BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

Scheme of Teaching and Examinations-2022

Outcome-Based Education (OBE)and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

I Semester (Mechanical Engineering Stream) **Dept ME** **(For Physics Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATM101	Mathematics for MES-I	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BPHYM102	Physics for MES	PHY	2	2	2	0	03	50	50	100	04
3	ESC	BEMEM103	Elements of Mechanical Engineering	Mechanical	2	2	0	0	03	50	50	100	03
4	ESC-I	BESCK104E	Introduction to C Programming	Respective Engg Dept.	2	0	2	0	03	50	50	100	03
5	ETC-I	BETCK105A	Smart Materials and Systems	Any Dept	3	0	0	0	03	50	50	100	03
6	AEC	BENGK106	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMC	BKSKK107/ BKBKK107	SamskrutikaKannada / Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
8	AEC/SDC	BIDTK158	Innovation and Design Thinking	Any Dept	0	2	0	0	02	50	50	100	01
				TOTAL	**13**	**8**	**6**	**0**	**19**	**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**-Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

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

Student's Induction Program: Motivating (Inspiring) Activities under the Induction program – The main aim of the induction program is to provide newly admitted students a broad understanding of society, relationships, and values. Along with the knowledge and skill of his/her study, students' character needs to be nurtured as an essential quality by which he/she would understand and fulfill the responsibility as an engineer. The following activities are to be covered in 21 days. Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to Local areas, Familiarization with Department/Branch and Innovation, etc. For details, refer the ANNEXURE-I of Induction Programs notification of the University published at the beginning of the 1st semester.

AICTE Activity Points to be earned by students admitted to BE/ B.Tech., / B. Plan day college program (For more details refer to Chapter 6, AICTE Activity Point Program, Model Internship Guidelines): Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4 years Degree programs through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Program. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, any time during the semester weekends, and holidays, as per the liking and convenience of the student from the year of entry to the program. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth Semester Grade Card shall be issued only after earning the required activity points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

***-**BMATM101 Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. ****The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.**

#-BPHYM102 SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0).**All 01 Credit-** courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
BESCK104A	Introduction to Civil Engineering	3	0	0	BETCK105A	Smart Materials and Systems	3	0	0
BESCK104B	Introduction to Electrical Engineering	3	0	0	BETCK105B	Green Buildings	3	0	0
BESCK104C	Introduction to Electronics Engineering	3	0	0	BETCK105C	Introduction to Nano Technology	3	0	0
BESCK104D	Introduction to Mechanical Engineering	3	0	0	BETCK105D	Introduction to Sustainable Engineering	3	0	0
BESCK104E	Introduction to C Programming	2	0	2	BETCK105E	Renewable Energy Sources	3	0	0
					BETCK105F	Waste Management	3	0	0
					BETCK105G	Emerging Applications of Biosensors	3	0	0
					BETCK105H	Introduction to Internet of Things (IOT)	3	0	0
					BETCK105I	Introduction to Cyber Security	3	0	0
					BETCK105J	**Introduction to Embedded System**	3	0	0
(PLC-I) Programming Language Courses-I									
Code	**Title**	**L**	**T**	**P**					
BPLCK105A	Introduction to Web Programming	2	0	2					
BPLCK105B	Introduction to Python Programming	2	0	2					
BPLCK105C	Basics to JAVA programming	2	0	2					
BPLCK105D	Introduction to C++ Programming	2	0	2					
The course BSCK104E, **Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT**									

- The student has to select one course from the ESC-I group.
- MES stream Students shall opt for any one of the courses from the ESC-I group **except, BESCK104D - Introduction to MechanicalEngineering**
- 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 either ETC-I or PLC-I group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institution Affiliated to VTU, Belagavi)

Scheme of Teaching and Examinations-2022

Outcome-Based Education (OBE)and Choice Based Credit System (CBCS)

(Effective from the academic year 2022-23)

II Semester (Mechanical Engineering Stream) **Dept ME** **(For the students who attend the 1st semester under Physics Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	*ASC(IC)	BMATM201	Mathematics for MES-II	Maths	2	2	2	0	03	50	50	100	04
2	#ASC(IC)	BCHEM202	Chemistry for MES	Chemistry	2	2	2	0	03	50	50	100	04
3	ESC	BCEDK203	Computer-Aided Engineering Drawing	Civil/Mech Engg dept	2	0	2	0	03	50	50	100	03
4	ESC-II	BESCK204C	Introduction to Electronics Engineering	Respective Engg Dept	3	0	0	0	03	50	50	100	03
5	PLC-II	BPLCK205B	Introduction to Python Programming	Any Dept	2	0	2	0	03	50	50	100	03
6	AEC	BPWSK206	Professional Writing Skills in English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMS	BICOK207	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01
8	AEC/SEC	BSFHK258	Scientific Foundations for Health	Any Dept	1	0	0	0	01	50	50	100	01
				TOTAL	**14**	**4**	**8**	**0**	**18**	**400**	**400**	**800**	**20**

SDA-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE** -Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** – Integrated Course (Theory Course Integrated with Practical Course)

-BMATM201** Shall have the 03 hours of theory examination(SEE), however, practical sessions question shall be included in the theory question papers. * The mathematics subject should be taught by a single faculty member per division, with no sharing of the course(subject)module-wise by different faculty members.**

#-BCHEM202- SEE shall have the 03 hours of theory examination and 02-03 hours of practical examination

ESC or ETC of 03 credits Courses shall have only a theory component (L:T :P:S=3:0:0:0) or if the nature the of course required practical learning syllabus shall be designed as an Integrated course (L:T:P:S= 2:0:2:0)

All 01 Credit- courses shall have the SEE of 01 hours duration and the pattern of the question paper shall be MCQ

