**:**	40L+12P		**SEE**	**:**	50 Marks
Course Type	**:**	ASC(IC)		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Basic Mathematics Courses.
Knowledge on Fundamental Concepts	Basic differentiation, integration and Statistics
Knowledge on Connected Tools (If any)	Basic computer knowledge.

Course Learning Objectives: This course will enable the students to	
CLO1	To develop the knowledge of Partial differential Equation to solve the Engineering related problems.
CLO2	To facilitate the students with a concrete foundation of vector differentiation and its applications.
CLO3	Analyze the Civil engineering problems by applying partial differential equations.
CLO4	Use the knowledge of numerical methods to explain and solve the challenges in real world situation.
CLO5	To acquire the knowledge of modern mathematical tools using Python.

Module – 1	**08 Hrs**

Series Expansion and Multivariable Calculus:
Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems. Indeterminate forms - L'Hôpital's rule, problems. Partial differentiation, total derivative - differentiation of composite functions, Jacobian and problems, Maxima and minima for a function of two variables - Problems.

Applications: Computation of stress and strain, estimating the critical points and extreme values.

Self-study: Euler's theorem and problems, Method of Lagrange's undetermined multipliers with single constraint.
(RBT Levels: L1, L2 and L3)

Text Book 1: Ch 4: 4.3(4),4.4, Ch 5: 5.2, 5.4(2), 5.5, 5.6, 5.7, 5.11, 5.12.
Text Book 2: Ch 3: 3.5, 3.11, 3.13, 3.18, 3.22, Ch 4: 4.1, 4.5, 4.10.

Module – 2	**08 Hrs**

Vector Calculus:
Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.
Vector Integration: Line integrals, Surface integrals. Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem. Problems.

Applications: Velocity and Acceleration of moving particles.

Self-Study: Volume integral and Gauss divergence theorem.
(RBT Levels: L1, L2 and L3)

Text Book 1: Ch 8: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.11, 8.13, 8.14,8.19, 8.20, 8.21.
Text Book 2: Ch 15: 15.2, 15.3, 15.4, 15.5, 15.6.

Module – 3	**08 Hrs**

Partial Differential Equations (PDEs):
Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation.

Applications: Problems of one-dimensional heat equation and wave equation
Self-Study: Solution of Laplace equation.
(RBT Levels: L1, L2 and L3)

Text Book 1: Ch 17: 17.1, 17.2, 17.3, 17.4, 17.5, Ch 18: 18.4, 18.5, 18.7.
Text Book 2: Ch 18: 18.1, 18.2, 18.3, Ch 19: 19.4, 19.5, 19.7.

Module – 4	**08 Hrs**

Numerical Methods -I:
Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems. Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems.
Numerical integration: Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules(without proof). Problems.

Applications: Area, velocity and population.

Self-Study: Trapezoidal, Lagrange's inverse Interpolation.
(RBT Levels: L1, L2 and L3)

Text Book 1: Ch 28: 28.2, 28.2(2), 28.2(3). Ch 29: 29.1(1,2,3), 29.6, 29.9, 29.10, 29.11, 29.12, 29.13, Ch 30: 30.4, 30.5, 30.7, 30.8.
Text Book 2: Ch 32: 32.1, 32.2, 32.3, 32.4, 32.7, 32.9, 32.10, 32.14. Ch 13: 13.2, 13.4, 13.5, 13.6.

Module – 5	**08 Hrs**

Numerical Methods – II:

Numerical Solution of Ordinary Differential Equations (ODEs): Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor corrector formula (No derivations of formulae). Problems.

Applications: Finding approximate solutions to solve mechanical engineering problems.

Self-Study: Adam-Bashforth method.
(RBT Levels: L1, L2 and L3)

Text Book 1: Ch 32: 32.1, 32.3, 32.5, 32.7, 32.9, 32.10.
Text Book 2: Ch 33: 33.1, 33.3.

Course Outcomes: After completing the course, the students will be able to	
CO1	Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO2	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line integral and surface integral.
CO3	Demonstrate partial differential equations and their solutions for physical interpretations.
CO4	Apply the knowledge of numerical methods in solving physical and engineering phenomena.
CO5	Get familiarize with modern mathematical tools namely Mathematica/MatLab/Python/Scilab.