(ESC-II) Engineering Science Courses-II					**(ETC-II) Emerging Technology Courses-II**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
BESCK204A	Introduction to Civil Engineering	3	0	0	BETCK205A	Smart materials and Systems	3	0	0
BESCK204B	Introduction to Electrical Engineering	3	0	0	BETCK205B	Green Buildings	3	0	0
BESCK204C	Introduction to Electronics Engineering	3	0	0	BETCK205C	Introduction to Nano Technology	3	0	0
BESCK204D	Introduction to Mechanical Engineering	3	0	0	BETCK205D	Introduction to Sustainable Engineering	3	0	0
BESCK204E	Introduction to C Programming	2	0	2	BETCK205E	Renewable Energy Sources	3	0	0
					BETCK205F	Waste Management	3	0	0
					BETCK205G	Emerging Applications of Biosensors	3	0	0
					BETCK205H	Introduction to Internet of Things(IoT)	3	0	0
					BETC2K05I	Introduction to Cyber Security	3	0	0
					BETC2K05J	**Introduction to Embedded System**	**3**	**0**	**0**
(PLC-II) Programming Language Courses-II									
Code	**Title**	**L**	**T**	**P**					
BPLCK205A	Introduction to Web Programming	2	0	2					
BPLCK205B	Introduction to Python Programming	2	0	2					
BPLCK205C	Basics of JAVA programming	2	0	2					
BPLCK205D	Introduction to C++ Programming	2	0	2					
The course BESCK205E, Introduction to C Programming, and all courses under PLC and ETC groups can be taught by faculty of ANY DEPARTMENT									

- The student has to select one course from the ESC-II group.
- Mechanical Engineering stream Students shall opt for any one of the courses from the ESC-II group **except, BESCK204D -Introduction to Mechanical 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 either ETC-II or PLC-II group.
- If students study the subject from ETC-I in 1st semester he/she has to select the course from PLC-II in the 2nd semester and vice-versa

BMS Institute of Technology & Management

(An Autonomous Institute under VTU, Belagavi, Karnataka - 590018)
Avalahalli, Doddaballapur Main Road, Bengaluru – 560064

I Semester

Course Title:	**Mathematics-I for Mechanical Engineering stream**		
Course Code:	**BMATM101**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:2:2:0	Exam Hours	03
Total Hours of Pedagogy	40 hours Theory + 10-12 Lab slots	Credits	04

Course objectives: The goal of the course **Calculus, Ordinary Differential Equations and Linear Algebra** (**22MATM11**) is to

- **Familiarize** the importance of calculus associated with one variable and two variables for Mechanical engineering.
- **Analyze** Mechanical engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

Teaching-Learning Process
Pedagogy (General Instructions):
These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop student's theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module-1 Calculus (8 hours)

Introduction to polar coordinates and curvature relating to mechanical engineering.

Polar coordinates, Polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems.

Self-study: Center and circle of curvature, evolutes and involutes.
Applications: Applied Mechanics, Strength of Materials, Elasticity.
(RBT Levels: L1, L2 and L3)

Module-2 Series Expansion and Multivariable Calculus (8 hours)

Introduction to series expansion and partial differentiation in the field of mechanical engineering applications.

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

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with a single constraint.

Applications: Computation of stress and strain, Errors and approximations in manufacturing process, Estimating the critical points and extreme values, vector calculus.
(RBT Levels: L1, L2 and L3)

Module-3 Ordinary Differential Equations (ODEs) of first order (8 hours)

Introduction to first order ordinary differential equations pertaining to the applications for mechanical engineering.

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations - Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Applications of ODE's – Orthogonal Trajectories, Newton's law of cooling.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations. **Problems.**

Self-Study: Applications of ODE's: L-R circuits. Solvable for x and y.
Applications: Rate of Growth or Decay, Conduction of heat.
(RBT Levels: L1, L2 and L3)

Module-4 Ordinary Differential Equations of higher order (8 hours)

Importance of higher-order ordinary differential equations in Mechanical Engineering applications.

Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre homogeneous differential equations. Problems.

Self-Study: Formulation and solution of oscillations of a spring. Finding the solution by the method of undetermined coefficients.
Applications: Applications to oscillations of a spring, Mechanical systems and Transmission lines.
(RBT Levels: L1, L2 and L3)

Module-5 Linear Algebra (8 hours)

Introduction of liner algebra related to Mechanical Engineering applications.
Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss - Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector.

Self-Study: Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications of Linear Algebra: Network Analysis, Balancing equations.
(RBT Levels: L1, L2 and L3)

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	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Solutions of Second order ordinary differential equations with initial/ boundary conditions
7	Solution of differential equation of oscillations of a spring with various load
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 eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Suggested software's : Mathematica/MatLab/Python/Scilab

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

CO1	Apply the knowledge of calculus to solve problems related to polar curves.
CO2	Learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO3	Analyze the solution of linear ~~and n~~on ~~-li~~near ord~~i~~n~~ary~~ di~~ff~~erential equations.
CO4	Get acquainted with solving equations by matrix methods
CO5	Get familiarize with modern mathematical tools namely SCILAB/PYTHON/MATLAB

Question paper pattern:

- **SEE** will be conducted for 100 marks.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module.
- There will be three tests and 2 assignments for theory and 1 test for lab under **CIE**.
- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The CIE marks distribution for theory is 20 marks from the three tests and 10 marks from two assignments. There will be 20 marks allocated for lab test.

CIE test will be announced prior to the commencement of the course.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
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, 10th Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
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.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminar

COs and POs Mapping (Individual teacher has to fill up)

COs	POs						
	1	**2**	**3**	**4**	**5**	**6**	**7**
CO1	3	2					
CO2	3	2					
CO3	3	2					
CO4	3	2					
CO5					3		

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

DEPARTMENT OF PHYSICS
Choice Based Credit System (CBCS)
SEMESTER - I/II

PHYSICS FOR ME STREAM (2:2:2) 4
(SPECIFIC TO MECHANICAL STREAM BRANCHES)
(Effective from the academic year 2022 -2023)

Course Code	**BPHYM102/202**	**CIE Marks**	**50**
Course Type	**Integrated**	**Course Credit**	**4**
Teaching Hours/Week (L:T:P:S)	**2:2:2:0**	**SEE Marks**	**50**
Total Number of contact Hours Theory/lab sessions	**40 hours Theory + 12 lab sessions**	**Exam Hours**	**03 + 02**

Course Objectives:
This course will enable students to:

- To understand the types of oscillation, shock waves & its generation, and applications.
- To Study the elastic properties of materials and failures of engineering materials.
- To understand the fundamentals of thermoelectric materials and devices and their application.
- To study the essentials of photonics and crystal structures for engineering applications.
- To study the various relevant material characterization techniques.
- Apply the concepts required for the measurement of physical parameters related to engineering.
- Compare and analyze the results of the experiments.

Preamble: Introduction, Oscillations and shock waves - Applications. Elastic, thermoelectric properties of materials and their applications, Lasers and its applications, structure of materials and its characterization techniques.