Text Books	
1	Higher Engineering Mathematics, B. S. Grewal, 44th Edition, 2021, Khanna Publishers, ISBN: 978-81-933284-9-1.
2	V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
3	E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books	
1	James Stewart: "Calculus" Cengage Publications, 7thEd., 2019.
2	Srimanta Pal & Subodh C. Bhunia: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3	N.P Bali and Manish Goyal: "A Textbook of Engineering Mathematics" Laxmi Publications, 10thEd., 2022
4	C. Ray Wylie, Louis C. Barrett: "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.
5	H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed.,2014
6	H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed.,2014
7	James Stewart: "Calculus" Cengage Publications, 7th Ed., 2019.

Web links and Video Lectures (e – Resources)	
1	http://nptel.ac.in/courses.php?disciplineID=111
2	http://www.class-central.com/subject/math(MOOCs)
3	http://academicearth.org/
4	VTU e-Shikshana Program
5	VTU EDUSAT Program

List of Laboratory experiments (2 hours/week per batch/ batch strength 15) 10 lab sessions + 1 repetition class + 1 Lab Assessment	
1	Finding partial derivatives and Jacobian.
2	Applications to Maxima and Minima of two variables.
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Verification of Green's theorem
5	Solution of one-dimensional heat equation and wave equation
6	Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4th order and Milne's predictor-corrector method

CO – PO MAPPING

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

Semester: I/II						
Applied Chemistry for ME Stream **Stream : ME (Common to ME, AE & ASE)**						
Course Code	**:**	BCHEM102/ BCHEM202		**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	2:2:2		**CIE**	**:**	50Marks
Total Hours	**:**	40L+12P		**SEE**	**:**	50Marks
Course Type	**:**	ASC(IC)		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Applied Chemistry
Knowledge on Fundamental Concepts	Sustainable Energy sources, Energy storage Corrosion science, Engg Materials like polymers, sensors, Phase diagrams, Nano chemistry & waste Management.
Knowledge on Connected Tools (If any)	

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the chemical properties of materials and their relevance in engineering applications.
CLO2	Integrate sustainability to minimize waste and energy in material selection, design, and manufacturing.
CLO3	Use thermodynamic concepts to analyze and optimize mechanical processes.
CLO4	Gain knowledge for selecting and designing corrosion protection methods
CLO5	Develop skills in using analytical techniques to assess material properties and performance.

Module – 1 **Sustainable energy & Energy storage devices**	**08Hrs**
Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Green fuel-Introduction, Advantages of green fuel, Production of hydrogen by electrolysis of water (Proton exchange method) and its advantages. Bio Diesel: Introduction, Synthesis, properties & applications. Power alcohol-Introduction and Advantages. Solar Energy: Introduction, construction, working, advantages & disadvantages of Photovoltaic cells. **Electrochemical energy system:** Introduction, classification of battery, Construction, working & applications of Li-ion battery, Li-Polymer Battery and Sodium-ion Battery. Fuel cells: Introduction, Advantages of Fuel cells over conventional method. Construction, working & applications of Methanol-oxygen fuel cell. **Self-learning**: Electrode material restoration in Batteries.	

Text Book 1: Ch 3- 3.1,3.2,3.3, 3.4,
Text Book 2: Ch 1- 1.4 ,1.5,1.6

Module – 2	**08Hrs**
Corrosion Science and Metal Finishing	

Corrosion: Introduction, electrochemical theory of corrosion, types of corrosion- differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement).

Corrosion control**:** Metal coating-galvanization, Surface conversion coatings -Anodizing of Aluminium, cathodic protection-sacrificial anode method. Corrosion penetration rate (CPR)-Introduction & numerical problems.

Metal finishing: Introduction, technological importance. Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel. Difference between Electroplating & Electroless Plating.

Self-learning: Factors affecting the rate of corrosion, factors influencing the nature and Quality of electrodeposit (Current density, concentration of metal ion, pH and temperature)**.**

Text Book 1: Ch 2- 2.1,2.2,2.3,2.4, 2.5
Text Book 2: Ch2- 2.1,2.2,2.3, 2.4

Module – 3	**08 Hrs**
Macromolecules for Engineering Applications	

Polymers: Introduction, methods of polymerization (Condensation and Free radical), molecular weight of polymer- number average and weight average, numerical problems. Synthesis, properties and industrial applications of poly vinyl chloride (PVC) and polystyrene.