Module – 1

Oscillations and Shock waves

Self-study topics: Basics of Oscillations, Simple Harmonic motion, Differential equation for SHM, Types of springs and their applications, Types of sound waves.

Oscillations: Introduction, Free oscillations of Springs, Stiffness Factor and its Physical significance, series and parallel combination of springs(Derivation).Theory of damped oscillations (Qualitative), Types of damping (Graphical approach). Theory of forced oscillations (Derivation), resonance, sharpness of resonance. Applications of oscillations, Numerical Problems.

Shock waves: Introduction, Mach number and Mach Angle, definition and characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves, Numerical problems.

(8 Hours)

Module – 2

Elasticity

Self-study topics: Basics of Elasticity, Stress& Strain Curve.

Elasticity: Introduction, Poisson's ratio. Derivations of relation between (Y, n & σ) and (K, Y &σ), limiting values of Poisson's ratio, Strain Hardening and Strain softening, Beams- bending moment (derivation), Cantilever-expression for young's modulus (derivation), I-section girder and their Engineering Applications. Factors affecting the elastic properties. Numerical problems.

(8 Hours)

Module – 3

Thermoelectric materials and devices

Self-study topics: Different forms of energy and their conversions, basics of electrical conductivity, emf and current.

Introduction, Thermo emf and thermo current, Seeback effect, Peltier effect, Seeback and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T_1 and T_2, thermo couples, thermopile, Construction and working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (RTG), Numerical Problems. **(8 Hours)**

Module – 4

LASER and Crystal Structure

Self-study topics: Properties of light, Basics of crystal structure.

LASER: Introduction, Properties of a laser Beam, Interaction of Radiation with Matter, Condition for laser action- Population Inversion, Metastable State, Requisites of a Laser System, construction and working of CO_2 laser, Applications: Laser Range finder and LIDAR, Numerical Problems.

Crystal Structure: Introduction, crystal systems, crystal planes and Miller indices, Inter-planar spacing (derivation), Pervoskites, Polymorphism, Numerical Problems.

(8 Hours)

Module – 5

Materials Characterization and Instrumentation Techniques

Self-study topics: Principle and working of optical Microscope, Bragg's law, X-Ray Diffraction.

Introduction to Nano materials: Introduction, Nanomaterials and nanocomposite. Principle, construction and working of powder X-ray Diffractometer, crystallite size determination by Scherrer equation.

Instrumentation Techniques: Principle, construction, working and applications of Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) and Atomic Force Microscopy (AFM), Numerical Problems.

(8 Hours)

Laboratory component

(10 experiments have to be completed from the list of experiments)

List of experiments:

1. Uniform Bending
2. n by Torsional Pendulum
3. Forced Mechanical Oscillations and resonance
4. Series and parallel resonance
5. Fermi Energy of Conductor
6. Spring Constant
7. Resistivity by Four Probe Method
8. Single Cantilever
9. Energy band gap of a given semiconductor
10. Laser diffraction
11. I by torsional pendulum
12. Optical Fiber
13. Reddy's Shock tube
14. Study of motion using spread Sheets

15. Application of Statistics using Spread Sheet
16. PHET Interactive Simulation

Course outcomes (COs):

The students will be able to:

CO_1: Apply the principles of oscillations, waves and elasticity in materials.

CO_2: Apply the principles of thermoelectricity and solid state physics for mechanical engineering applications.

CO_3: Analyze the optical, mechanical and materials properties for various applications.

CO_4: Evaluate the physical parameters for the related technology.

CO_5: Evaluate and interpret the obtained experimental result (s) related to engineering fields.

Continuous Internal Evaluation (CIE)

PHYSICS (L:T:P/Credit = 2:2:2/4) **Duration: 03**

		Internal Assessment	**Max-marks**	**Average marks**	**Marks after Scale-Down**	**Final Marks**
Theory Component	IA	IA-1 (1.5 hrs.)	40	30	**30 Marks** **Passing standard** (40% i.e., 12 marks)	30+20 = 50
		IA-2 (1.5 hrs.)	40			
		IA-3 (1.5 hrs.)	40			
	Assignment	A1 (1 hr)	10	10		
	AAT	AAT-1 (1 hr)	10			
Practical Component	Cumulative marks of experiments	30 marks per experiment (conduction, calculation, viva, report, record submission, 2hrs/per week, batch strength: 18	-	15	**20 Marks** **Passing standard** (40% i.e., 08 marks)	
	IA	IA (02/03 hrs.)	50	05		

Semester End Examination (SEE)

Examination Duration: 3 hrs. **Max. Marks**: **100**

Note: The maximum of 04/05 questions to be set from the practical component of the integrated course, the total marks of all question should not be more than 30 marks.

			Max. Marks	**Max. Marks**	**Final marks**
Theory Component	No. of modules	05	200	100	**50** **Passing standard** (35 % i.e., 18 marks)
	Questions/Module	02	40		
	Marks/Question	20	20		
	No. of Question to be answered/module	01	20		
	No. of Questions to be answered /course	05	100		

Note: A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if **CIE** score ≥**40 %, SEE** score ≥**35 %,** and a sum total of **CIE+SEE** ≥**40 %.**

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. M N Avadhanulu and P G Kshirsagar, "Engineering Physics," S. Chand and company Pvt. Ltd., 11th edition, 2014.
2. R K Gaur & S L Gupta, "Engineering Physics," Dhanpat Rai Publications, 8th edition, 2018.
3. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition
4. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
5. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997
6. Mechanical Properties of Engineered Materials by Wole Soboyejo, CRC Press; 1st edition, 2002
7. Heat & Thermodynamics and Statistical Physics (XVIII-Edition) – Singhal, Agarwal &Satyaprakash – Pragati Prakashan, Meerut, 2006. 4
8. Heat and Thermodynamics (I-Edition) – D.S.Mathur - S. Chand & Company Ltd., New-Delhi, 1991
9. Heat and Thermodynamics,Brijlal& Subramanyam,S. Chand & Company Ltd., New-Delhi.
10. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.
11. Characterization of Materials- Mitra P.K . Prentice Hall India Learning Private Limited.
12. Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S.Ramachandra Rao & Shubra Singh, Wiley, India Pvt Ltd.
13. Nano Composite Materials-Synthesis, Properties and Applications, J. Parameswaranpillai, N.Hameed, T.Kurian, Y. Yu, CRC Press.
14. Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd,Delhi,2014
15. S O Pillai, "Solid State Physics," New Age International publishers, 8th edition, 2017.
16. David Jeffery Griffiths, "Introduction to Electrodynamics", Pearson New International Edition, 4th edition, 2017
17. B B Laud, "Lasers and Non-Linear Optics," New Age International publishers, 3rd edition, 2018.
18. Arthur Beiser, "Concepts of Modern Physics", Tata McGraw-Hill Education, 6th edition, 2010.
19. Resnick, Walker and Halliday "Principles of Physics, Wiley publisher, 10th edition, 2015.
20. Ben G. Streetman, Sanjay Banerjee, "Solid State Electronic Devices" Pearson Prentice Hall, 6th edition, 2010.
21. S. K. Dwivedi, A Textbook of Engineering Physics, I K International Publishing House Pvt. Ltd., 1st edition 2010.
22. C L Arora, "B.Sc. Practical Physics", S CHAND and company Ltd. 1st edition 2010
    Worsnop and Flint, "Advanced physics practical for students", Metuen and Co, London 2005.
23. D Chattopadhyay and P C Rakshit, "Advanced course in Practical Physics", New central book agency 8th edition, 2013.

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 theirapplications: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=PLtkeUZItwHK5y6qy1GFxa4Z4RcmzUaaz6

DEPARTMENT OF MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – I

ELEMENTS OF MECHANICAL ENGINEERING (2:1:0) 3
(Effective from the academic year 2022-23)

Course Code	**BEMEM103/203**	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:
This course will enable students to:

1. Identify different sources of energy and their conversion process.
2. Explain the working principle of IC engines, EV's, Hybrid electric vehicles and refrigeration.
3. Recognize various metal joining processes and power transmission elements.
4. Discuss the working of conventional machine tools, machining processes, tools and accessories.
5. Describe the advanced manufacturing systems, robotics and concepts of IoT.

Module – 1

Preamble: Importance of Mechanical Engineering in the current scenario, industrial /defence application, research in the field of Mechanical Engineering, impact of Mechanical Engineering on societal and sustainable solutions. World energy outlook.

Conventional energy sources: Fossil fuels: solid, liquid and gaseous fuels.

Non-conventional energy sources: Solar power: principle of conversion, flat plate collector, Wind energy: conversion, wind mill and Hydro power: hydro power station.

Refrigeration: Principle of refrigeration, refrigerants and its properties, parts of refrigerator, terms used in refrigeration system, principle and working of vapour compression refrigerator, room air conditioner.

(8 Hours)

Self- Study: Working of central air conditioning system

Module – 2

Internal Combustion Engines: Parts, terminology**,** working of 4 stroke petrol and diesel engine, comparison between petrol and diesel engine, numerical problems

Electric vehicles (EV) and Hybrid Electric vehicles (HEV): Basic principles of EV and HEV. Components of EV and HEV. Power transmission in EV and HEV.

(7 Hours)

Self- Study: Working of hovercraft.

Module – 3

Metal Joining Processes: Soldering: method, types, advantages; Welding: Principle of Arc, TIG and MIG welding.

Belt Drives: Open and cross belt-drives, pulleys and its types, velocity ratio of pulleys, creep and slip in the belts, derivation for length of belt, numerical problems on length of belt and tension in a belt.

Gear Drives: Types of gear drives, advantages and disadvantages of gear drives over belt drives.

Hands on Training: Soldering, arc, gas, MIG and TIG welding

(9 hours)

Self- Study: Brazing and gas welding.

Module – 4

Conventional Machine Tool: Lathe, engine lathe, specification, major parts; Lathe operations: plain turning, taper turning by swivelling compound rest, facing, thread cutting, drilling, knurling. (Sketches to be used only for explaining the operations)

Computer Numerical Control (CNC) machines: Elements of a CNC system, salient features of CNC controls, advantages and disadvantages of CNC.

Hands on Training: Operations of lathe machine.

(8 hours)

Self- Study: 3D printing technologies and applications.

Module – 5

Industrial Automation: Types of automation: Fixed, programmable and flexible automation; basic elements with block diagrams; Control systems: Closed loop and open loop

Robotics: Elements of robotic system, type of robotic joints; robotics configuration: polar, cylindrical, cartesian; applications of robots: material handling, process operation and assembly and inspection; advantages and disadvantages of industrial robotics.

Internet of Things (IoT): Fundamental concept, definition and characteristics, things in IoT, IoT functional blocks and IoT communication models.

(08 hours)

Self- Study: IoT in industry.

Course Outcomes:

The students will be able to:

CO1:	Summarize various energy conversions, refrigeration system and air conditioners.
CO2:	Describe working principles of power transmission systems and advanced mobility systems.
CO3:	Analyze the performance of IC engines and power transmitting devices.
CO4:	Identify suitable conventional and advanced manufacturing processes for real world applications.
CO5:	Demonstrate ability to work as an individual and a team member to investigate the recent technologies by self-learning.

Assessment Methods:

<table>
<tr><th colspan="7">CONTINUOUS INTERNAL EVALUATION (CIE)</th></tr>
<tr><th colspan="2"></th><th>Internal Assessments</th><th>Max. Marks</th><th>Average Marks</th><th>Marks after scale-down</th><th>Final Marks</th></tr>
<tr><td rowspan="5">Theory Component</td><td rowspan="3">IA</td><td>IA-1 (1.5 hrs)</td><td>40</td><td rowspan="3">40</td><td rowspan="3">30</td><td rowspan="5">50

Passing Standard (40% i. e 20 Marks)</td></tr>
<tr><td>IA-2 (1.5 hrs)</td><td>40</td></tr>
<tr><td>IA-3 (1.5 hrs)</td><td>40</td></tr>
<tr><td>Assignment</td><td>A-1 (1hr)</td><td>20</td><td rowspan="2">20</td><td rowspan="2">20</td></tr>
<tr><td>AAT</td><td>AAT-1 (1 hr)</td><td>20</td></tr>
<tr><td colspan="7">SEMESTER END EXAMINATION (SEE)
Examination Duration: 03 hrs Max. Marks: 100</td></tr>
<tr><th colspan="3"></th><th>Max. Marks</th><th colspan="2">Max. Marks</th><th>Final Marks</th></tr>
<tr><td rowspan="5">Theory Component</td><td>No. of Modules</td><td>05</td><td>200</td><td rowspan="5" colspan="2">100</td><td rowspan="5">50