Composites: Introduction, synthesis, properties and industrial applications of Kevlar fibre and Carbon based reinforced composites-graphene.

Plastics**:** Introduction, synthesis, properties and industrial applications of poly methyl Methacrylate (PMMA).

Biodegradable polymer: Introduction, synthesis, properties and applications of poly lactic acid (PLA).

Lubricants: Introduction, classification, properties and applications of lubricants.

Self-learning: Different types of Adhesives, properties and applications.

Text Book 1: Ch 3- 3.1,3.2, 3.3
Text Book 2: Ch 3- 3.1,3.2,3.3,3.4,3.5

Module – 4	**08 Hrs**
Sensors & Materials for Engineering applications	

Sensors: Introduction, Types, Principle & applications of Thermometric Sensor(Temp) & Electrochemical Gas sensor for the detection of pollutants(NO_X & SO_X)

Metals & Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Brass and Alnico alloy.

Ceramics: Introduction, classification based on chemical composition, properties and applications of pervoskite (CaTiO3).

Glass: Introduction, Composition, Types, Preparation of Soda-lime glass, properties and applications of glass.

Refractories**:** Introduction, classification based on chemical composition, properties and application of refractory materials

Self-learning: Abrasives: Properties and applications of silicon Carbide (carborundum).	
Text Book 2: Ch4- 4.1,4.2,4.3,4.4,4.5 **Text Book 3: Ch1- 1.1,1.2,1.3,1.4,1.5**	
Module – 5 **Nano chemistry, Phase Rule & Waste Management**	**08 Hrs**
Nano chemistry: Introduction, size dependent properties of nanomaterial (surface area, catalytic property), synthesis of nanoparticles by sol-gel method. Nanomaterials**:** Introduction, properties and engineering applications of carbon nanotubes and graphene. **Phase rule:** Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation, lever rule, Phase diagram: Two component-lead-silver system, Iron-Carbon System. **Waste Management:** Introduction, Types of waste, Sources, Characteristics, Environmental & Ill effects, Disposal methods of Solid & E-waste. **Self-learning:** synthesis of nanoparticles by co precipitation & chemical vapour deposition method.	
Text Book 2: Ch5- 5.1,5.2,5.3,5.4,5.5 **Text Book 3: Ch 5: 5.15.2,5.3, 5.4**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify the terms and processes involved in scientific and engineering applications
CO2	Explain the phenomena of chemistry to describe the methods of engineering processes
CO3	Solve for the problems in chemistry that are pertinent in engineering applications
CO4	Apply the basic concepts of chemistry to explain the chemical properties and processes
CO5	Analyze properties and processes associated with chemical substances in multidisciplinary situations.

Text Books	
1	A Text Book of Engineering Chemistry, R.V.Gadag and NityanandaShetty, I.K.International Publishing house. 2nd Edition, 2016. ISBN:9384588024
2	Chemistry of Engineering materials, MaliniS,KS Anantha Raju, CBS publishers PvtLtd., 1st Edition 2022 ISBN-13: 978-9354664427
3	Basuchandra's Engineering chemistry For I/II semester BE students , By Dr. Chandrashekar B M and Dr. Basavaraju B C , Banbayalu Publication, Bengaluru , Second Edition 2017

Reference Books	
1	Engineering Chemistry, PC Jain & Monica Jain, Dhanpat Rai Publication, -

	16thEdition 2015,ISBN ·:9789352160006, 9352160002
2	"Engineering Chemistry", O.G. Palanna, Tata McGraw Hill Education Pvt.Ltd. New Delhi, Fourth Reprint, 2015. ISBN-13:9780071321846
3	Engineering Chemistry, Satya prakash &Manisha Agrawal, Khanna Book Publishing, Delhi. 1st Edition, 2012, ISBN-13:978-9380016757

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=j5Hml6KN4TI
2	https://www.youtube.com/watch?v=X9GHBdyYcyo
3	https://www.youtube.com/watch?v=1xWBPZnEJk8

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1				1			1		1
CO2	3	1	1				1			1		1
CO3	3	1	1				1			1		1
CO4	3	1	1				1			1		1
CO5	3	1	1				1			1		1