Passing Standard (40% i. e 20 Marks)</td></tr>
<tr><td>Questions/ Module</td><td>02</td><td>40</td></tr>
<tr><td>Marks/ Question</td><td>20</td><td>20</td></tr>
<tr><td>No. of Questions to be answered/ module</td><td>01</td><td>20</td></tr>
<tr><td>No. of Questions to be answered/ course</td><td>05</td><td>100</td></tr>
<tr><td colspan="7">A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if CIE Score ≥ 40 %, SEE Score ≥ 35 %, and a sum total of CIE + SEE Score ≥ 40%</td></tr>
</table>

Textbooks:

1. K. R. Gopalakrishna, "Elements of Mechanical Engineering", Subhas Publications, 38th Edition, 2019.
2. K. P Roy, "Elements of Mechanical Engineering", Media Promoters & Amp; Publishing Pvt. Ltd, 7th Edition, 2014.

References:

1. S. Trymbaka Murthy, "Text book of Elements of Mechanical Engineering", MEDTECH, Scientific International Pvt Ltd, 1st Edition, 2019.
2. Husain, Iqbal, "Electric and Hybrid Vehicles: Design Fundamentls", CRC Press, 3rd Edition, 2021.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things a Hands on Approach", Hydrabad Universities Press, 2020.
4. Dr. A. S. Ravindra, "Elements of Mechanical Engineering", Best Publications, 7th Edition, 2009.

B.E COMPUTER SCIENCE AND ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – I / II

ESC-1 Introduction to C Programming (2:0:2) 3
(Effective from the academic year 2022-2023)

Course Code	**BESCK104E/204E**	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:2	SEE Marks	50
Total Number of Contact Hours	26(L) + 26(T)	Exam Hours	03

Course Objectives:

1. Elucidate the basic architecture and functionalities of a computer.
2. Apply programming constructs of C language to solve the real-world problems.
3. Explore user-defined data structures like arrays, structures, and pointers in implementing solutions to problems.
4. Design and Develop Solutions to problems using modular programming constructs such as functions and procedures.

Module – I

Introduction to C: Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C.

Textbook: Chapter 1.1-1.9, 2.1-2.2, 8.1 – 8.6, 9.1-9.14 **(6 Hours)**

Module – II

Operators in C, Type conversion and typecasting.

Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.

Textbook: Chapter 9.15-9.16, 10.1-10.6 **(6 Hours)**

Module – III

Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.

Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays,Passing arrays to functions.

Textbook: Chapter 11.1-11.13, 12.1-12. **(6 Hours)**

Module – IV

Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays.

Applications of arrays and introduction to strings: Applications of arrays, case study with sorting techniques.

Introduction to strings: Reading strings, writing strings, summary of functions used to read and write characters.Suppressing input using a Scan set.

Textbook: Chapter 12.7-12.12 **(6 Hours)**

Module – V

Strings: String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings.

Pointers: Understanding the Computer's Memory, Introduction to Pointers, Declaring Pointer Variables

Structures: Introduction to structures.

Textbook:Chapter13.1-13.6,14.1-14.3,15.1 **(6 Hours)**

List of Laboratory experiments (2 hours/week per batch/ batch strength 36)

1	C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
2	C Program to convert Kilometers into Meters and Centimeters.
3	C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b1, b2, b3 such that the equation is balanced on both sides and it must be the reduced form.
5	Implement Matrix multiplication and validate the rules of multiplication.
6	Compute sin(x)/cos(x) using Taylor series approximation. Compare you result with the built-in library function. Print both the results with appropriate inferences.
7	Sort the given set of N numbers using Bubblesort.
8	Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
9	Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students.
10	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.

Suggested software's : gcc compiler, Ubuntu Operating System

Course Outcomes

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

CO1. Elucidate the basic architecture and functionalities of a computer and recognize the hardware parts.

CO2. Apply programming constructs of C language to solve the real-world problem.

CO3. Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.

CO4. Explore user-defined data structures like structures, unions and pointers in implementing solutions.

CO5. Design and Develop Solutions to problems using modular programming constructs using functions.

CONTINUOUS INTERNAL EVALUATION (CIE)

		Internal Assessments (IAs)	Max. Marks	Average Marks	Marks after scale-down	Final Marks
Theory Component	IA	IA-1 (1.5 hr)	40	40	30 Marks **Passing Standard** (40% i. e 12 Marks)	**30 +20 = 50**
		IA-2 (1.5 hr)	40			
		IA-3 (1.5 hr)	40			
	Assignment	A-1 (1 hr)	10	10		
	AAT	AAT-1 (1 hr)	10			
Practical Component	Cumulative Marks of Experiments	10 Marks/ Expt. (Write-up, Conduction, Viva-voce, Report, etc.) (2 hrs/Week) / batch (Strength: 36)	-	15	20 Marks **Passing Standard** (40% i. e 08 Marks)	
	IA	IA-1 (02/03 hrs)	50	5		

SEMESTER END EXAMINATION (SEE)

Examination Duration: 03 hrs **Max. Marks:** 100

Note: The maximum of 04/05 questions to be set from the practical component of integrated course, the total marks of all questions should not be more than 30 marks.

			Max. Marks	Max. Marks	Final Marks
Theory Component	No. of Modules	05	200	100	50 **Passing Standard** (35% i.e 18 Marks)
	No. of Questions/ Module	02	40		
	Marks/Question	20	20		
	No. of Questions to be answered/ module	01	20		
	No. of Questions to be answered/ course	05	100		

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if **CIE Score ≥ 40 %**, **SEE Score ≥ 35 %,** and a sum total of **CIE + SEE Score ≥ 40%**

Text books:

1. Computer fundamentals and programming in c, “Reema Thareja”, Oxford University, Second edition, 2017.

References:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGowan-Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1.Elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html

2.https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity inunderstanding the topics and verities of problem solving methods.

DEPARTMENT OF MECHANICAL ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER – I/II

ETC -1 SMART MATERIALS AND SYSTEMS (3:0:0) 3
(Common to all Branches)
(Effective from the academic year 2022-23)

Course Code	**BETCK105A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:
This course will enable students to:

1. Study various types of smart materials used in engineering application.
2. Study basics of smart sensors, actuators deployed in engineering application.
3. Understand the coupling properties and underlying physical phenomena of different active materials.
4. Describe the basic principles and mechanisms of the stimuli-response for the most important smart materials.
5. Propose improvement on the design, analysis, manufacturing and application issues involved in integrating smart materials and devices under various engineering structures and products.
6. Demonstrate knowledge and understanding of the physical principles underlying the behaviour of Shape Memory Alloy and piezoelectric materials.

Module – 1

Preamble: Relevance of material science in day today activities, Importance of materials in industrial, defence and research application and its economic implications.

Smart Materials and Structures: Introduction to Smart Materials, need of smart materials, types of smart materials, difference between smart materials and structure, components of smart materials, properties of smart materials, advantages and disadvantages of smart materials, applications of smart structures.

(8 Hours)

Self-study: Smart clothes and Smart Shoes.

Module – 2

Shape Memory Alloys: Introduction shape memory alloys, Shape memory effect, Processing and characteristics. Experimental Phenomenology: one way and two way memory, advantages and disadvantages and applications

(8 Hours)

Self- Study: NiTiNOL shape Memory

Module – 3

Piezoelectric Smart Materials: Introduction, Inchworm Linear motor, Properties of Piezoelectric materials, Applications, Comparison of major sensing and actuation methods.

MEMS: Introduction to MEMS, Intrinsic characteristics, advantages and disadvantages of MEMS, applications.

(8 hours)

Self- Study: Accelerometers, gyroscopes used in cell phones

Module – 4

FibreOptics: Introduction, Physical Phenomenon, Characteristics, Fibre optic strain sensors (types only), Optical fibres as load bearing elements, Crack detection applications.

Biomimetics: Characteristics of Natural structures. Fibre reinforced: Organic matrix natural composites, Natural creamers, Mollusks. Biomimetic sensing.

(8 hours)

Self- Study: Elephant trunk.

Module – 5

Electro rheological (ER) and Magneto rheological (MR) Fluids: Mechanisms and Properties, Characteristics, Fluid composition and behaviour, Application of ER and MR fluids (Only Brakes, Clutches and Dampers).

Environmental and sustainable concerns: Lead free smart materials for energy harvesting applications.

(08 hours)

Self- Study: Application of Rheological fluids for valves

Course Outcomes:

The students will be able to:

CO1:	Describe the physical phenomenon, properties, and characteristics of various smart materials.
CO2:	Identify and analyze various smart materials and components for their properties based on the applications.
CO3:	Summarize the latest developments in the field of smart materials and system.
CO4:	Discuss on environmental and sustainable concerns with respect to smart material.

Assessment Methods:

CONTINUOUS INTERNAL EVALUATION (CIE)						
		Internal Assessments (IAs)	**Max. Marks**	**Average Marks**	**Marks after scale-down**	**Final Marks**
Theory Component	IA	IA-1 (1.5 hrs)	40	40	30	50 **Passing Standard** (40% i. e 20 Marks)
		IA-2 (1.5 hrs)	40			
		IA-3 (1.5 hrs)	40			
	Assignment	A-1 (1hr)	20	20	20	
	AAT	AAT-1 (1 hr)	20			

SEMESTER END EXAMINATION (SEE)					
Examination Duration: 03 hrs					Max. Marks: 100
			Max. Marks	**Max. Marks**	**Final Marks**
Theory Component	No. of Modules	05	200	100	50 **Passing Standard** (40% i. e 20 Marks)
	Questions/ Module	02	40		
	Marks/ Question	20	20		
	No. of Questions to be answered/ module	01	20		
	No. of Questions to be answered/ course	05	100		
A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if **CIE Score ≥ 40 %**, **SEE Score ≥ 35 %,** and a sum total of **CIE + SEE Score ≥ 40%**					

Textbooks:

1. Smart Structures –Analysis and Design, A.V.Srinivasan, Cambridge University Press, New York, 2001, (ISBN:139780521154383).
2. Smart Materials and Structures, M.V.Gandhi and B.S.Thompson Chapmen & Hall, London, 1992 (ISBN:0412370107)

References:

1. Smart Structures: Physical Behaviour, Mathematical Modelling and Applications, P. Gauenzi, Wiley, 2009.
2. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, Berlin, New York, 2002.
3. Analysis and Performance of Fiber Composites, B. D. Agarwal and L. J. Broutman, John Wiley & Sons, 2015.
4. Engineering aspects of Shape memory Alloys, T. W. Duerig, K. N. Melton, D. Stockel,C, Mayman, Butterworth, Heinemann, 1990.
5. Smart Structures and Materials, Brian Culshaw, Artech House, 2000
6. Engineering Analysis of Smart Material Systems by Donald J. Leo, 2007.

Version 1

Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
SEMESTER – I

Communicative English (1:0:0) 1
(Common to all Branches)
(Effective from the academic year 2022-2023)

Course Code	**BENGK106**	CIE Marks	50
Teaching Hours/Week (L: T:P)	1:0:0	SEE Marks	50
Total Number of Lecture Hours	15	Exam Hours	01

Course objectives:

This course will enable students to

1. Familiarise with basic English Grammar and Communication Skills in general.
2. Identify the nuances of phonetics, intonation and enhance pronunciation skills
3. Enhance English vocabulary and language proficiency for better communication skills.
4. Learn about Techniques of Information Transfer through presentation.

Module – 1

Preamble: Importance of English grammar, Vocabulary and Communication skills enhancing the employability skills of Engineering graduates.

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, Intrapersonal and Interpersonal Communication Skills. **3 hours**

Module – 2

Introduction to Phonetics: Phonetic Transcription, Sounds in Phonetics (44 sounds), Diphthongs, Consonants and Vowels, Pronunciation, Common errors in pronunciation, Word accent, Voice modulation, Tone and pitch, Mother Tongue Influence, Various Techniques for Neutralization of Mother Tongue Influence. **3 hours**

Module – 3

Introduction to English Grammar: Basic English Grammar: Parts of Speech, Use of Articles and Prepositions. Word Formation, One Word Substitution, Question Tags, Strong and weak forms of Words, Affixes (prefix and Suffix)- Exercises **3 hours**

Module – 4

Basic English Communicative Grammar and Vocabulary: Introduction to Vocabulary, All types of Vocabulary -Exercises, Tense and Types of Tenses, The Sequence of Tenses (rules in use) Exercises on Tenses, Abbreviations, Contractions, Word Pairs (Minimal Pairs) **3 hours**