Semester: I/II						
Course Title: Computer-Aided Engineering Drawing **Stream: ME (Common to all the branches)**						
Course Code	**:**	**BCED103/ BCED203**		**Credits**	**:**	3
Hours/Week (L: T:P)	**:**	2:0:2		**CIE**	**:**	50Marks
Total Hours	**:**	40 L		**SEE**	**:**	50Marks
Course Type	**:**	ESC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	**Nil**
Knowledge on Fundamental Concepts	**Nil**
Knowledge on Connected Tools (If any)	**Nil**

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the basic principles and conventions of engineering drawing
CLO2	Use drawing as a communication mode
CLO3	Generate pictorial views using CAD software
CLO4	Gain the knowledge about the development of surfaces
CLO5	Visualize engineering components

Module – 1	**08 Hrs**
Introduction to Engineering drawing Drawing Instruments and their uses, relevant BIS conventions and standards. Lettering, line conventions, dimensioning, material conventions, and free hand practicing. Co- ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz., tangency, parallelism, inclination and perpendicularity. Orthographic Projections: Planes of projection. **Projections of points** in all the four quadrants. **Projections of Straight lines** True length and True inclinations of a line, Apparent length and apparent inclinations of a line. Projection of straight line inclined to both the planes **Text Book 1: Ch 1, Ch 2, Ch 3** **Text Book 2: Ch 1, Ch 2, Ch 3**	
Module – 2	**08 Hrs**
Projections of Plane Surfaces Introduction to projection of plane surfaces, Projection of Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to horizontal and vertical planes. **Text Book 1: Ch 3** **Text Book 2: Ch 12**	
Module – 3	**08 Hrs**

Projections of Solids

Introduction to Projections of Solids, Projections of Right Regular Prisms- Square, Pentagonal & Hexagonal. Pyramids- Square, Pentagonal & Hexagonal, Cone, Tetrahedron and Hexahedron (Cube) inclined to both the planes.

Text Book 1: Ch 3

Text Book 2: Ch 14

Module – 4	**08 Hrs**

Isometric Projection

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones, Hemisphere and spheres. Isometric projection of combination of two solids.

Development of lateral surfaces

Development of lateral surfaces of right regular prisms- Triangular, Square, Pentagonal & Hexagonal. Cylinders, pyramids- Triangular, Square, Pentagonal & Hexagonal and cones resting with base on HP only.

Text Book 1: Ch 4

Text Book 2: Ch 17 Ch 15

Module – 5	**08 Hrs**

Application Problems and Multidisciplinary Exercises (CIE only)

Application of projection of lines, Planes, Solids; Problems on application of isometric projections and development of lateral surfaces.

Free hand sketching: True freehand, guided freehand, roads, buildings, utensils, hand tools and furniture etc.

Graphs and charts: Column chart, Pie chart, Line chart, Gantt chart etc.. using Microsoft excel or suitable software.

Text Book 1: Ch 5

Text Book 2: Ch 20

Course Outcomes: After Completing the Course, the students will be able to	
CO1	Draw and communicate the objects with definite shape and dimensions
CO2	Recognize and draw the shape and size of objects through different views
CO3	Develop the lateral surfaces of the object
CO4	Create a Drawing views using CAD software
CO5	Illustrate the interdisciplinary engineering components or systems through its graphical representation.

Text Books	
1	K.R. Gopalakrishna, *Engineering Graphics*, 32nd edition. :Subhas Publications, 2013.
2	N.D. Bhatt, *Engineering Drawing*, 48th edition. Gujarat: V.M. Panchal Charutha Publishing House, 2005.

Reference Books	
1	A Primer on Computer Aided Engineering Drawing, 2nd edition, Published by VTU, Belagavi.

2	Luzadder Warren J., Duff John M Eastern, 2009, Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, 7th edition, Best Publications.
3	Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015.

CO – PO MAPPING

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

Semester: I/II						
Innovation and Design Thinking (Common to all the branches)						
Course Code	**:**	**BIDT108/BIDT208**		**Credits**	**:**	1
Hours/Week(L:T:P)	**:**	1:0:0		**CIE**	**:**	50 Marks
Total Hours	**:**	15		**SEE**	**:**	50 Marks
Course Type	**:**	HSSMC		**SEE Duration**	**:**	1 Hours

Prerequisites:	
Courses	Mathematics, Science and English
Knowledge on Fundamental Concepts	Creative Thinking, Problem-Solving and Decision-Making, Basic Business and Entrepreneurship, Communication and Collaboration Skills
Knowledge on Connected Tools (If any)	**NA**

Course Learning Objectives: This course will enable the students to	
CLO1	Elucidate the concept of design thinking for product and service development.
CLO2	Describe the fundamental concept of innovation and design thinking.
CLO3	Discuss the methods of implementing design thinking in the real world.