Module – 5

Communication Skills for Employment: Information Transfer: Oral Presentation and its Practices. Difference between Extempore\ Public Speaking, Communication Guidelines, Reading and Listing Comprehension-Exercises. **3 hours**

Course outcomes: The students will be able to:

1. Understand and apply basic English grammar for effective communication.
2. Identify the nuances of phonetics, intonation and enhance pronunciation skills.
3. Understand and use all types of English vocabulary and language proficiency.
4. Enhance their knowledge about techniques of information transfer through presentations.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus
- Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and Pos (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE

Textbooks

1. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford Publications, 3rd Edition, 2015
2. Sanjay Kumar and Pushpa Lata, Communication Skills, Oxford University Press,
3. A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

References

1. Gajendra Singh Chauhan, Technical Communication Cengage Learning India Pvt Limited, Latest Revised Edition, 2019
2. Michael Swan, Practical English Usage, Oxford University Press, 2016
3. N.P.Sudharshana and C.Savitha, English for Engineers, Cambridge University Press ,2018

Version 1

Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
SEMESTER – I/II

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ Samskrutika Kannada (1:0:0):1

(Effective from the academic year 2022-2023)

ವಿಷಯ ಸಂಕೇತ Course Code	BKSKK107/207	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನದ ಅಂಕಗಳು CIE Marks	**50**
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ Teaching hours/Week (L: T:P)	**1:0:0**	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು SEE Marks	**50**
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Number of contact hours	**15**	ಪರೀಕ್ಷೆಯ ಅವಧಿ Exam Hours	**01**

Course Objectives: ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪತ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. **ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.**
2. **ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.**
3. **ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.**
4. **ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.**
5. **ಸಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.**

ಘಟಕ–1

ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು:

ಕರ್ನಾಟ ಸಂಸ್ಕೃತಿ – ಹಂಪ ನಾಗರಜಯ್ಯ

ಕರ್ನಾಟಕ ವಿಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ–ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ

ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ–ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ **3 ಗಂಟೆಗಳು**

ಘಟಕ–2

ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ:

ವಚನಗಳು–ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ

ಕೀರ್ತನೆಗಳು–ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ–ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ–ಕನಕದಾಸರು

ತತ್ವಪದಗಳು: ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಶರೀಫ **3 ಗಂಟೆಗಳು**

ಘಟಕ–3

ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ: **ಡಿ.ವಿ.ಜಿ.ಯವರ ಮಂಕು ತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು.** ಕುರುಡು ಕಾಂಚಾಣ: ದಾ. ರಾ. ಬೇಂದ್ರೆ **ಹೊಸ ಬಾಳಿನ ಗೀತೆ: ಕುವೆಂಪು** **3 ಗಂಟೆಗಳು**
ಘಟಕ–4
ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ: **ಡಾ.ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ:ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ–ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್** **ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ–ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ** **3 ಗಂಟೆಗಳು**
ಘಟಕ–5
ಸಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ: ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ **ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ** **3 ಗಂಟೆಗಳು**
Course outcome (course skills set) **ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ** (BKSKK107/207) **ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ:** 1. **ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.** 2. **ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕುರಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.** 3. **ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯತ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗಡೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಹೆಚ್ಚಾಗುತ್ತದೆ.** 4. **ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.** 5. **ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.**
Assessment Details (both CIE and SEE) The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together. Continuous Internal Evaluation (CIE): **Two Unit Tests each of 30 Marks (duration 01 hour**) • First test after the completion of 30-40 % of the syllabus • Second test after completion of 80-90% of the syllabus One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and Pos (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE

Textbook:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ಡಾ.ಹಿ.ಚಿ ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,

ಪ್ರಸಾರಾಂಗ ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

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Department of Humanities and Social Sciences
Choice Based Credit System (CBCS)
SEMESTER – I/II

ಬಳಕೆ ಕನ್ನಡ Balake Kannada (Kannada for Usage) (1:0:0):1

(Common to all Branches)
(Effective from the academic year 2022-2023)

Course Code	BKBKK107/207	CIE Marks	50
Teaching Hours/Week (L: T:P)	1:0:0	SEE Marks	50
Total Number of Lecture Hours	15	Exam Hours	01

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು (Course Learning Objectives):

- **To Create awareness regarding the necessity of learning local language for comfortable and healthy life.**
- **To enable learners to Listen and understand the Kannada language properly.**
- **To speak, read and write Kannada language as per requirement.**
- **To train the learners for correct and polite conservation.**

Module – 1

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 conversation, Listening and Speaking Activities.Key to Transcription.**ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು.** Personal Pronouns, Possessive Forms, Interrogative words. **3 hours**

Module – 2

ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು Possessive forms of of nouns, dubitive question and Relative noun. **ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು** Qualitative, Quantitative and Colour Adjectives, Numerals. **ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು – ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ)** Predictive Forms, Locative Case. **3 hours**

Module – 3

ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು Dative cases and Numerals. **ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು** Ordinal numerals and Plural makers. **ನ್ಯೂನ/ನಿಷೇದಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ವ ಸ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು** Defective /Negative Verbs and Colour Adjectives**.** **3 hours**

Module – 4

ಅಪ್ಪಣೆ/ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and urging words (Imperative words and sentences). **ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು** Accusative Cases and Potential Forms used in General Communication. **"ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು** Helping verbs "iru and iralla" Corresponding Future and Negation Verbs. **ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧಸೂಚಕ ಮತ್ತು ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇದಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ** Comparitive, Relationship, Identification and Negation words. **3 hours**

Module – 5

ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾ ಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು, Different types of tense, time and verbs.
ದ್, ತ್, –ತು, –ಇತು, –ಆಗಿ, –ಅಲ್ಲ, –ಗ್, –ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ Formation of Past, Future and Present Tense Sentences with Verb Forms. **ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮತ್ತು**

ರಾಜ್ಯದ ಬಗ್ಗೆ ಕುರಿತಾದ ಇತರೆ ಮಾಹಿತಿಗಳು Karnataka state and general information about the state. ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ Kannada Language and Literature. ಭಾಷೆ ಕಲಿಯಲು ಏನನ್ನು ಮಾಡಬೇಕು ಮತ್ತು ಮಾಡಬಾರದು Do's and Dont's in Learning a Language **3 hours**