Module – 1	**3 Hrs**
PROCESS OF DESIGN **Understanding Design thinking,** Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping. **Text Book 1: Ch: 1, 1.1-1.3** **Text Book 2: Part-1 & 2**	
Module – 2	**3 Hrs**
Tools for Design Thinking, Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design **Text Book 2: Part-3**	
Module-3	**3 Hrs**
Design Thinking in IT Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping **Text Book 2: Part-4**	
Module-4	**3 Hrs**
DT For strategic innovations, Growth – Story telling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design **Text Book 3: Ch:1-4**	
Module-5	**3Hrs**
Design thinking workshop, Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test **Web link**: 6	

Course Outcomes: After completing the course, the students will be able to	
CO1	Appreciate various design process procedures
CO2	Generate and develop design ideas through different technique
CO3	Identify the significance of reverse Engineering to Understand products
CO4	Draw technical sketch for design ideas
CO5	Conduct and Facilitate Design Thinking Workshops

Text Books	
1	John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
3	Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

Reference Books	
1	Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
2	Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

Web links and Video Lectures (e – Resources)	
1	www.tutor2u.net/business/presentations/. /product lifecycle/default.html
2	https://www.mindtools.com/brainstm.html
3	https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
4	www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
5	https://support.google.com/docs/answer/179740?hl=en
6	https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinkingprocess?srsltid=AfmBOooAVU05ROoNzpmVccbI_73KpwNEpzSmCs2OYaxfrLQsYZnXHfUm

CO – PO MAPPING

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

||Jai Sri Gurudev||

SJC Institute of Technology
A Premier Institution in Engineering and Management Education

SJC Institute of Technology is a premier institute under Visvesvaraya Technological University (VTU) established in 1986. The Institute managed by Sri Adichunchanagiri Shikshana Trust (R.) founded in 1974 by the divine soul of Jagadguru Padmabhushana Sri Sri Sri Dr. Balagangadharanatha Mahaswamiji. The trust is under the astute visionary and spiritual guidance of Paramapoojya Jagadguru Sri Sri Sri Dr. Nirmalanandanatha Mahaswamiji. The Trust runs more than 516 Institutions all over the states of Karnataka, Maharashtra, Tamilnadu, Andhra Pradesh & Delhi. SJCIT is approved by AICTE, accredited by NAAC with A+ Grade, 6 Engineering Departments Accredited by NBA, NIRF Ranking in the bandwidth of (151-300) and Gold rated by QS I-Gauge. The institute offers eleven UG Courses: ECE, CSE, ISE, ME, CV, AE, AS, AI-ML, AI&DS, CSD & CV (Kan) and Five PG Courses in Engineering and MBA along with Nine VTU recognized R&D centers. The institute has an excellent track record of results with university ranks and placements in past years. Along with academics, the students also participate and excel in extra-curricular and co-curricular activities through active cultural, sports and social groups. Our goal is to mould students into highly skilled technical and management professionals with a wide range of analytical, strategic and leadership capabilities to meet the global challenges.

HIGHLIGHTS

- **38 years of excellence with relentless service to society imparting quality education.**
- **3060+ Students and 24000+ alumni network.**
- **204+ Experienced, Well qualified and Passionate faculty with 60+ Doctorates, 210+ Non-Teaching Staff.**
- **Consistency in achieving 95% & above Results with Ranks and Medals at University Exams. 72 Ranks and 15 Gold Medals have been fetched so far.**
- **Training and Expert Guidance on Technical Domains for Placement and Career Development with blended training model.**
- **100% Placement opportunity for all Students and more than 95% Placements for eligible candidates. 846+ job offers in 2022, 720+ job offers in 2023 and 456+ in 2024 still on going, with highest package of 28 LPA and average package 5.6 LPA.**
- **BGS-SJCIT Incubation foundation, IP Cell, EDC, CoEs, Student Excellence and Empowerment Development Centre (SEED).**
- **BGS R&D Centre - BARC, NAIN, BOSCH REXROTH Automation Centre, and Completed funded projects worth 3 crores projects worth 1crore.**
- **MoUs with reputed companies leading to Internships, Projects and Industry visits.**



SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

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