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು: **Course outcomes:**

At the end of the Course, The Students will be able to

1. Understand the necessity of learning of local language for comfortable life.
2. Listen and understand the Kannada language properly.
3. Speak, read and write Kannada language as per requirement.
4. Communicate (converse) in Kannada language in their daily life with Kannada speakers.
5. Speak in polite conservation

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

Two Unit Tests each of 30 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus
- Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration

Two assignments each of 20 Marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the Cos and Pos (to have a less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester End Examinations (SEE)

SEE paper shall be set for **50 questions, each of the 01 mark**. The pattern of the **question paper is MCQ** (multiple choice questions). The time allotted for SEE is **01 hour**. The student must secure a minimum of 35% of the maximum marks for SEE

Textbook:

ಬಳಕೆ ಕನ್ನಡ
ಲೇಖಕರು: ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ
ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ

All Engineering Departments
Choice Based Credit System (CBCS)
SEMESTER - I/II

Innovation and Design Thinking (0:2:0)1
(Common to all Branches)
(Effective from the academic year 2022 -2023)

Course Code	**BIDTK158**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:2:0	SEE Marks	50
Total Number of Lecture Hours	25	Exam. Hours	01

Course objectives:

This course will enable students to:

1. Demonstrate the fundamental concept of design thinking for product and service development.
2. Illustrate empathetic design for potential customers.
3. Develop and examine the problem solving techniques for innovative products and services.
4. Demonstrate the fundamental concept of innovation for product and service development.
5. To discuss the methods of implementing design thinking in the real world.

Module – 1

Introduction to Design Thinking: Introduction, Importance of design thinking, what is design thinking**:** principles of design thinking, the process of design thinking**,** double-diamond model. The Philosophy of Design thinking, rules of design thinking.

Frame work of Design Thinking: Aesthetics and creativity as design thinking mechanisms, Psychological and neural bases of creativity, a definition and framework of design thinking.

How to understand the problem: How to analyse problems, Search field determination.

Understanding of the problem: The blind spot of knowledge and awareness, Problem analysis: PESTEL-Analysis.

Case studies on PESTEL-Analysis. (5 Hours)

Module – 2

How to Observe: Observation Phase, Empathetic design, Tips for observing, Method for Empathetic Design: Behavioural Mapping and Tracking, Empathy Map, Heuristic Evaluation, Customer Journey**.**

How to Define the Problem: Point-of-view phase, Characteristics of target group, Persona, Jobs-to-be done, Means-end approach.

Ideate Phase: The creative process, success factor for creative process. brainstorming: rules and tips for brain storming, mind mapping, rules for mind mapping, synectics.

Case studies on Empathetic design. (5 Hours)

Module – 3

Evaluation of ideas: Checklists/Proc-Cons lists, assessment areas of innovations, PPCO method, SWOT analysis for ideas, theory of inventive problem solving(TRIZ), principle of evolution, innovation checklist, resource analysis.

Real-Time Design Interaction: Introduction, improving design process instrumentation, real-time design research instrument.

Collaboration in digital space: Creativity across distances, analysing design thinking working modes, evaluating existing tool for remote collaboration and digital whiteboard.

Case studies on SWOT analysis. (5 Hours)

Module – 4

Innovation Process: Model Unified innovation process model for engineering designers and managers, Feedback pathways and gates: designer and reviewer initiated.

Strategic innovations: Design thinking approach: - Growth, predictability, strategic foresight, change, sense making, value redefinition, extreme competition, experience design standardization, creative culture, rapid prototyping, strategy and organization and business model design.

Innovation Culture*:* Nested view of design thinking and practice, national culture and design practice, method, Insights: culture and design, methodological insights.

(5 Hours)

Module – 5

Prototype and Testing: Prototype phase, storyboarding, storytelling, test phase, tips for prototype testing, tips for interviews, tips for survey, requirements for space and materials, Agility for design thinking, the Scrum guide, How to conduct workshop, MVP and prototyping.

Efficacy of prototyping*:* The efficacy of prototyping under time constraints, introduction, method, materials and design task, participants, procedure, results, participant creations. interviews.

Business process modelling: Introduction, process models mediate communication, research question and iterating ideas.

(5 Hours)

Course Outcomes: The students will be able to:

1. Demonstrate the concept of design thinking for real world problems.
2. Illustrate empathetic design for potential customers.
3: Describe define and ideate phase in design thinking based on user's requirements.
4: Discuss innovation principle and culture for products and services.
5: Illustrate prototype and testing phase for products and services.

Assessment Methods

CIE Components (50 Marks)

Two Unit Tests each of 30 Marks (duration 01 hour)

Internal Assessments Tests (Two tests X 30Marks)	: 60 Marks
Assignments	: 20 Marks
Course project	: 20 Marks

The sum of two test, two assignments, will be out of 100 marks and will be scaled down to 50 marks

Semester-End Examination

- SEE question paper will be set for 50 questions of each of 01 marks
- The pattern of the question paper is MCQ.

Assessment Details (both CIE and SEE):

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).
- The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50).
- A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

1. Textbooks:
2. Christian Mueller-Roterberg, Handbook of Design Thinking, Tips & Tools for how to design thinking, Kindle Direct Publishing, 2018.
3. A Nil Hasso Plattner, Christoph Meinel and Larry Leifer, Design Thinking: Understand – Improve – Apply, Springer, 2011.
4. References:
5. Idris Mootee, Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School, John Wiley & Sons 2013.
6. Jeanne Liedtka , Andrew King , Kevin Bennett, Solving Problems with Design Thinking - Ten Stories of What Works ,Columbia Business School Publishing, 2013.
7. Gavin Ambrose Paul Harris, Basics of Design Thinking, AVA Publishing, Switzerland, 2009.

Web links and Video Lectures (e-Resources):

1. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Developmen
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering

8. https://support.microsoft.com/en-us/kb/273814

7. https://support.google.com/docs/answer/179740?hl=en

8. https://www.youtube.com/watch?v=2mjSDIBaUlM

9. thevirtualinstructor.com/foreshortening.html

10. https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf

11. https://dschool.stanford.edu/use-our-methods/ 6. https://www.interactiondesign.org/literature/article/5-stages-in-the-design-thinking-process 7.

12. http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49 8.

13. https://www.nngroup.com/articles/design-thinking/ 9.

14. https://designthinkingforeducators.com/design-thinking/ 10.

15. www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

16. NPTL : Design Thinking - A Primer - Course (nptel.ac.in)

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

http://dschool.stanford.edu/dgift/